India Studies in Business and Economics


K.L. Krishna
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# Perspectives on Economic Development and Policy in India

## In Honour of Suresh D. Tendulkar

Springer

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We dedicate this book to the memory of Prof. Suresh D. Tendulkar.

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**Part III Development and Trade**

# About the Editors and Contributors

## About the Editors

**Prof. K.L. Krishna** is currently the Chairperson of Madras Institute of Development Studies. He has been leading the India KLEMS Productivity project, funded by the Reserve Bank of India, as part of the World KLEMS Initiative, since 2009. In the past, he has served as Director, Delhi School of Economics; Head, Department of Economics as well as Dean, Faculty of Social Sciences, University of Delhi. He was also the Executive Director, Centre for Development Economics; Founding Managing Editor, *Journal of Quantitative Economics*; and President, The Indian Econometric Society. He obtained his Ph.D. in Economics from the University of Chicago and is an expert on econometrics, industrial economics, economics of productivity, regional inequality and empirics of trade.

**Prof. Vishwanath Pandit** is the former Vice Chancellor of the Sri Sathya Sai Institute of Higher Learning (Deemed University), Puttaparthi, India. He served as Head of the Department of Economics, Delhi School of Economics, University of Delhi, and also as the Executive Director of Centre for Development Economics. He was also President of The Indian Econometric Society and Editor of the journal *Indian Economic Review*. He was associated with the United Nations World Project LINK as the India representative for several years. Prof. Pandit was honoured with the UGC Swami Pramavanada Saraswati National Award for 2004. He completed his Ph.D. from the University of Pennsylvania under late Nobel Laureate Prof. Lawrence Klein and has worked extensively on macroeconomics and policy modelling, especially in the context of India.

**Prof. K. Sundaram** is Chairman, Advisory Committee on National Accounts Statistics, Central Statistical Organization, GoI and was Member, Expert Group to Review the Methodology for Measurement of Poverty, Planning Commission, GoI. He served as Head, Department of Economics as well as Dean, Faculty of Social Sciences, University of Delhi. Additionally, he was Regional Adviser, Asia and

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**Prof. Pami Dua** is the Director and Professor of Economics, Delhi School of Economics as well as Chairperson, Research Council and Dean, Academic Activities and Projects, University of Delhi. She is currently serving as a member of the Monetary Policy Committee of the Reserve Bank of India and is associated with the United Nations World Project LINK as the India representative. She is also Editor of the Indian Economic Review. She has served as Head, Department of Economics, Delhi School of Economics and is also former President of the *Indian Econometric Society*. She obtained her Ph.D. in Economics from London School of Economics and has published widely in time series econometrics, forecasting, macroeconometrics and business cycle analysis.

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# Introduction

Professor Suresh Dhondopant Tendulkar was an outstanding economist. He was among the very few academicians who combined three tasks as an excellent researcher, a dedicated teacher and a competent advisor to policy makers at the highest level; each performed to near perfection. His success lay in his analytical competence, his ability to evaluate and meaningfully utilise the available quantitative and qualitative information and on top of it, his deep understanding of problems at the grass root level. At a personal level, Suresh was a warm friend, an excellent colleague and above all a great human being. His untimely and rather sudden passing away on 21 June, 2011, in Pune where he had gone for a short family visit has been a shock which many of us are yet to reconcile with.

Born on 15 February, 1939, at Kolhapur, Maharashtra, Prof. Tendulkar had his early education in Pune where the family had moved when he was only a child. His higher education was at the Delhi School of Economics where he joined in 1960 for the Master's degree in Economic Statistics and completed it with a first class. Subsequently, he was trained at Harvard University where he secured the doctoral degree in 1968 working on a Multi-sectoral Planning Model for India with H.S. Houthakkar and H. B. Chenery as his supervisors. On his return to India in September 1968, Suresh joined the Indian Statistical Institute (ISI), Delhi, where he worked till 1978. In January 1971, he married Sunetra (nee Pramodini Nadgauda), and they had two daughters Juee and Saee, born in 1972 and 1977.

Before being invited by the University of Delhi to a Professorship at the Delhi School of Economics (DSE) in 1978, Suresh had a two year stint at the World Bank, Washington. He served as Head of the Department of Economics and later as Director, Delhi School of Economics, for three years each, and edited the journal, ***Indian Economic Review***, for six years, 1981 through 1986. He also served as the Executive Director of the Centre for Development Economics (CDE) at DSE.

Professor Tendulkar played an important role in policy formulation for India in various capacities. These included membership of the Fifth Central Pay Commission, Disinvestment Commission and the High Level Expert Committee for Long-term Grain Policy. The choice of Suresh D. Tendulkar for the Membership

and subsequently the Chairmanship of The Prime Minister's Economic Advisory Council in August 2008 was an obvious one.

Suresh had a life-long involvement with the data generation process motivated by an abiding concern for the quality of data that informed his entire academic career. His contribution to the development of India's Statistical System as it exists today has been considerable. He served as a member and later as Chairman of the governing council of the National Sample Survey organization (NSSO). He also made substantial contributions as Chairman of the National Accounts Advisory Committee. Subsequently, he served as a member of the National Statistical Commission (Chaired by Prof. C. Rangarajan) and later as the first Chairman of the newly constituted National Statistical Commission. He continued his links with the NSSO as Chairman of its steering Committee. He also served as a member of the Board of Directors for the Reserve Bank of India.

Professor Tendulkar had an exceptional ability for being effectively involved in team work for research across many areas. He authored two major books, namely, ***Reintegrating India with the World Economy***, with T.N. Srinivasan (2003) and ***Understanding Reforms: Post 1991 India***, with T.A. Bhavani (2007, 2012). He also wrote more than a hundred substantive research papers covering a wide range of subjects: from "Press as a Public Utility" (***New Quest*** 1983a) to "An Approach towards Integrating Large and Small Scale Surveys" in Bardhan (1989). It would, however, be fair to say that the measurement and analysis of living standards in India with a focus on inequality and poverty was the dominant theme of the academic work accomplished by Suresh over many years.

He wrote a series of papers with L.R. Jain focused on the construction of a set of appropriate consumer price indices for valid comparisons of movements in real levels of living across fractile groups and across States and across the rural and urban population segments (Jain and Tendulkar 1989, 1992) and, on the same theme, another major paper with Jain and B.S. Minhas as his co-authors (1991). Suresh and Jain also combined with K. Sundaram to write some important papers on poverty in India. (Jain et al. 1988, 1989; Tendulkar et al. 1993).

Among the major papers on inequality written by Suresh D. Tendulkar, we have his paper "Economic Inequality: Indian Perspective" in Beteille (1983b) and "Inequality and Equity during Rapid Growth Process" in Acharya and Mohan (2010). We also have his numerous papers and reports on poverty in India co-authored by his long-standing friend and colleague at Delhi School of Economics, Sundaram (Sundaram and Tendulkar 1983, 1993, 2003 and 2005 to list a few).

In the context of, both, inequality and poverty, access to employment opportunities and the quality of such employment play an important role. Suresh's paper on organized sector employment in the pre- and post-reforms period is a major piece of work on the subject in Tendulkar (2006). Suresh, jointly with Sundaram, also explored the unemployment–poverty linkages (Sundaram and Tendulkar 1988) and gave shape and content to the concept of the Working Poor in the Indian context (Sundaram and Tendulkar 2002, 2006).

To commemorate the remarkable contribution of Prof. Tendulkar to teaching and research, the Department of Economics, University of Delhi and Centre for Development Economics, Delhi School of Economics organized a conference on 19 and 20 July, 2012. Reflecting his reputation and interaction with reputed academics, the conference was attended by several scholars from India and abroad. Speakers and panellists in the conference, other than the contributors to this book, included T. C.A. Anant, Abhijit Banerji, Abhijit V. Banerjee, Pranab Bardhan, Kaushik Basu, Andre Beteille, T.A. Bhavani, Aditya Bhattacharjea, Biswajit Chatterjee, Vikas Chitre, Ashwini Deshpande, S. Mahendra Dev, Subir Gokarn, Nagesh Kumar, Arvind Panagariya, V.R. Panchmukhi, Santosh Panda, Kirit Parikh, C. Rangarajan, M. Govinda Rao, Atul Sarma, Pronab Sen, Shekhar Shah and Rohini Somanathan.

Given Prof. Tendulkar's areas of interest and preoccupation, the major themes for the conference selected themselves quite naturally. These were as follows:

(a) poverty, well-being and inequality,
(b) India and the world economy,
(c) economic reforms and policy formulation and
(d) statistical systems and data quality.

While (c) and (d) were chosen for panel discussions, the deliberations relating to these have significantly got reflected in the papers under (a) and (b) included in this volume. The coverage of different papers in the volume is as follows.

The lead chapter of the volume by **T.N. Srinivasan** offers a contextual and insightful review of Suresh's work on economic development and planning model and processes in India; on India in the world economy; and on the political economy of economic reforms in India. Also on offer is a critical review of Tendulkar's important conceptual and policy relevant work on measurement of poverty in India (the Tendulkar Committee Report, in particular), and some very interesting results of Srinivasan's analyses of trends in Inequality in India (post-2000) and in poverty (both pre- and post-2000).

Among the papers by Suresh on economic development and planning models and processes in India reviewed here, Srinivasan highlights his analysis of consumption expenditure in rural Uttar Pradesh (Tendulkar 1969) and his paper on Interaction between Domestic and Foreign Resources in Economic Growth (Tendulkar 1971) which are nicely tied to Suresh's training under Houthakker and Chenery at Harvard. The bunch of papers by Suresh critiquing India's Fifth Five Year Plan are rightly placed in the context of the fervent analytical and empirical analyses of issues in planning and development that prevailed at the Planning Unit of the Indian Statistical Institute (ISI), Delhi, with which Suresh was associated for a full decade. Suresh's work on Re-integrating India with the World Economy and that on Understanding Reforms: Post 1991 India that examines the political economy dimensions of economic reforms in India receive a thorough and insightful review with the linkages between the two drawn neatly. Srinivasan's paper also presents fresh empirical results on trends in inequality in the period since 2000 showing that conjectures about worsening inequality in India in this period are not confirmed by careful analysis of the evidence. Similarly, his econometric

analysis of the evidence on poverty in India covering both the pre- and the post-2000 periods does not confirm any structural breaks.

In the next chapter, **Y.V. Reddy** offers a very thoughtful analysis of the political economy of the post-1991 economic reforms in India examined by Tendulkar and Bhavani (2007, 2012). Reddy draws our attention to a neglected dimension of the pro-market reforms: the intellectual antecedents in the political space provided by the writings of C. Rajagopalachari (or C.R. as he was popularly known) and the Swatantra Party he founded.

The paper by **R. Radhakrishna, C. Ravi** and **B. Sambi Reddy** attempts an assessment of well-being in a multidimensional perspective that goes beyond conventional measures of poverty to include, in particular, indicators of malnutrition. It examines the trends in poverty—both conventionally measured as also in its multidimensional avatar—and in inequality across states and social groups in the period since the economic reforms of 1991. Using the Atkinson Social Welfare Function, it is shown that acceleration of growth in social welfare was accompanied by a worsening of inequality.

**Thomas Weisskopf** highlights the alternative domains of inequality: in terms of income, consumption, wealth or equally meaningfully in terms of access to goods and services. Also highlighted are the moral, political, economic and social perspectives on inequality in each of these domains. A contrast is also drawn between measures of inequality which relate to the entire size distribution or some segment thereof. The paper presents a large number of insightful illustrations across these classificatory categories.

This is followed by **S. Subramanian** who raises some important conceptual and analytical problems with measurement of poverty and inequality, more so, in the presence of variations in the size of the population. He draws attention to a certain commonality of outcomes between Derek Parfit's quest for a satisfactory theory of well-being and the economist's quest for a satisfactory measure of poverty. Drawing upon his own work, Subramanian puts forward four axioms that each measure of poverty must satisfy. These include income focus, anonymity, monotonicity and transfer. The paper goes on to show that the frequently used measures of inequality, namely the Theil index, the squared coefficient of variation, the Gini coefficient, and the Atkinson family of ethical inequality indices, encounter problems in simultaneously satisfying all these requirements. Suggestions are made to modify these measures so as to resolve some of these problems.

Economic development is neither a linear nor a simply structured process within which households and individuals are required to make decisions about whether to enter the labour force or stay on in the education/skill—development process and delay entry into the workforce and, thus, forego current wages. These choices, that shape the work participation rates (and therefore also the size and structure of the labour force), are rendered even more complex when we factor-in demographic changes—especially fertility decline. Understanding and evaluating changes in the size and structure of employment in the presence of both economic growth and demographic change, therefore, presents significant challenges. This is the problem dealt with by **K. Sundaram** on the basis of the Employment-Unemployment

Survey of the NSS 66th Round. He also combines this with the information from the provisional population totals of the 2011 population census. The paper examines the interplay of demographic changes, changes in living standards and household decisions on schooling and participation in the labour force. It is shown that, in this perspective, what may appear to be a non-realization of the benefits of a slowdown in population growth may only reflect a postponement of the so-called demographic bonus. The paper also examines some issues relating to the measurement of poverty and presents estimates of Working Poor in India for 2005 and 2010. Drawing attention to an across-the-board reduction in the proportion and count of the Working Poor over the period and to the other positive developments such as a strong growth in employment in the Organised Manufacturing Sector, the author argues that these improvements in the quality of employment must temper our disappointment with the small growth in the size of the workforce.

**J.V. Meenakshi** and **Brinda Viswanathan** address issues related to the measurement of under nutrition—both from the perspective of defining energy (calorie) norms and measuring food intakes at the household level. They question the use of the 95th percentile of heights and weights of the rural Indian population to define a reference individual for working out the calorie norms. They show that, if the energy requirements of a healthy individual are derived on the basis of the latest ICMR recommendations by reference to the median (instead of the 95th percentile) of heights, the resultant calorie norms are significantly lower than those currently used. This is especially the case if the population is assumed to be predominantly engaged in a sedentary lifestyle. On the question of measurement of food intakes, they examine the issues related to recall period and meals outside the home—and the extent to which these might underestimate the intake of calories. For example, the use of consumption estimates based on a one-week recall period are shown to yield much lower estimates of the prevalence of calorie inadequacy called prevalence of under-nutrition (POU) compared to that obtained from using a 30-day recall period. They show that the use of more realistic assumptions on norms taken in conjunction with adjustments for reference periods and meals taken outside the home in estimating calorie intakes results in estimates of POU that are substantially lower than currently assessed, though, in absolute terms, they remain disturbingly high.

The last two papers of the volume deal with the Indian economy in its international perspective. To provide adequate motivation, **Pami Dua** and **Partha Sen** briefly discuss the movement of FDI and net portfolio equity flows specifically to East Asia and South Asia since the mid-seventies. They proceed to set up an eight equation theoretical model for exchange rate stabilization by the central bank. The central part of the model is a choice process which includes money, government bonds and foreign exchange resources. To this is added a dynamic adjustment system involving volatility of capital flows. With assumptions about the central bank policy built in, we have what is termed as the "Exchange Market Pressure Model" which implies that the central bank will tend to intervene in the foreign exchange market to stabilise the exchange rate movements around a desired level depending on the level and expected changes in the foreign exchange reserves. The

currently available sophisticated econometric techniques are utilized to empirically articulate the theoretical model.

When the economy was only moderately open, one would tend to take account of the so-called pass through effect in dealing with movements in trade flows. Under the prevailing free trade policy regime, this takes a somewhat different form. It is quite likely that exports would over time involve higher import content. This would also correspondingly get reflected in much larger pass through effects, besides other problems in dealing with trade balance, exchange rate management and tariff rates. It is this problem that **Bishwanath Goldar** takes up in the last contribution in this collection. The problem is examined at the industry level as well as at the firm level using cross-section data for some years drawn from input–output tables. Import intensity is found to vary with the extent to which an enterprise has an export orientation. It also examines the impact of the availability of imports. It is found that the relationship has shifted over years.

Suresh has left behind a legion of friends and admirers both inside and outside the academia. As a part of this circle of friends and admirers, we have been fortunate to have been also his colleagues and academic collaborators for several decades. It is our privilege to offer this collection as a humble tribute to Late Professor Suresh D. Tendulkar.

K.L. Krishna
Vishwanath Pandit
K. Sundaram
Pami Dua

## References

Jain, L. R., & Tendulkar, S. D. (1989). On a relationship between the real and the nominal relative disparities in the consumption of cereals in rural India. *Journal of Development Economics, 31*, 271–95.

Jain, L. R., & Tendulkar, S. D. (1992). Inter-temporal, inter-fractile group and rural-urban differential in the cost of living, real levels of living, inequality and poverty for all-India, 1970–71 to 1988–89. *Journal of Indian School of Political Economy, 4*, 456–483.

Jain, L. R., Sundaram, K., & Tendulkar, S. D. (1988). Dimensions of rural poverty: An inter-regional profile. *Economic and Political Weekly, 23*, 2395–2408.

Jain, L. R., Sundaram, K., & Tendulkar, S. D. (1989). Level of living and incidence of poverty in rural India: A cross-section analysis. *Journal of Quantitative Economics, 5*, 187–209.

Minhas, B. S., Jain, L. R., & Tendulkar, S. D. (1992). Rural and urban cost of living: 1983 to 198788, state-wise and all-India. *Journal of Indian School of Political Economy, 3*, 420–442.

Srinivasan, T. N., & Tendulkar, S. D. (2003). *Reintegrating India with the world economy*. Washington, D.C: Institute for International Economics and New Delhi: Oxford University Press.

Sundaram, K., & Tendulkar, S. D. (1983). Poverty reduction and redistribution in sixth plan: Population factor and rural-urban equity. *Economic and Political Weekly, 18*, 1617–1632.

Sundaram, K., & Tendulkar, S. D. (1988). Towards an explanation of inter-regional variations in poverty and unemployment in rural India (Chapter 10). In T. N. Srinivasan & P. Bardhan (Eds.), *Rural poverty in South Asia* (pp. 315–362). New Delhi: Oxford University Press.

Sundaram, K., & Tendulkar, S. D. (1993). Poverty in Asia and the Pacific: Conceptual issues and national approaches to measurement. *Economic Bulletin for Asia and the Pacific, 44*, 42–58.

Sundaram, K., & Tendulkar, S. D. (2002). *Working poor in India: Employment poverty linkages and employment policy options*. Issues in Employment and Poverty, Recovery and Reconstruction Department, International Labour Office, Geneva, Discussion paper 4.

Sundaram, K., & Tendulkar, S. D. (2003). Poverty among social and economic growth in India in 1990s. *Economic and Political Weekly, 38*, 5263–5276.

Sundaram, K., & Tendulkar, S. D. (2005). Poverty outcomes in India in the 1990s (Chapter 13). In A. Deaton & V. Kozel (Eds.), *The great Indian poverty debate* (pp. 249–305). New Delhi: MacMillan India Ltd.

Sundaram, K., & Tendulkar, S. D. (2006). India: Employment-poverty linkages and policy options (Chapter 8). In Rizwanul Islam (Ed.), *Fighting poverty, The development-employment link* (pp. 267–311). Boulder, London: Lynne Reinner Publishers, U.S.A. for the International Labour Organisation.

Tendulkar, S. D. (1969). Econometric study of monthly consumption expenditure in rural Uttar Pradesh. *The American Journal of Agricultural Economics, 51*, 119–137.

Tendulkar, S. D. (1971). Interaction between domestic and foreign resources in economic growth: Some experiments for India. In H. B. Chenery, S. Bowles, W. P. Falcon, C. Gotsch, D. Kendrick, A. MacEwan, C. Sims & T. Weisskopf (Eds.), *Studies in development planning* (pp. 122–154). Cambridge, Massachusetts, USA: Harvard University Press.

Tendulkar, S. D. (1983a). Press as a public utility. *New Quest*, March–April, 91–96.

Tendulkar, S. D. (1983b). Economic inequality in an Indian perspective. In A. Beteille (Ed.), *Equality and inequality: Theory and practice* (pp. 71–128). New Delhi: Oxford University Press.

Tendulkar, S. D. (1989). An approach towards integrating large and small scale surveys (Chapter 8). In P. Bardhan (Ed.), *Conversations between economics and anthropologists. Methodological issues in measuring economic change in rural India* (pp. 200–217). New Delhi: Oxford University Press.

Tendulkar, S. D. (2006) Employment growth in factory manufacturing sector during pre- and post reform periods. In S. D. Tendulkar, A. Mitra, K. Narayanan & D. K. Das (Eds.), *India: Industrialisation in a reforming economy, essays for K.L. Krishna.* New Delhi: Academic Foundation.

Tendulkar, S. D. (2010), Inequality and equity during rapid growth process. In S. Acharya & R. Mohan (Eds.), *India's economy performance and challenges.* New Delhi: Oxford University Press.

Tendulkar, S. D., & Bhavani, T. A. (2007). *Understanding reforms, post 1991 India*. New Delhi: Oxford University Press.

Tendulkar, S. D., & Bhavani, T. A. (2012). *Understanding reforms: post 1991 India—An update*. New Delhi: Oxford University Press.

Tendulkar, S. D., Sundaram, K., & Jain, L. R. (1993). *Poverty in India, 1970–71 to 1988–89.* International Labour Organisation, Asian Regional Team for Employment Promotion, Working Paper.

# Part I
# Economic Reforms and Policy Formulation

# Chapter 1
# Planning, Poverty and Political Economy of Reforms: A Tribute to Suresh D. Tendulkar

**T.N. Srinivasan**

**Abstract** This paper pays tribute to Professor Suresh D. Tendulkar's contribution and scholarship to economics, economic-policy making, and economic reforms in India. The paper's scope is by no means exhaustive, and primarily focuses on his contributions on economic planning in India, the political economy of economic reforms, and his important conceptual and policy-relevant work on poverty measurement. The paper also presents results on empirical exercises comparing trends in inequality, and various poverty lines in India in the recent past. The paper concludes with policy observations on economic reforms in India, and directions for further empirical research on poverty.

**Keywords** Poverty · Inequality · Political economy · India · Professor Suresh D. Tendulkar

**JEL Classification** I30 · 132 · P48

## 1.1 Introduction

Suresh D. Tendulkar, (hereafter Suresh) joined the Planning Unit (PU) of the Indian Statistical Institute (ISI) at New Delhi in 1968 soon after obtaining a doctorate from Harvard University where his thesis committee included Hollis Chenery, Hendrik Houthakker and David Kendrick. The PU had originally been established to assist Professor P.C. Mahalanobis during his term as a member of the Planning

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Commission. I joined in 1964. B.S. Minhas, who had joined in 1962, headed it. For about ten years we were colleagues, friends and co-residents at Hauz Khas. I left ISI in 1977 as I moved to Yale. Suresh left a year later to take up a professorship at the Delhi School of Economics (DSE). My friendship with Suresh, his wife Pramodini (Sunetra) and their daughters Juee and Sai continued during my three decades at Yale since 1980. We frequently corresponded and also met during my visits to India. After Suresh retired from the DSE he held various positions successively in the Prime Minister's Economic Advisory Council including its chairmanship and also in the national level official statistical agencies. During our long association our exchanges included personal matters and economics, policy and in particular quality of economic data. We collaborated on our book *Reintegrating India with the World Economy* (Srinivasan and Tendulkar 2003).

We met, for the last time it turned out, on December 30, 2009 at the conference on Frontiers of the Interface between Statistics and Sciences in celebration of the 90th birthday of Dr. C.R. Rao. Suresh, Kirit Parikh, Abhijit Banerjee and I, as chair, participated in a session on "India: Data, Statistics and Economic Policy". Soon thereafter, on January 2, 2010 he sent me a copy of the report of the **Expert Group to Review the Methodology for Estimation of Poverty** chaired by him (Planning Commission 2009). The Group came up with a radically new poverty line. I recall my talking to him on my reactions (described below) to the report but I cannot find any record of this conversation. His next e-mail to me at the end of April 2010 asked me to clarify the distinction between **Financial Stability** which he said he did not understand and **Macroeconomic Stability** which he understood and described. I responded to him in three long e-mails during April 28–30, 2010. I must state here that I had briefly alluded to Euro Zone issues that were to become salient in 2011. I do not have any record of his reply to my long e-mails. His very last e-mail to me was on December 23, 2010 from Pune telling me that he was to leave Pune to reach Delhi on January 11. I neither saw him before he left for Pune nor do I recall whether he became ill before he was to leave for Delhi from Pune. I was in Delhi again in June 2011 but unfortunately I could not talk to him since he was critically ill. But I talked to Pramodini. With his passing away on June 21, 2011, India lost a great teacher, economist and policy analyst and I lost a very dear friend.

The rest of the chapter is organized as follows. I start in Sect. 1.2 with a discussion of the leading issues on planning models and processes in India as a prelude to work at ISI. Section 1.3 discusses Professor Tendulkar's research 1968 through 1978 while he was based at ISI. This is followed by Sect. 1.4, which discusses his research at Delhi School Economics from 1978 to 2011, including his work on economic reforms of India. This is followed by a discussion on some aspects of inequality in India in Sect. 1.5, and results from econometric exercises on poverty trends in Sect. 1.6. Section 1.7 concludes.

## 1.2 National Planning: Models and Empirical Research

The Planning Commission (PC) was established in March 1950 by a resolution of the Central Cabinet, very soon after the coming into force of a Constitution for India as a Union of States and Union Territories on January 26, 1950. Unlike the Finance Commission (FC) and the Office of the Comptroller and Auditor General (CAG), both of which are mandated by Articles of the Constitution, the PC is not mentioned in any article of the Constitution. For this reason, its jurisdiction and power from a constitutional perspective, de jure, are presumably subsumed under those of the central government in the constitution. Although the Cabinet Resolution designed the PC only as an advisory body, and there is, as far as I know, no explicit delegation to the PC of any of its powers by the Central cabinet. The PC has, however, defacto come to exercise enormous power in the decisions of resource allocation of the Central and State governments.

A consensus across the political spectrum on Planning for National Development with the state playing a major role in the Indian economy had emerged in the pre-independence era in anticipation of independence. This is clear from the pre-independence reports of the National Planning Committee of the Indian National Congress, appointed in 1938 by Subhash Chandra Bose, President of the Congress and chaired by Pandit Jawaharlal Nehru (IIAPR 1988), the group of Bombay businessman with their Bombay Plan (Thakurdas et al. 1944) and trade union leaders with their People's Plan (Banerjee et al. 1944) have also played a vital role in this context. Notable exception from the consensus was the followers of Mahatma Gandhi. Their conception of planning was of a (largely self-sufficient) village-based process with industrial enterprises as mostly village-based labour-intensive handicrafts, cottage industries and the few large enterprises run as trusts, by the entrepreneurs as trustees of the capital they managed (Agarwal 1944). Even the Colonial Government had established a Planning Board to formulate economic plans after the end of the Second World War. The cabinet resolution establishing the PC in 1950 refers to the pre-independence consensus on planning.

The First Five-year Plan of the post-independence PC covered the fiscal years 1950–51 through 1955–56, consisting primarily of the projects that were being considered for implementation by the Colonial Planning Board. It is only in the Second Five-year Plan onwards that a forward-looking analytical foundation for planning was laid with an overall approach and a detailed strategy of targets for investment as well as production. This foundation and its Development Strategy were authored by Professor P.C. Mahalanobis. His independently formulated two sector analytical model, which had been originally derived by Grigori Feld'man in 1928 for the Soviet Union played an enormous role: It would be no exaggeration to say that the strategy of development articulated in the second five-year plan was followed until the reforms of 1991. Vestiges of it continue since the reforms did not abolish or replace the PC.

Mahalanobis was formally made a member of the PC in 1953. To assist him he established the Planning Unit of the ISI at New Delhi as mentioned earlier. At the same time there was a Planning Division at the main campus of the Institute in Kolkata. A series of Working Papers, if I remember right, with the title Studies in Planning for National Development was also started. There were several pioneering theoretical and empirical studies in the series including one on the first input-output table for India, and others, on empirical estimates of aggregate consumption function and also on household consumption expenditure patterns. Another feature of the empirical research at ISI emanated again from Mahalanobis, namely, the importance of cross-checking sources of data prior to their use in analysis. In particular cross checking of the consumption expenditure data from the National Sample survey with the corresponding estimates from the National Accounts Statistics (NAS) Division of the Central Statistical Organization (CSO) were part of the series of Working papers. Some of these papers have been reprinted in Deaton and Kozel (2005). The research of the planning units in Delhi and Kolkata served as inputs into the planning models that were put together, particularly at the planning unit in Delhi by the late Professors Ashok Rudra of ISI and Alan Manne of Stanford University, and others.

Mahalanobis' emphasis on the cost-efficiency of well-designed sample surveys for estimating crop areas and output went back to the early days after the founding of ISI in 1931. After independence National Sample Surveys (NSS) had been established in ISI and a round of successive socioeconomic surveys was started by NSS. Mahalanobis was also involved in the establishment of CSO and also chaired the First National Income Committee. As chairman of the United Nation's Statistical Commission, Mahalanobis was instrumental in the formulation of the UN System of National Accounts.

Initially both the design and field divisions of NSS were in ISI and later the field division was shifted to government as part of its National Sample Survey Organisation (NSSO). The Sampling Design Division of ISI and NSSO worked in close collaboration. The analytical contribution of ISI on design of and estimation from a large-scale sample survey is also very well known. Indeed the fact that India is recognized as the global pioneer in the design and execution of large scale socioeconomic Surveys and their analyses is largely due to Professor Mahalanobis and ISI founded by him.

## 1.3 Suresh's Research at ISI

Given his interest in India's development and in empirical research, Suresh found a natural intellectual home in ISI at Delhi. His research training at Harvard had prepared him well for contributing to the ongoing programme (of research on plan and planning) at the Delhi planning unit of ISI. Hollis Chenery was among the pioneers of the use of quantitative models for economic planning and policy-making. Houthakker's econometric work was on household consumer

behaviour. It is no surprise that the first two papers published by Suresh after he joined ISI planning unit in Delhi reflected both his dissertation (Tendulkar 1969) and also the training he had from Houthakker (Tendulkar 1971).

### *1.3.1 The Initial Agenda: Consumption and Growth*

Let me begin with a few remarks on Tendulkar (1969). Remarkably this paper, written while he was still a graduate student at Harvard, is still worth reading and in my view worth replicating with the now publicly accessible household level data on consumption expenditure. The main objective of the paper was to estimate a dynamic demand function for households in the state of Uttar Pradesh based on the work of Houthakker and his co-authors. A large share of total consumer expenditure (54%) when valued using market prices was on commodities, which the household itself produced and consumed. This non-cash component of total consumption expenditure played an important role arising from the economic fact that a change in the price of commodities it consumes and produces has both income and substitution effects which move in opposite directions, with the net effect uncertain in theory.

Suresh persuasively argues that the dynamics of adjustment to price or income shocks through inventory adjustments requires a dynamic demand model of a stock-flow variety. His paper represents the first attempt at an econometric analysis of monthly consumption expenditures with a dynamic demand model in which expenditure and price effects are explicitly introduced. For the first time it also showed the behavioural differences of rural households with respect to the cash and non-cash components of their expenditure. In particular cash purchases act as an inventory adjustment mechanism while non-cash component of expenditure reflects habit persistence. The results confirm that any policy change that improves the terms of trade of agriculturists by increasing their income and expenditures would increase their demand for non-produced non-agricultural commodities in the process of development. The dynamic model enables Suresh to distinguish instantaneous effects of shocks and policies from their long run and steady state equilibrium values.

Careful researcher that he was, he explicitly notes the caveats of his study, in particular that his demand functions were not derived from an explicit utility maximization framework. Suresh's data covered the period July 1957–1963, which is more than half a century ago. With globalisation many changes have taken place including possibly greater monetisation of incomes and expenditures of Indian households, substantial increase in the range and quality of goods consumed (and produced) and increase in share of imported goods (of possibly higher quality compared to their domestic substitutes), as well as greater opportunities for investment and many others. Still, the non-cash component of household consumption and importantly the non-financial component of total household savings, and equivalently, the non-financially- intermediated component of household

investment, that is direct savings by households in the form physical assets, continue to be significant as shares of real GDP and real GDE. For these reasons it is worth replicating Suresh's first attempt with more recent data.

Tendulkar (1971) is based on his dissertation at Harvard and also on comments received from his colleagues after he joined in ISI. It presents a multi-sectoral, single period, optimising linear programming model that incorporates two constraints on domestic capital accumulation and on economic growth, one arising from domestic savings and the other from foreign exchange. The model is one of the genres of "two-gap" development and growth models. It addresses a comparative static problem of moving from given initial conditions in the base year to the target year of an exogenously set planning horizon by maximising its specified criteria function.[1] Suresh recognises that development is a dynamic process and as such a dynamic, rather than static, model would be appropriate. Nonetheless he adopted a single-period analysis after considering the methodological trade-offs between inter-temporal analysis of maximisation of a discounted sum of utility of aggregate consumption and single-period analysis of utility of a disaggregated bundle of commodities on computational costs, between methodological refinements and data requirements, and between analytical complexity and easy comprehensibility.[2]

The paper describes in detail the data on individual sectors and the formulation of the model in algebraic terms. In the open loop variant, the model concentrates only on the foreign exchange constraint, assuming a priori that the needed domestic savings could be mobilised through means that are not part of the model. The closed loop variant explicitly introduces both constraints and a feedback mechanism between changes in gross output and its uses, through their effects, on the one hand change in income generated, and on the other through income generation on consumption and on savings.

The comparison between the open and closed loop variants are shown in Figs. 6.4–6.7 and Table 6.3 of Tendulkar (1971). It is seen from Table 6.3 that the marginal productivity (MP) of foreign aid (i.e. foreign exchange inflow) shows

[1]In fact a society for which a plan for a finite horizon is being considered not only will almost surely exist in the future beyond the finite horizon, but will be aware of this fact also. For this reason, reflecting future in some way in the finite horizon models is done. This problem was well understood in the literature in the sixties. One procedure was to make the finite horizon endogenous as the time needed to move the economy from the initial period to a steady state growth path. The objective of such models was to minimize the time needed. The target steady state of some of the models was the so-called von Neumann model of steady state growth. The seminal Turnpike Theorem of Samuelson and Solow that showed, as long as the finite time horizon was sufficiently long, any efficient path from given initial and target economic states would spend a large part of its horizon close to the von Neumann path was very influential. My dissertation (Srinivasan 1962) was of this genre of models.

[2]Contemporary macroeconomic modellers would recognise that the analytical trade-offs that Suresh recognised more than four decades ago have their modern counterpart in those between aggregate—single-representative-agent based dynamic-stochastic-general-equilibrium (DSGE) models and versions of multiagent models.

diminishing returns in both versions. However, in the closed loop model, in which an additional rupee of foreign exchange inflow causes both the trade cum foreign exchange constraint and the domestic savings constraint, the MP of foreign aid is higher than its open loop variant at each level of foreign aid. It diminishes as aid levels increase, converging to the latter at 450 million in U.S. dollars. At this level, the contribution to MP is zero from the easing of the foreign exchange constraint, and only the benefit from easing the saving constraint remains in the closed loop model. There is also new information from Fig. 6.3, which depicts the aggregate private consumption (the criterion of maximization) for a given level of GNP and for given levels of foreign capital inflow. The curve for the closed loop, compared to that of the open loop variant, is higher at all levels of GNP as it increases with the increases in foreign capital inflow and the two converging at $450 million of inflow. Figures 6.3–6.7 depict the same story of differences between open-loop and closed-loop variants and the reason thereof with respect to other outcomes such as domestic savings and investment, consumption, etc.

### *1.3.2 Planning and Development Issues*

Clearly Tendulkar (1971) reflected the issues of planning in the 1960s. The development of computer technology has made it feasible to implement non-linear planning models, and with the shift in interest in policymaking in large developing countries such as China and India toward greater integration with the global economy and the use of the market mechanism, modelling interest also shifted toward applied general equilibrium (of closed and open economy) models (AGM). Scarf and Hansen (1973) illustrated the computability of an equilibrium Arrow-Debreu version of the General Competitive Equilibrium (GCE) model. They developed an algorithm for its computation. For this reason, not only the models came to be described as "Theory with Numbers" but also their genre came to be called Computable General Equilibrium (CGE) models. However, the genre is more appropriately called Applied General Equilibrium (AGE) models. Moreover, the Scarf-Hansen Algorithm is rarely used in AGM models since more efficient algorithms have been developed. A growing number of AGM models (particularly of international trade) have been used for analysing policy, including many models for India (e.g. Narayana et al. 1991).

In a careful but simple econometric analysis Jain and Tendulkar (1973) attempted to answer two questions. First, do Engel curves for five occupation groups and for each of eight commodity groups, on which household consumption expenditure per capita is divided, differ across the five occupation groups in rural and urban India? Second, if they differ, what is the source of the difference, that is, which are the pairs of occupations that have distinct consumption patterns? The simple methodology involves estimation of linear approximations of a possibly non-linear Engel curve, with an occupational dummy variable that shifts the intercept and slope (of the linear approximation of the Engel curve). Three

functional forms for the Engel Curves, namely linear, semi-log and hyperbolic are considered.

The obvious advantage of the dummy variable technology is that it enables the use of a simple 'F' test originally due to C.R. Rao (mostly referred to as 'Chow' test) for the hypothesis whether the linear approximation of a particular Engel curve for a commodity group differ across occupations, and if not, whether they differ in their intercepts, slopes or both. The authors also note its disadvantages. The paper (as are all papers of which Suresh is an author) is an example of the clarity of its exposition.

One of the limitations of the data used for the study as noted by the authors is that per capita household expenditure is the average for all households within each of the thirteen per capita total expenditure classes, so that instead of household-specific data (the so called. unit-level data in the terminology of NSSO), only averages had to be used Now that NSSO has made unit level data available to users for research purposes at a cost, the exercise of Jain and Tendulkar (1973) could be repeated with unit level data and perhaps also with other sophistications in methodology that the availability of better computing technologies would enable.

Suresh's contributions during 1974–78 have to be placed in their political context. Mrs. Gandhi's Prime Ministership from January 1966 ended in 1977 with her defeat by the Janata Party at the end of her dictatorial Emergency Rule of 1975–1977. During 1966–1977, particularly in the 1970s several draconian laws were enacted extending the coercive power of the state and its intrusive dominance to many areas of gainful economic activity and competition, such as financial intermediation, exports, imports and the freedom of large enterprises to hire or retrench workers.

Respected and distinguished economist, Professor D.R. Gadgil, was in effect unceremoniously removed (presumably at Mrs. Gandhi's command) from being the Deputy Chairman of the PC in May 1971. His tragic death from cardiac arrest on the way back home in Pune by train was another serious blow. Pitambar Pant, who was the Chief of the Perspective Planning Commission, under whose leadership emerged the remarkable paper on Perspectives of Development: India 1961–76: An implication of Planning for a Minimum Level of Living (Srinivasan and Bardhan 1974), was also reassigned to a different position. C. Subramaniam succeeded Dr. Gadgil for about a year and later, until 1977 by D.P. Dhar and P.N Haskar, whose sympathies for left-wing ideology were well known. The PC was also reconstituted.

For Suresh and myself, then at ISI, the fact that one of our colleagues and Head of Delhi ISI and a dear friend, B.S. Minhas, and our friend from DSE, Sukhamoy Chakravarty, became members of the reconstituted PC, was exciting. The differing policy perspectives and above all, policy judgments, of a theorist (Sukhamoy) and of a down to earth farmer, empirical and policy economist (Minhas) eventually led to the resignation of Minhas from the PC after the government nationalized wholesale trade in wheat. This was a policy driven almost entirely by ideology in total disregard of ground realities. Minhas had predicted in the debates within the PC and with Chakravarty that the nationalization would fail. After it indeed failed,

he was invited to rejoin the PC. He refused though Mrs. Gandhi, who respected his frankness and integrity, continued to seek his advice.

The reconstituted PC inherited the Fourth Five Year Plan (1969–1974), formulated by the PC headed by Professor Gadgil. The first Five Year Plan formulated by the new commission was the Fifth Five Year Plan (1974–1979). Naturally, we at ISI, in particular Suresh, wanted to analyse it. All of the six publications listed in his CV during 1974–78 are on planning. Of these, as many as four relate to the Draft of the Fifth Five Year Plan (the first one drafted by the reconstituted planning commission) and its various objectives. The first paper was on Planning Models for Growth and Redistribution in India and a sixth, published in 1977, was on some basic issues on the planning process itself. It is clear from his critical remarks in his four papers on the Draft of the Fifth Five Year Plan, three of which were published in 1974 and especially his paper (Tendulkar 1977) that he was disappointed with the planning process in India. Some, including myself, were to argue later in the post reform era for the abolition of the PC and its replacement by an agency that was empowered not only to decide on the size, composition, financing and time schedule for completion of public investment projects including central, state and centrally sponsored ones, but also monitoring their implementation and taking corrective action as needed (Singh and Srinivasan 2006). As of 1977, Suresh had hopes of reforming the process of planning as practiced by the PC. Interestingly the creation of a Public Investment Board is currently (2012–13) being debated.

I will not discuss Suresh's six post-1974 papers individually, but will summarize his assessment and critique of the plans and planning. First, the fundamental issues of financing the plan in India's fiscal federation and of specific public policies for their implementation were absent or inadequate. Tendulkar (1974a) traces the absence of concerns about financing issues to Professor Mahalanobis, the author of the Second Five Year Plan and of India's Development Strategy from 1956 until the mid-eighties. He amply quotes from Mahalanobis himself in support of the proposition that a planning authority in full, direct and effective control of financial, monetary, funding and aid needs public investment can finance any designed level of aggregate investment in real terms. The quotation is worth reproducing.

> We have taken our stand on the obviously true proposition that if something can be shown to be feasible in physical terms, then the financial and fiscal machinery can always be adjusted to supply a satisfactory monetary counterpart (provided there is no difficulty in making the necessary institutional changes).

The implicit sweeping away under the carpet of the core issues of the fiscal and financial system to raise revenue to cover expenditures in a non-inflationary way is simply breath-taking.

Tendulkar (1974a) argues that the analytical model of the Fifth Plan was inadequate in its institutional specification and operationally unsatisfactory. The empirical bases for its three major policy-oriented conclusions emerging from the model were a poor approximation of recent experience. Further, the de-emphasis, if not abandonment altogether, of earlier commitments on self-reliance and poverty removal cannot be attributed solely to exogenous factors. Even in their absence, the

biases and inappropriate institutional specification and socio-political infeasibility involved in working out the policy from ex post facto redistribution (Tendulkar 1977) would have led to the same result. On the objective of the removal of poverty (Tendulkar 1974a) argues that the statement in the Draft Fifth Plan was a non-statement, with its focus on abstract logic rather than on operational feasibility. Programmes for poverty eradication are vague and couched in non-operational terms such as "attitude transformation" and "structural reformation". The possibilities of the government taking policy decisions for distribution purposes appear at best remote.

Tendulkar (1977) is a very thoughtful appraisal of India's planning process that draws on Tendulkar (1974a, b, c). This was important in view of the then rumours of possible change in the attitude toward the planning process of the newly established Janata Party Coalition which came to power after the defeat of Mrs. Gandhi's Government in early 1977. A shift to the Rolling Five Year Plan with an annual review for needed policy correction in contrast to Fixed Five Year and Annual Plans was widely talked about. Tendulkar makes three major points: Neither method of planning, rolling or fixed, would be likely to succeed in the absence of the credibility of planning process itself. The establishment of planning process is essentially political. Both methods have their strengths and weaknesses. The flexibility of response to changing circumstances of the rolling is provided at the cost of its greater complexity and prerequisites compared to the fixed five-year plan. In the Indian context the prerequisites and complexities of a rolling plan appear too demanding. An abrupt change to it without adequate preparation and discussion could unfurl to unforeseen and unintended effects.

Unfortunately, Tendulkar (1978) on the employment objective of the Fifth Five Year Plan was inaccessible to me. To conclude, Suresh's analytical and policy contributions during his ISI period continue to be relevant. His emphasis on the need to establish the political feasibility of proposed changes in the method of planning as he emphasized in the seventies are as relevant now as they were then, except the proposed change is a broad agenda of reforms ('big bang' and others). The grounds for his scepticism of the feasibility of change to rolling plans seems to be relevant also to the feasibility of "big bang and other" reforms for example.

## 1.4 Suresh's Research at DSE (1978–2011)

Turning to Suresh's many substantial contributions after he joined DSE,[3] let me note at the outset that these have been rightly praised by others in this conference for their relevance and importance to the field of developmental economics in general and to India's economic policy in particular. These multifaceted

[3]Suresh joined others at DSE such as Pranab Bardhan and Mrinal Datta Chaudhuri, who had left ISI earlier. In my perspective as an ISI-Mahalanobis loyalist I used to call them in jest as "traitors".

contributions to economics and other substantive areas are too many to be discussed here. I will concentrate on his book with me (Srinivasan and Tendulkar 2003; Tendulkar and Bhavani 2012). Tendulkar and Bhavani (2012) were to have been the paperback revised edition of Tendulkar and Bhavani (2007), based on notes prepared in February 2011 by the two authors.[4] It was completed by Bhavani after Suresh's death in June 2011 and published in 2012 (Tendulkar and Bhavani 2012). In my view the fact that Srinivasan and Tendulkar (2003) and Tendulkar and Bhavani (2007, 2012) two complement each other all three ought to be read together for getting a full understanding of Suresh's remarkable command of economics, economic history and political economy of India.

### *1.4.1 India and the World Economy*

Although both of us were responsible for all five chapters of our book, Suresh took primary responsibility for Chap. 2 (India in the World trading system: a quantitative assessment) and Chap. 4 (Domestic constraints on International Participation). In remarkably concise 48 pages, Chap. 2 describes analytically India's foreign trade from its pre-independence roots and traces the extreme insularity from world markets during 1950–73, piecemeal opening and deregulation during 1974–91, and the macroeconomic and balance of payments crisis of 1991. The crisis is rightly viewed as a turning point that led to systemic reforms of 1991. Interestingly, the chapter not only places India's exports in an Asian perspective but also looks at the emerging software exports in India's current account. Any student or scholar interested in the interrelated history of India's growth, development and trade as well as its ideological and political foundations need not go any further than Chap. 2 and its references. The chapter is quantitative and analytically rigorous. It emphasizes that, contrary to what many believe, the constraints on India's development are primarily domestic.

In Chap. 4 of our book Suresh explores macroeconomic (mis)management of the economy, physical and financial infrastructure and needed flexibility of restructuring in manufacturing and industry as the major domestic constraints. Alas they continue to constrain India's growth even as of 2013. In the concluding chapter on Conclusions and the Tasks Ahead, we briefly discuss political economy issues by identifying the principal interest groups (large industrialists, farm interest groups, bureaucrats and labour unions active in the political arena) and exploring how different items of the 1991 reform agenda would affect their interests and thus their stance towards reforms. We found that depending on the item, different groups lost to a different extent the rents they were earning in the pre-reform era. Obviously

[4]I would like to express my gratitude to Professors Tendulkar and Bhavani for mentioning me along with my friends and collaborators, Manmohan Singh, Jagdish Bhagwati and late P.N. Dhar; labeling all of us as 'long-time reformers by conviction'.

there was no simple aggregate measure of net change in rents and more importantly the aggregate impact on electoral politics. We summed up by noting that the political economy of the reform in the Indian context is complex with domestic and foreign interest groups as well multilateral institutions (IMF and the World Bank) in the picture.

We ended our brief discussion of Political Economy of Reform by expressing the hope that by emulating China's successful and imaginative use of external commitments (as signatories of international agreements such as the Uruguay Round agreement) and pressures (such as by the World Bank and the IMF) to resist the push of domestic interest groups, Indian governments, whatever be their political affiliation, will be able to push the reforms further. We obviously did not anticipate the *Policy and Political Paralysis* and the inability to act that characterized the middle of the second decade of the 21st Century. I must add that we did not attempt to formalize our discussion of political economy as a game between interest groups and the policy makers given their respective bargaining powers and strategic choices.

### *1.4.2 Political Economy of Reforms*

Professor Bhavani, a student of Suresh, modestly says in the Preface Tendulkar and Bhavani (2012) that with Suresh's untimely demise she 'had to take the responsibility of completing the draft'. The draft she refers to is the one that Suresh and she began drafting with the information (particularly on Political Economy) and data that they had discussed and put together between February 2011 and April 2011 when Suresh left for Pune. As I mentioned earlier I will focus on Tendulkar and Bhavani (2012). The discussion of Tendulkar and Bhavani (2012) of political economy issues and drawing on them at appropriate relevant contexts of policies adopted are deeper and more extensive than in Srinivasan and Tendulkar (2003). In particular the questions in the post 1991 reforms process in this chapter and the analytical framework in Chap. 2 reflect the remarkable depth and width of coverage.

The authors justifiably characterize Indian reforms as systemic, *continuing, and wide-ranging though* the reforms process was by no means smooth, internally synchronized, complete, or fully successful. They cite the oft repeated argument by political scientists (e.g. Roy Jenkins cited by them) that India is an unlikely candidate for *systemic reforms* because of its being a low-income democracy with large diversity in religion, language and other socio-economic-political dimensions (ethnicity, caste, regional origin) inhibiting consensus building in favour of systemic change. Moreover India's institutional environment with its entrenched belief in economic nationalism and socialism and a governance structure of coalition politics is widely believed to be inimical to any reforms. Importantly the originators of reforms constituted minorities within their own parties, with no strong political bases of their own. The questions that arise are how such political leaders not only

initiated reforms in a presumably hostile political context but also managed the reforms to move in the same consistent direction over a decade and a half.

I find the hypothesis of political scientists that a consensus *in favour* of reforms is a necessary condition for them to be adopted to be unpersuasive. I would argue that as long as the reform agenda has elements of interest to each of the major parties it would be difficult for them to build a consensus to prevent its adoption as argued by the reformer of New Zealand's economy, Roger Douglas, who successfully transformed New Zealand from a socialist swamp into a thriving market economy. Be that as it may, the authors set themselves the task of offering a 'set of coherent and plausible clues towards unscrambling the puzzling features of Indian reform process…' (p. 5).

In Chap. 2 the authors present their chosen analytical framework for completing their task, drawing on the work of Douglass North augmented by certain conceptual distinctions suggested by William Baumol. In this framework, 'the performance of economies over time is determined by path-dependent responses of individual entrepreneurs and organizations to changing incentive structure generated by the evolving institutional matrix consisting of mutually interacting formal and informal rules of the game in the social, political and economic domains (Ibid.)'. The thoughtful authors recognize that it is easier to describe the framework in words than to formally model it algebraically let alone rigorously estimate it econometrically and derive policy implications.

They quote North himself as admitting that no theory of economic dynamics comparable in precision to general equilibrium theory (e.g. Arrow-Debreu theory of general equilibrium in a complete set of contingent commodity markets) is available and that he offers 'an initial scaffolding of an analytical framework that help an analytical understanding of the way economies evolve over time'. Interestingly Professor Mahalanobis rationalized the Feld'man-Mahalanobis two sector model as 'scaffolding' for building an understanding of essential aspects of dynamics of growth and capital accumulation from a policy perspective. The mathematical model abstracts from non-essential features of reality and retains only essential features for the sake of tractability. Once the model is put through its paces and the features of policy gleaned (i.e. heavy industry strategy) the foundation for building of development analysis is complete and the 'scaffolding' is thrown away. Of course, North does not offer an algebraic analogue of the two-sector model. Yet the authors amply demonstrate that North's scaffolding is as useful in policy analysis as the two-sector model.

The elaboration in Chap. 2, of formal and informal rules of the game, the introduction of a broader than Schumpeterian role of entrepreneurs invoking Baumol to include all those who use creative, novel, and ingenious methods to gain social recognition, power prestige, or wealth is innovative and very useful. Given that not much is known about the supply of entrepreneurs, Baumol focuses on their available supply in three types, those engaged in productive, unproductive and destructive activities. The section on institutions and economic performance draws on North's attempt to unify the approach to the distinct processes of technological and institutional change by redefining the terms of factor augmenting or attenuating

technological change to include the effect of institutional change on the marginal product of inputs brought about by the change. The chapter concludes with a very brief discussion of Interest groups, Distributional Coalition and Distributional Equilibrium. The distinction due to Sudipto Kaviraj between vertical mobilization that appeals to commonality of non-economic identity (e.g. caste) and cutting across economic identities and horizontal mobilization that appeals to commonality of economic interests (e.g. wages) and cutting across non-economic identities in the context of reforms is appealing.

Chapters 3, 4, 5 and 6 overlap the chronology laid out in sections of Chap. 2 primarily drafted by Suresh in Srinivasan and Tendulkar (2003). Naturally they cover more events, policies and politics of each phase of the chronology. The basic difference is the consistent emphasis on political economy reflected in each chapter of Tendulkar and Bhavani (2012). Chapter 3 on post-independence development strategy describes the emphasis on state-directed and state-controlled strategy with emphasis on the expansion of the public sector and insularity from world markets. Except for minor changes of phrases used and their relative emphasis the account is the same in the two books. Chapter 4 on the slow growth phase of 1950–80 is suggestively subtitled *Incentive Structure and Economic Performance* and draws on North. It argues that the slow growth, low fiscal and current account deficits of this phase constituted growth equilibrium. Scarcity rent creating quantitative controls and their selective and discretionary exercise enabled rent allocation to chosen interest groups without affecting the budget or current account, thus enabling the pursuit of a low fiscal and current account deficits. Insularity from world markets and eliminating domestic competition through discretionary import and investment licensing which created significant scarcity rents were the policy instruments. The interest groups were small in size and conflicts among them were minor.

The gains from the incentive structure provided domestic savings, which combined with external aid were adequate to finance the investment needs of slow growth. The authors argue plausibly that the interest groups and the government had no incentive to move from this path of policies and their outcomes thus generating equilibrium of slow growth, low fiscal and current account deficits. Chapter 5 on the decade of the 1980s looks at the emergence of regional parties and the entry of farmers, small industrialists/ traders as disturbing the growth and distributional equilibrium of the previous three decades inducing a shift away from horizontal to vertical mobilizations. Chapter 6 on the context and timing of the 1991 reforms considerably overlaps the story in Srinivasan and Tendulkar (2003). It seems to me that Chaps. 7–9 are primarily the contributions of Professor Bhavani. Since my focus is on Suresh's contributions I will not elaborate on them except to say that their substantial political economy content is very impressive and I agree with most of it. The two Appendices, Appendix I (itself consisting of Appendices A, B, C and D on Economic Data) and Appendix II with 4 tables on Pre-poll alliances and the electoral performances and 17 more with various economic data, would be extremely useful to students and scholars of India's Development.

In conclusion, let me first emphasize that Suresh's analytical and policy contributions during his ISI period continue to be relevant. His emphasis on the need to establish the political feasibility of proposed changes in the method of planning as he emphasized in the seventies are as relevant now as they were then, except that the proposed change is a broad agenda of reforms ('big bang' and others). The grounds for his scepticism of the feasibility of change to rolling plans seems to be relevant also to the feasibility of "big bang and other" reforms for example. Second the number and range of his contributions after he resigned from ISI, particularly his books with Professor Bhavani (Tendulkar and Bhavani 2007, 2012) are remarkable for their depth in their exploration of India's Development and Political Economy.

## 1.5 Inequality in India

### *1.5.1 Some Data-Based Issues*

In celebrating Tendulkar's contributions and to pay a tribute to his memory I thought it would be appropriate and to look at some aspects of poverty and inequality in India, drawing to the extent I could, on the available data on household expenditure from all rounds of the NSS including the so called 'thin' rounds of non–quinquennial years. In so doing I will be ignoring the differences in sample design across rounds, in particular the major design changes introduced in the 28th round of 1973–74. I will also be neglecting the facts that surveying household expenditure was not the primary objective in some of the rounds; not all rounds covered a full year and even those that did, the year did not always correspond to a fiscal year or an agricultural year etc. My ignoring all these is not because I believe them to be irrelevant but only because I neither have full details of the design changes nor do I have the expertise or time to adjust properly for them even if had. My hunch, and it is only a hunch, is that effects of design changes on poverty estimates are likely to be relatively minor compared to the effects of other factors.

I should also mention that the size of the total central sample in the early rounds was not large compared to the quinquennial surveys since 1980. However in my view, contrary to common belief including that of the Planning Commission, the sizes of central samples of annual rounds have been large enough to yield reliable estimates poverty at the all India level and also at the level of large states. In any case I would proceed on that basis. I should however mention that had the State Samples of equal size that were meant to be independently analysed by states for use in addressing state specific issues been included, the total sample sizes of annual rounds would have doubled. Scandalously and wastefully the State Samples have been very rarely used.

NSSO (2001) published on the occasion of the Golden Jubilee of NSSO is comprehensive in its description of the changes across rounds in concepts used by

NSS, Unfortunately its Annexure 3 gives the number of villages and urban blocks surveyed in each round but not total sample size in terms of number of rural and urban households surveyed. One has to access the report of each round to get its sample size in terms of households canvassed. Fortunately Özler (1996) have done so for rounds 3–48 covering the period 1951–1993 and we use their compilation in appropriately weighting the sample observations of each round in the regressions in Sect. 1.4.

### *1.5.2 Inequality Since 2000*

Inequality measures involve assessing the relative positions of individuals in the distribution in a society of whatever inequality measure (of income, consumption, particular commodities such as food, health service, etc.) is of interest. Poverty involves examining an individual's position relative to some absolute norm and assessing the distribution of the individuals in the society with respect to their departures from the norm.

In the decade of the 2000s it has been claimed that In India and many other developed and developing countries inequality has been on the rise. The literature on this claim is large and growing, diverse with some contributors not even defining inequality precisely, let alone statistically testing its rise rigorously with appropriate data and assumptions. What follows is one such exercise to test this proposition.

Although individual household (unit) records of the consumer expenditure are in principle available from the NSSO, I use only the published reports of the household expenditure in the rounds of the eight years 2001–02 to 2009–10 with the exception of 2008–09. This meant that I had to use distributions by size classes (12 or 10 in all) of MPCE. Thus the Lorenz curves in Figs. 1.1 and 1.2 respectively of the distributions of MPCE at current prices for Rural and Urban areas for the eight

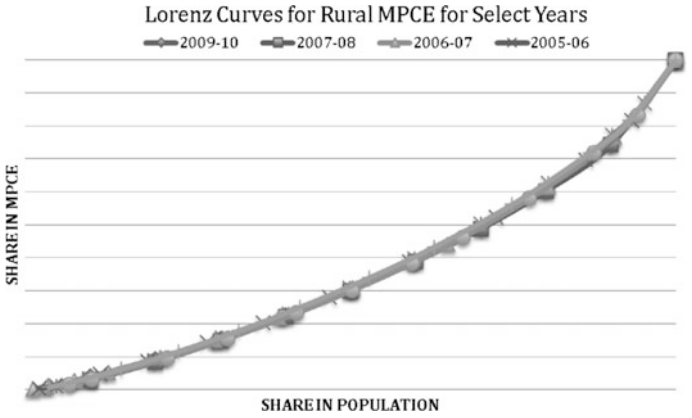


**Fig. 1.1** Lorenz curves for rural MPCE for select years

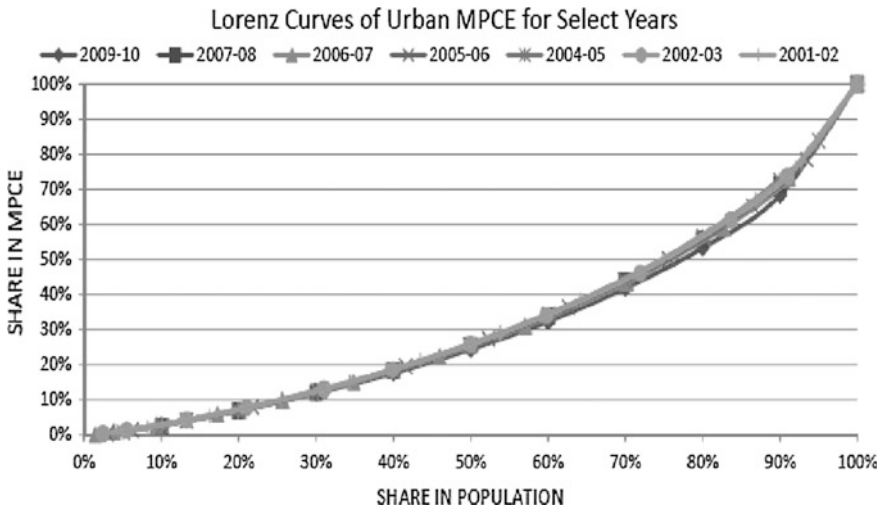


**Fig. 1.2** Lorenz curves of urban MPCE for select years

years are based on replacing continuous distributions by histograms corresponding to the size classes. Naturally this procedure involves potentially significant approximation errors that could be large if the number of size classes is few. I will assume that these errors do not bias the Inter year comparisons below of the Lorenz curves and of Gini coefficients based on them. Since it is well known that Gini coefficients are not only crude aggregate measures of inequality but also insensitive to changes in the distribution it is preferable to compare the distributions themselves rather than only the Gini coefficients. I will in fact do both. Looking at the distributions in Figs. 1.1 and 1.2 it is apparent that in the decade 2000–2010 the Lorenz curves did not change very much. To be sure, I also did a Kolmogorov-Smirnov test of a bilateral comparison respectively of the Rural and Urban Lorenz curves for the years 2001–02 and 2009–10. The results are presented in Table 1.1. No statistically significant difference between the two Lorenz curves is seen in either Rural or Urban areas.

**Table 1.1** Kolmogorov-Smirnov test for Lorenz curves for rural MPCE

| | D | *p*-value |
|---|---|---|
| *Rural* | | |
| Group 1–2009–10 | 0.2333 | 0.552 |
| Group 2–2001–02 | −0.0667 | 0.953 |
| Combined K-S test | 0.2333 | 0.928 |
| *Urban* | | |
| Group 1–2009–10 | 0.1667 | 0.739 |
| Group 2–2001–02 | −0.0667 | 0.953 |
| Combined K-S test | 0.1667 | 0.998 |

**Table 1.2** (a) Gini coefficients for rural MPCE, (b) Gini coefficients for urban MPCE

| Year | Gini Coefficient | Standard Error | t-statistic | *p*-value | 95% confidence Interval | |
|---|---|---|---|---|---|---|
| (a) | | | | | | |
| 2009–10 | 0.40 | 0.077 | 5.17 | 0.00 | 0.249 | 0.555 |
| 2007–08 | 0.41 | 0.080 | 5.12 | 0.00 | 0.252 | 0.566 |
| 2006–07 | 0.51 | 0.794 | 6.45 | 0.00 | 0.358 | 0.669 |
| 2005–06 | 0.46 | 0.785 | 5.95 | 0.00 | 0.313 | 0.621 |
| 2004–05 | 0.44 | 0.081 | 5.40 | 0.00 | 0.280 | 0.601 |
| 2002–03 | 0.47 | 0.081 | 5.83 | 0.00 | 0.315 | 0.635 |
| 2001–02 | 0.44 | 0.078 | 5.60 | 0.00 | 0.283 | 0.589 |
| (b) | | | | | | |
| 2009–10 | 0.44 | 0.080 | 5.47 | 0.00 | 0.284 | 0.601 |
| 2007–08 | 0.44 | 0.081 | 5.44 | 0.00 | 0.281 | 0.599 |
| 2006–07 | 0.55 | 0.082 | 6.68 | 0.00 | 0.388 | 0.712 |
| 2005–06 | 0.51 | 0.082 | 6.30 | 0.00 | 0.356 | 0.679 |
| 2004–05 | 0.47 | 0.080 | 5.87 | 0.00 | 0.313 | 0.627 |
| 2002–03 | 0.52 | 0.815 | 6.36 | 0.00 | 0.359 | 0.678 |
| 2001–02 | 0.49 | 0.799 | 6.22 | 0.00 | 0.340 | 0.653 |

Table 1.2a, b present Gini coefficients and their confidence intervals. It is evident from the tables that unsurprisingly Urban Gini coefficients exceed the Rural ones once in each of the eight years. Although a statistical test of the hypothesis that the Ginis of the eight years were the same could be done, even without doing so it is clear from the confidence intervals that they are the same. For example, the largest Rural Gini was 0.51 in 2006–07 which is within the confidence interval around the lowest Gini of 0.40 in 2009–10 and vice versa.

Instead of comparing Lorenz curves based on the histograms of the distributions of MPCE one could compare the cumulative distribution functions (CDF) derived from the histograms. Lorenz curves plot the shares of total MPCE of the population shares in the vertical axis against the shares of total population that incur them in the horizontal axis. It is obvious that the Lorenz curve is unaffected by any deflation of MPCE of all individuals by the same deflator, since such deflation does not affect either axis. Strictly speaking under the very strong sufficient conditions all individuals and households face the same vector of commodity prices at each point of time and over time all prices change at the same rate, using a deflation that changes at the common deflator to deflate expenditures of all individuals and households would be appropriate even if the individuals are diverse in their preferences. An alternative sufficient condition would be to assume that all individuals and households have the same preferences and face the same vector of prices with prices varying over time at possibly different rates.

CDFs on the other hand plot (on the vertical axis) the cumulative population shares at the upper limit MPCE values (on the horizontal axis) **at current prices** of

**Table 1.3** Kolmogorov Smirnov tests For CDF of MPCE

| | D | *p*-value |
|---|---|---|
| *Rural* | | |
| Group 1–2009–10 | 0.1727 | 0.732 |
| Group 2–2001–02 | −0.0091 | 0.999 |
| Combined K-S test | 0.1727 | 0.998 |
| *Urban* | | |
| Group 1–2009–10 | 0.2455 | 0.532 |
| Group 2–2001–02 | −0.0091 | 0.999 |
| Combined K-S test | 0.2455 | 0.911 |

successive size classes. The lower and upper limits of each size class have been chosen so that the size class represents the same share of population each year. It would appear that deflation of all size classes by the same deflator could affect the CDF by distorting the horizontal axis, so that the CDFs of the undeflated and deflated MPCEs would be different. In any case instead of comparing CDFs of MPCE at current prices we compare the CDFS of Rural MPCEs deflated by the consumer price index for Rural Labour (CPIRL) and Urban MPCEs by the consumer price index for industrial workers (CPIIW). The CDFs of deflated Rural and Urban MPCEs are shown in Figs. 3 and 4 respectively. The Kolmogorov-Smirnov bilateral comparison tests of CDFs of deflated MPCEs of 2001–02 and 2009–10 for Rural and Urban areas are reported in Table 1.3. The tests confirm what Figs. 3 and 4 suggest, namely, that there is no change in the CDFs of deflated MPCEs in the decades of 2009–10. Given the crudeness of the deflation procedure the importance of this finding should not be exaggerated. For this and other reasons including that the time periods analysed and the methodology of analysis are different from Sen and Himanshu (Sen 2004) it should not be compared to their finding that inequality increased sharply in the 1990s.

For many reasons, primarily due to data problems and possibly serious approximation errors, absence of robustness checks and crudeness of deflation I would not claim that my statistical tests on Lorenz curves and CDFS of uniformly deflated MPCE distributions have established rigorously the in India in the decade of the 2000s inequality has not changed.

The sufficient conditions under which a uniform deflator for all individuals (households) would be appropriate are strong. However, while in principle an individual (household) specific deflator based on the individual's preferences and the policies he/she faces at each point of time would be an appropriate one to use (provided preferences do not shift over time), there are conceptual and data problems. First, we have to have panel data so that the same set of individuals are sampled over time. Second, even if we did, there are many conceptual problems including one of aggregation of real income over individuals. Thus although the use of uniform deflator is problematic there is no better alternative.

## 1.6 Poverty Before and After 2000

Inequality and poverty are distinct concepts and that the changes over time in one need not correspond or correlate with changes in the other. There is an extensive literature on the choice of poverty norms, in particular whether a scalar norm or a vector of norms would be appropriate and whether they could be deemed to be inter-temporally stable. In my paper, (e.g. Srinivasan 2007) on poverty, I have discussed this issue and have nothing new to add. Subramanian's paper in this volume discusses this issue.

I **will simply assume** that (i) there is general agreement in India on the norms being scalars called poverty lines (PL) for the society as a whole and/or for well-defined socioeconomic groups within the society as well as their stability in real terms (ii) the PLs are defined as the value at well-defined and specified prices in some base year of specified bundles or baskets (called Poverty Line baskets or PLBs) and (iii) a well-defined procedure for backdating and updating PLs in base year prices is also specified.

If my memory serves me right, in India the updating (and backdating) was done (until Lakdawala Committee changed it in 1993) by inflating (and deflating) **the base year value** of the PLB, i.e. the PL of the base year, using a single overall price index for rural and urban areas **rather than revalue the PLB itself** at the prevailing prices of the goods and services included in the PLB, the price vector being drawn from the prices of commodities and services included in the chosen price index. For this reason, the debate on the contents of the PLB is entirely misplaced as all PLB's which happen to have the same value at base year prices would serve just as well as poverty lines for the base year and hence all subsequent years!

The official data on poverty published by the Planning Commission until 1979, to the best of my knowledge, were based on PLs of Rs. 20 per capita in rural areas and Rs. 25 per capita in urban areas at 1960–61 prices. These PLs were defined by an expert group in 1961 (see Srinivasan and Bardhan 1974). but they did not spell out the basis for them, although the Perspective Planning Division gave the pragmatic reason that, "In deciding the minimum objective a balance has to be struck between what may be considered desirable and what is in fact feasible by way of the of rate of income growth and of income redistribution within a given period of time". These PLs did not include expenditures of a household on education and health services as these were meant to be provided at no cost to the household by the state.

The PLs were reviewed in 1979 by a Task Force chaired by Yoginder Alagh. It recommended new poverty lines of Rs. 49 and Rs. 56 respectively for rural and urban areas at 1973–74 prices and in addition recommended replacing the mean MPCE of the NSS survey data by its corresponding value in the National Accounts Statistics. Also, they defined the food basket that would provide the energy equivalent of 2400 kilocals per capita per day (kcal pcpd) for rural and 2100 kcals pcpd for urban areas, and its composition based on patterns corresponding to these levels of consumption from NSS data for 1973–74. They also used consumer price

indices for agricultural labour for rural and non-manual workers for urban areas for adjusting the poverty line for price changes; and further made pro-rata adjustments to NSS estimates of per capita expenditure per day to account for the difference between NSS and NAS estimates of total consumption. Official Poverty data from then on were based on both recommendations of the Task Force. The Lakdawala Committee of 1993 accepted the Task Force's first recommendation on PLs but, in my view rightly, not its second recommendation on pro-rata adjustment, and also changed the procedure for the updating PLs. In effect official poverty estimates from 1973–74 till 2004–05 were based on the PLs defined by Task Force and the updating procedures of the Lakdawala Committee.[5] They also suggested that henceforth poverty estimates be made entirely on the basis of NSS consumption data and provided estimates from 1973–74 to 1987–88. All subsequent estimates of the PC followed this method (Planning Commission 1993) until the report of the Tendulkar Committee. Based on the methodology of the report (Planning Commission 2009) the Planning Commission (2013) has published poverty estimates for 2004–05 and 2011–12 for India as a whole and the states. Ignoring the effect of the changes in poverty lines the proportion of the poor in India's population fell from over 50% in the early fifties to 22% in 2011–12. The data for 2011–12 became available only after the exercises in Sects. 6.1–6.3 below had been completed.

### *1.6.1 Related Studies*

Datt (1998) had revised and updated poverty indicators (poverty ratio, poverty gap and poverty gap squared) of Rural and Urban India as a whole and of major states using the poverty lines of Rs. 49 per capita per month in Rural areas and Rs. 57 per capita in Urban areas at 1973–74 prices as recommended by the Task Force (1979). He did not replace the mean MPCE of each round with its counterpart from National Accounts Statistics. He estimated semi-log time trends of poverty. My first exercise was simply to replicate Datt's trend estimate in part to check, whether he had used (square root of) sample sizes as weight as is done in this paper to improve the efficiency of the parameter estimates. However both sets of estimates are unbiased. It appears he had not—his estimate of the rate of decline of Rural and Urban poverty during 1951–1994 were respectively 0.86 and 0.75%. My estimates were respectively 0.89 and 0.77%. Both the slopes were statistically significant with *p*-values of 0.000 (Table 1.4a).

[5]I am greatly indebted to Mr. K.L. Datta, Consultant in the Ministry of Rural Development, Government of India, for letting me see Chap. 2 on The Methodology of Poverty Measurement from his forth coming untitled book analysing Poverty Measurement and Policy in India (Datta, forthcoming). My email exchanges with him and the chapter were very helpful in clarifying the changes in poverty measurement by the Planning Commission and also evaluation of the changes made (as well as needed and not yet made) by independent scholars.

**Table 1.4** (a) Summary of empirical results, (b) seemingly unrelated regressions with serially and across equations independent residuals

| Author | Log poverty | Time | Coefficient | Standard error | *p*-value |
|---|---|---|---|---|---|
| (a) | | | | | |
| Datt | Rural | 1950–1993 | −0.0089 | 0.00189 | 0.00 |
| | Urban | 1950–1993 | −0.0076 | 0.00179 | 0.00 |
| Planning Commission | Rural | Quinquennial | −0.022 | 0.00137 | 0.00 |
| | Urban | Quinquennial | −0.025 | 0.0022 | 0.00 |
| World Bank $1.25 (PPP) | Rural | Quinquennial | −0.019 | 0.0029 | 0.002 |
| | Urban | Quinquennial | −0.045 | 0.037 | 0.207 |
| Gupta and Datta (1984) | Rural | 1960–78 | −0.006 | 0.0039 | 0.115 |
| | Urban | 1960–78 | −0.013 | 0.0036 | 0.004 |
| Updated figures using Datt and CPIAL and CPIW | Rural | 2000–2009 | −0.0046 | 0.0165 | 0.795 |
| | Urban | 2000-2009 | −0.730 | 0.0288 | 0.065 |
| (b) | | | | | |
| Datt | Rural | 1950–1993 | −0.0089 | 0.00179 | 0.00 |
| | Urban | 1950–1993 | −0.0076 | 0.00169 | 0.00 |
| Planning Commission | Rural | Quinquennial* | −0.022 | 0.0011 | 0.00 |
| | Urban | Quinquennial* | −0.025 | 0.0019 | 0.00 |
| Updated figures using Datt and CPIAL and CPIW | Rural | 2000–2009 | −0.0046 | 0.0136 | 0.795 |
| | Urban | 2000–2009 | −0.0730 | 0.0236 | 0.065 |

My next set of regressions estimated the trends of official poverty ratios during six quinquennial year surveys over three decades of 1973–74 to 2004–05 omitting 1999–2000 because of its well-known problems. As seen from Table 1.4b the yearly average trend rates of decline at 2.2 and 2.5% respectively in rural and urban areas. Both are statistically significant with *p*-values of 0.000. Since the rates of decline seem rather rapid, the sample size of six is very small and the trends have to be corroborated with independent data before they are used.

I updated to the decade of 2000 poverty lines of Task Force (1979) using CPIAL for Rural areas and CPIIW for urban area, estimated poverty ratios using the CDFs derived from the histograms. Naturally there could be significant approximation errors in the ratios. Predictably the standard errors of the estimated regression coefficient are high. The estimated annual average decline 0.465 in rural areas is not statistically significant from zero. The rate of decline at 7.3% for urban areas is too fast (halving of poverty every decade) to be credible and it is statistically significant at a 6.5% level of significance only. The slow and significant decline if rural poverty is consistent with the general belief that the agricultural sector has been stagnant and the occurrence of a spate of farmer suicides in some states. Consistency in this crude sense should not be viewed as establishing a causal story.

### 1.6.2 Econometric Exercises

It goes without saying that there would be significant correlation between rural and urban poverty ratios suggesting that the residuals of trend regressions for the two could be estimated using the technique of Seemingly Unrelated Regressions (SUR) allowing for the residuals to be correlated. However, Table 1.4b reports results for the simple case of uncorrelated disturbances. In such a case the parameter estimates remain unchanged as compared to the estimates from running separate regressions but there are efficiency gains in the form of lower standard errors for the estimated parameters because of larger sample in combining the two regressions. This is seen clearly be comparing the residual mean squares in the corresponding regressions. For example consider Rural regressions in 1.4a, and its counterpart in 1.4b. Both have the same slope coefficient −0.0224644. But the slope coefficient in 1.4b, has a lower standard error compared to its counterpart in 1.4a. The following additional trend regressions are run, and reported in Tables 1.5 and 1.6. These include separate regressions of poverty ratios of World Bank at its $1.25 a day at 1995 PPP exchange rates and of Gupta and Datta (1984), and grand pooling of regressions.

Finally, I tested for structural breaks in my longest time series of poverty series included in the regressions reported in Tables 1.6, at 1985–86 and 1990–91 that are exogenously imposed. This time frame was selected as India implemented a few hesitant economic reforms in the mid-1980s, and systemic reforms covering several sectors in 1991 after a severe macroeconomic and balance of payments crisis. The coefficients for these structural breaks are not significant. One of the main reasons could be the limited number of observations in the 1990–2009 period relative to the earlier years. However, we have limited concurrent observations in the 1990–2009 period relative to the earlier years. Further Bai and Perron (1998) tests were done to test if they were any endogenous structural breaks.

My plans were to compute time series of poverty levels from 1950–51 to 2009–10 based on (updated and backdated) poverty lines of the Planning Commission,

**Table 1.5** Grand pooling

| | Coefficient | *p*-value |
|---|---|---|
| Rural | −0.0087356 | 0.00 |
| Urban | −0.007104 | 0.01 |

**Table 1.6** Exogenous breaks in poverty trends

| Log poverty | Time | Coefficient | *p*-value | 95% confidence interval | |
|---|---|---|---|---|---|
| Urban | 1950–1985 | 0.011 | 0.36 | −0.0141861 | 0.037275 |
| Rural | 1985–2009 | −0.011 | 0.14 | −0.0221102 | 0.0000142 |
| Urban | 1950–1991 | 0.0001 | 0.98 | −0.0114702 | 0.0117099 |
| Rural | 1991–2009 | –0.019 | 0.16 | −0.0280707 | 0.0053086 |

the Task Force of 1979, Gupta and Datta (1984), the Expert Groups chaired by Lakdawala and Tendulkar (in 2009) and the World Bank's $1.25 a day at 1995 PPP exchange rates. For various reasons they could not be realized. Instead I drastically limited my effort of to extend different poverty lines to cover the time span of six decades and chose to use the poverty ratios that various authors had published using their poverty lines for the years they chose to cover in a common semi-log time trend framework. This meant that my intention to use annual rounds of non-quinquennial years could be implemented only partially since the poverty ratios of several authors are available only for the quinquennial years! Unfortunately the myth, and it is a myth since no one has provided convincing evidence in support, that only in the large sample sizes in quinquennial years could yield reliable estimates, seems to have been bought without much thought by official, national and international agencies. Be that as it may in the time trend regressions that follow I have made the best of a bad bargain by using all the information available, meaningfully I hope!

### *1.6.3 Revision of Poverty Measurement by the Tendulkar Committee*

The Tendulkar committee submitted its report in November 2009. It painstakingly rationalized its apparently radical revision of poverty measurement in India by proposing a single PLB applicable to all of India's residents, rural or urban and in whichever state or union territory they happened to be residents. Presumably the PLB was meant to be universal in this sense but possibly eternal as well in the sense of being time invariant. To be fair the Committee neither explicitly suggests its PLB as an eternal norm nor does it explicitly say that it is not. This universal PLB was "*the MRP [Mixed Reference Period] equivalent of PCTE (Per Capita Total Consumer Expenditure] corresponding to 25.7% of urban BPL [Below Poverty Line] population… [or] poverty ratio*" (Planning Commission 2009, p. 7).

In arriving at its universal PLB, the committee started with the observation "*that the latest available official estimate of rural poverty ratio of 28.3% for 2004–05 is widely perceived to be too low mainly because of understated price adjustment (mentioned earlier) and its basis of a very old and outdated 1973–74 poverty line basket (PLB) while the corresponding urban proportion 25.7 percent of the BPL population is less controversial in terms of order of magnitude of extent of urban poverty*" (Ibid., p. 6) It then goes on to list seven points in favour of its recommended PLB Ibid., pp. 7–8).

It is ironic that the committee, after rightly deciding not to anchor poverty line around average energy requirements (in kilo calories per day) per person based on FAO/WHO energy requirements in kilo calories per day of persons of specified age, sex and activity status and in the case of a female, her pregnancy and lactation

status,[6] nonetheless felt it needed to draw support for its PLB by pointing out in its point six that *"the revised minimum calorie norm for India recommended by FAO is currently around 1800 calories per capita per day which is very close to the calorie intake of those near the new poverty lines in urban areas (1176 calories per capita and higher than the revised FAO norm (1996 calories per capita) in rural areas in the 61st round of NSS*" (Planning Commission 2009, p. 8). The seventh point in support the new PLB is that it happens to be close to close to but less than the 2005 PPP $1.25 poverty norm used by the World Bank in its latest poverty estimates. Unless the World Bank's or for that matter any other PL is independently rationalized or justified on some normative grounds the fact that the committee's PL is close to them is no argument in its favour.

The committee also carried out external validation checks *"for the consistency of the new All India and state level poverty lines derived from the recommended PLB and recommended price adjustment procedure with regard to nutritional, educational and health outcomes derived from the related specialized out,-oriented service*" (Ibid., p. 8). Although I am very much attracted to and supportive of the idea of a universal norm of poverty for all Indian citizens (and arguably also for non-citizen residents), I was not persuaded by the rationale used by the committee for the particular PLB it chose as the universal norm. By saying this I do not mean to dismiss the so-called validation checks used by the committee but only to express my scepticism about the rationale behind these checks themselves. Also some of the arguments in support of the PLB offered by the committee seem irrelevant for the purpose to me. If my memory serves me, which it may not, I had expressed my reservations to Suresh in our unrecorded conversation in January 2010 and promised to think about them.

The Group described its procedure (Steps A-F) for deriving final poverty lines at 2004–05 prices and their updating (Steps G-H) in Annex C. It reports state wide and All-India poverty lines for the year 2004–05 for rural and urban areas separately. Their updated values for 2009–10 are also available from the PC. However, without access to the household level unit values each year, particularly the non-quinquennial years in which they are not publicly available, poverty lines and levels based on the committee's procedure are impossible to compute. I can personally testify to this fact in my own failure in my attempt to do so for this paper. The committee was aware of this problem and for this reason had recommended "*that the NSO publish by state and rural and urban population, the median levels of unit values for all the items for which quantities are available*" *and* "*that the*

[6]The eminent statisticians, late Professor P.V. Sukhatme (1911–1997), in several papers stressed the importance of allowing for intra and inter individual variation in energy intakes around a requirement, defined as long term averages. He had argued that not doing so in identifying all individuals whose energy intakes below the average requirements for the population as a whole as necessarily undernourished would lead to erroneous estimation of the share of undernourished in a population and by the same token erroneous estimate of the poverty ratio in a population using a poverty line anchored at the average energy requirement for a population. See Srinivasan (1992) and Sukhatme (1982).

*planning commission set up either in-house or in some suitable institution a unit that can perform the required computations whenever necessary and support the state governments to do the calculations, if necessary*" (Ibid., p. 15). Neither recommendation has been implemented as yet.

## 1.7 Conclusion

This paper is primarily intended to be a tribute to Suresh Tendulkar and his contributions to poverty measurement and also planning. It did not cover all his writings, particularly during his tenure as the Chairman of the Prime Minister's Economic Advisory Council. Nor did it explore his contribution as Chairman of National Statistical Office. Given my chosen task, the previous sections of the paper did not go deeply into policy issues. Yet Suresh's doctoral thesis and his work during the decade (1968–78) he spent at ISI were very much on national planning. A significant part of my work in ISI during (1964–77) was also on planning models. Put another way, both of us then still had faith in the public-sector led planning largely managed by non-price based economic management as essential for achieving the overarching national objective of poverty eradication. Without entering into my later deviations from this faith and reasons thereof and into debates on policy to which I have had my say in my other writings, let briefly summarize my policy observations.

First, the empirical results support a broad observation that until the hesitant reforms of mid-eighties and systemic reforms post 1991, growth was slow and no downward trend in poverty ratio. Since the reforms, the growth rate of real GDP accelerated and the poverty ratio declined. It is also the case that from a policy perspective the reforms broadly speaking abandoned the insularity from world markets and absence of domestic and external competition, and encouraged the entry of domestic and foreign private sector entities. For example the development and the success of the IT sector and the emergence of large entities that did not even exist in the pre-reform era testify to the success of competition of Indian entities in global markets that was created by the reforms. Sadly the post reform era is also one in which administrative and political corruption are widely believed to have increased. Most importantly, one-party rule at the Centre came to an end with the defeat of Rajiv Gandhi's Congress Party rule in 1989 and ushered in an era of rule by coalition of regional parties for the first time at the Center.

A causal story attributing the economic reforms as having brought about growth acceleration and poverty reduction that is theoretically and econometrically sound is virtually impossible to provide for several reasons. These include the inadequacy of the number of observations and difficulty of identifying a sufficient number of exogenous variables. However several analyses, largely of a descriptive kind, including Srinivasan (2011) are available. I would argue that by and large the analyses, though not all, support the proposition that the reforms of moving away from the license-permit raj were justified and the results confirm that. It is if

anything not fully implementing the agenda of 1991 reforms, not initiating needed reforms relating to factor markets, infrastructure, and financial sector that have contributed to the growth slowdown since the three golden years of 9 percent a year average growth during the three fiscal years 2005–06 to 2007–08. The global financial crisis of 2008 or the Euro zone uncertainties since late 2011, added modestly to the growth slowdown that was already in progress and growth recovery after the financial crisis of 2008 lasted only until the Euro Zone sovereign debt crisis hit. Incidentally India's own sovereign debt (and the gross fiscal deficits) is arguably unsustainable.

Suresh Tendulkar made lasting contributions to the empirical analysis of India's Economic Development. In particular his work on Poverty Measurement as has attracted the attention of academics and policy makers. Of course the ongoing academic research on conceptual underpinnings of poverty measurement should be encouraged. The prospect of making a path breaking contribution and possibly publishing it in a globally known theoretical journal are obvious incentives. If any additional incentives are needed they should be explored.

In my view, surprisingly there have been only few papers that exploit the increasing availability of data on individuals and households and the computing technology to analyse them have been published on poverty and levels of living in India. Let me conclude with a couple of possible explorations.

The first is studying inequalities of access to services (education, health, clean water etc.) using data from the population Censuses and NSS together. A pioneering study of this approach is by de Barros et al. (2009). Given the available access to unit level data from several rounds of NSS of a stratified random sample from the Universe Covered by the Censuses the opportunity for doing theoretical and empirical work, particularly in devising statistically valid "populations" from censuses from which the sample of particular rounds of NSS could be deemed a random samples and also for imaginatively replicating the work of Barros et al. (2009) is very attractive. The second attractive exploration is to extract from oblivion to which the data from State Level samples of each round has been condemned by the criminal neglect of governments and do analyses of the multiple facets of poverty using both Central and State Samples.

Raj Chetty along with his colleagues has been doing pioneering research in public finance by following individuals for their childhood to adulthood. A recent working paper of Chetty et al. (2011) shows the significant impact of teacher value added in adulthood not only with respect to economic outcomes such as earnings but also other outcomes such as teenage pregnancy of girls. Of course long-term data sets that allow the researcher to follow individuals through their lives are rare. I recognize such data most probably don not exist in India. Nonetheless, my last suggestion is to explore whether any modified form, albeit simple, of the type of research that Chetty and his colleagues are doing with available Indian data.

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in revising the paper. My sincere thanks to Mr Azad Singh Bali for his painstaking research assistance and to Cody Eckert for administrative assistance.

## Appendix

### List of Acronyms

| | |
|---|---|
| AGEM | Applied general equilibrium model |
| CGEM | Computable general equilibrium model |
| CSO | Central statistical office |
| GDE | Gross domestic expenditure |
| GDP | Gross domestic product |
| GNP | Gross national product |
| ISI | Indian Statistical Institute |
| MP | Marginal productivity |
| NAS | National account statistics |
| NSO | National statistical office |
| NSS | National sample survey |
| NSSO | National Sample Survey Organization |
| PC | Planning Commission |
| PL | Poverty line |
| PLB | Poverty line basket |
| PU | Planning Unit |

## References

Agarwal, S. N. (1944). *The Gandhian plan of economic development for India*. Bombay: Padma Publications.

Bai, J., & Perron, P. (1998). Estimating and testing linear models with multiple structural breaks. *Econometrica, 66*, 47–78.

Banerjee, B. N., Parikh, G. D., & Tarkunde, V. M. (1944). *People's plan for economic development of India*. New Delhi: Indian Federation of Labour.

Chetty, R., Friedman, J. N., & Rockoff, J. E. (2011). *The long-term impacts of teachers: Teacher value-added and student outcomes in adulthood*. Working paper no. 17699, Cambridge, MA: National Bureau of Economic Research.

Datt, G. (1998). *Poverty in India and Indian States: An update*. Working paper no. 47, Washington D.C.: International Food Policy Research Institute.

Datta, K. L. *Untitled book on analysis of poverty in India*. New Delhi: Concept Publishing (Forthcoming).

de Barros, R. P., Ferreira, F. H. G., Vega, J. R. M., & Chanduvi, J. S. (2009). *Measuring inequality of opportunities in Latin America and the Caribbean*. Palgrave Macmillan and the World Bank.

Deaton, A., & Kozel, V. (2005). *The great Indian poverty debate*. New Delhi: Macmillan.

Force, T. (1979). *The task force on minimum consumption demand*. New Delhi: Planning Commission.

Gupta, S. P., & Datta, K. L. (1984). Poverty calculation in the sixth plan. *Economic and Political Weekly, 19*, 632–638.

IIAPR. (1988). *Report of the national planning committee, 1938*. New Delhi: Indian Institute of Applied Political Research.

Jain, L. R., & Tendulkar, S. D. (1973). Analysis of occupational differences in consumer expenditure patterns in India. *Sankhya: The Indian Journal of Statistics: Series B, 35*, 239–358.

Narayana, N., Parikh, K., & Srinivasan, T. N. (1991). *Agriculture, growth, and redistribution of income policy analysis with a general equilibrium model of India*. New York: Elsevier Science.

NSSO. (2001). *Golden jubilee publication*. New Delhi: National Sample Survey Organisation.

Özler, B. D. (1996). *A database on poverty and growth in India*. Washington D.C.: Policy Research Department, World Bank.

Perspective Planning Division. (1974). Perspectives of development: 1961–1976: Implications of planning for a minimum level of living. In T. N. Srinivasan & P. K. Bardhan (Eds.), *Poverty and income distribution in India* (pp. 9–38). Calcutta: Statistical Publishing Society.

Planning Commission. (1993). *Report of the expert group on estimation of proportion and number of poor*. New Delhi: Perspective Planning Division, Planning Commission.

Planning Commission. (2009). *Report of the expert group to review the methodology for estimation of poverty*. New Delhi: Planning Commission.

Planning Commission. (2013). *Press note on poverty estimates, 2011–12*. New Delhi: Planning Commission.

Scarf, H. E., & Hansen, T. (1973). *The computation of economic equilibria*. New Haven: Yale University Press.

Sen, A., & Himanshu (2004). Poverty and Inequality in India-II: Widening Disparities during the 1990s. *Economic and Political Weekly*, *39*, 4361–4375.

Singh, N., & Srinivasan, T. N. (2006). *Federalism and economic development in India: An assessment*. MPRA Paper No. 12452, Munich: Munich Personal RePEc Archive, Munich University Library.

Srinivasan, T. N. (1962). Investment criteria and choice of techniques of production. *Yale Economic Essays, 2*, 59–115.

Srinivasan, T. N. (1992). Under-nutrition: Concepts, measurement and policy implications. In S. Osmani (Ed.), *Nutrition and poverty* (pp. 103–109). Oxford: Clarendom Press.

Srinivasan, T. N. (2007). Poverty lines in India: Reflections after the Patna conference. *Economic and Political Weekly, 42*, 4155–4165.

Srinivasan, T. N. (2011). *Growth, sustainability and India's ecoconomic reforms*. New Delhi: Oxford University Press.

Srinivasan, T. N., & Bardhan, P. K. (1974). *Poverty and income distribution in India*. Calcutta: Statistical Publishing Society.

Srinivasan, T. N., & Tendulkar, S. D. (2003). *Reintegrating India with the world economy*. New Delhi: Oxford University Press (India).

Sukhatme, P. V. (1982). Measurement of undernutrition. *Economic and Political Weekly, 17*, 2000–2016.

Tendulkar, S. D. (1969). Econometric study of monthly consumption expenditures in rural Uttar Pradesh. *American Journal of Agricultural Economics, 51*, 119–137.

Tendulkar, S. D. (1971). Interaction between domestic and foreign resources in economic growth: Some experiments for India. In H. B. Chenery (Ed.), *Studies in development planning* (pp. 122–154). Cambridge, MA: Harvard University Press.

Tendulkar, S. D. (1974a). Planning for growth, redistribution and self-reliance in the fifth five-year plan-I. *Economic and Political Weekly, 9*, 27–40.

Tendulkar, S. D. (1974b). Planning for growth, redistribution and self-reliance in the fifth five-year plan-II. *Economic and Political Weekly, 9*, 63–80.

Tendulkar, S. D. (1974c). Draft fifth plan and removal of poverty. *Economic and Political Weekly, 9*, 283–289.

Tendulkar, S. D. (1977). Planning process planning commission and rollover planning: Some basic issues. *Economic and Political Weekly, 12*, 1777–1782.

Tendulkar, S.D. (1978). Employment (a critical review of the draft five year plan 1978–83 with reference to the employment objective). *Seminar*, No. 228.

Tendulkar, S. D., & Bhavani, T. A. (2007). *Understanding reforms: Post-1991 India*. New Delhi: Oxford University Press (reprinted paperback edition in 2012).

Thakurdas, P., Birla, G., Dalal, A., Mathai, J., Kasturbhai, L., Shroff, A. D., et al. (1944). *The "Bombay Plan" for India's economic development*. New York: International Secretariat, Institute of Pacific Relations.

# Chapter 2
# Understanding Economic Reforms for India: A Book Review

**Y.V. Reddy**

**Abstract** Economic development going well beyond growth has been the principal agenda of each and all of the governments in India since it became independent more than six decades ago. Many factors, including, in particular, the fact that India chose to follow a democratic political system and that the state was agreeably destined to play a vital role in the social, political and economic development of the country, have been critical in shaping the State of the Nation at different times. The country, unavoidably, went through phases of development, retardation and crises from time to time until 1991 when a totally new paradigm had to take over. The last book that Professor Suresh Tendulkar wrote, co-authored by Professor Adi Bhavani, brings it all out remarkably well. No wonder, after all Suresh was a critic, a witness as well as an important contributor to the process of policy formulation for many years. The book is a must read for those all interested in India's development.

**Keywords** Economic Reforms for India · Economic Policy in India

India's post 1991 reforms have been widely discussed in alternative contexts with different approaches and in varying depths. Most of us tend to believe that we understand the process which has been on for more than two decades. Yet its depth of coverage, its analytical underpinnings and its social, political and economic consequences are by no means easy to grasp. Not surprisingly so since, by its very nature, the process is extremely complex and multifaceted. We have therefore to remain indebted to Professor Suresh Tendulkar and his co-author Professor T.A. Bhavani for helping us with their book **Understanding Economic Reforms for India—Post 1991**, published first in 2007. We are also grateful to Oxford University Press for bringing out a second edition of the book in 2012 with an additional chapter to update the discussion. Since this edition is in paperback it is

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bound to encourage greater readership among social scientists, policy makers, teachers and students, and many others interested in India's progress.[1] Since the current edition came out after Professor Suresh D. Tendulkar had passed away it begins with a tribute to him. I strongly feel that the brief tribute must be read by economists, political scientists and policymakers to gain inspiration from an eminent scholar-statesman who fits the description of both a "guru" and a "rishi".

Tendulkar and Bhavani deal broadly with four related issues.

The first two chapters outline the general agenda of reforms along with its analytical framework, following the work of W. Baumol and Douglas North. The next four chapters deal with the different phases of economic policy in India since independence. Here we have a characterization of the so called Nehruvian model of (Chap. 3) followed by an analysis of the slow growth regime which ended circa 1981. The 'Eighties, marked by higher growth along with the cost of fiscal imbalance, seemed to be a turning point. Chapter 6, the last in this set, examines why the reforms had become unavoidable in 1991.

The third major issue taken up in Chaps. 7 and 8 relates to the political dimensions of economic policy formulation and implementation. The last chapter looks ahead with a vision of problems and possible solutions.

The new paper-back edition is valuable, both for the comprehensive research presented in the volume and as well as an excellent update. It is no doubt also timely because since the second half of 2012 India seems to be going through severe swings in the mood for reform—from prolonged extreme pessimism to a burst of actions on the reform front towards the end of the year.

The reform process in the Indian perspective has been analysed in the book in terms of the role of five factors namely, (a) external influences; (b) the reforming leaders; (c) economic and political crisis; (d) ownership of reforms; and (e) the needed consensus building. The framework is a lasting contribution which captures the inter play of different factors and interpretation of facts. Let us now take up the underlying issues in some detail.

The first Chapter on the "Reforms Process" seeks to explain many aspects of the reform process since 1991, recognizing that the reform process has not been smooth, internally synchronizing, complete or fully successful. It attempts to illustrate its systemic, continuing and wide ranging character. While the continuing elements are highlighted in all the chapters, the update tries to explain reasons for the apparent discontinuity or a pause in the very recent past. The book seems to offer some clues towards unscrambling the puzzling features of the Indian reform process, while addressing political economy and institutional aspects. As mentioned earlier, the analytical framework adopted is that suggested by economic historian Douglas North supplemented with certain conceptual distinctions made by William

[1]Having received a copy of the first edition of the book autographed by Suresh soon after it was published in 2007, I had the privilege to read the book and find how excellent it was in its coverage and depth. Without much delay I felt inclined to convey to him how outstanding the work was, giving me a chance for even deeper interaction with him on complex issues bothering us all.

Baumol (p. 5). Economic reform is recognized as a process, and the context, timing and directions of the various elements of the process have been explored.

A description of the framework in the next chapter can be treated as a set of useful tools in understanding reforms. There is almost a prophetic statement towards the end of the chapter which deserves to be highlighted. It says, "As long as interest groups together do not take fiscal deficits to unsustainable levels through the earlier mentioned transmission mechanisms and so long as partners in the distributional coalition honour the implicit contract regarding their individual agreed shares, the distributional coalition is viable. The coalition becomes unviable the moment it makes the public exchequer unsustainable in terms of huge fiscal deficits." (p. 16). There are some who believe that the current environment of discomfort with coalition politics may be reflecting the unviability that has been flagged by the authors.

Next we have an impressive summary of the development strategies adopted after independence. The narration is comprehensive but succinct and unexceptionable. However, conspicuous by its absence, is the role of Rajaji (C. Rajagopala Chari), the first Indian to have taken over as the Governor General of India. Rajaji was later also Chief Minister of the then Madras State. He was, undoubtedly, an impressive national leader who rubbed shoulders with Pandit Nehru. He proved the uses of deregulation by pioneering the abolition of post Second World War ration system of food-grains in Madras state, and making a success of it. He differed significantly with the development strategies adopted at the Avadi session of Congress Party, described as Nehruvian socialism. He founded a political party, namely, Swatantra Party, among whose objective was the abolition of what he described as "License Permit Raj". While the Party attracted a large following among the intellectuals in India, the party lost its electoral battles.

In some sense, the intellectual and political guru of deregulation and liberalization in India was Rajaji who along with many of his followers had to sacrifice their political careers in view of the rejection of their ideology by the electoral dynamics. In other words, many people unequivocally rejected at that point of time a strategy of development that emerged as being relevant decades later—in 1980s and 1990s in India. It is, perhaps, necessary to explore further the dynamics behind the failure to gain legitimacy at that time of what now appears to be an eminently sensible development strategy. Such exploration could help appreciate the social context and the timing of the reform that has actually occurred three to four decades later.

"The Slow-growth Phase" up to 1980–81 covered in Chap. 4 is very exhaustive and is a very good description of the forces that led to what may be described as low growth equilibrium. The uniqueness of the slow growth phase over three decades since 1950 is best summarized in the concluding paragraph of the chapter. "GDP growth averaged around 3% during the decade. We interpret this to be a case of low-growth equilibrium with fiscal and balance-of-payments stability albeit with distorted prices" (p. 56). But it is very interesting that the decade of 1980s produced impressive growth accompanied by noticeable deterioration in the fiscal conditions and in the balance of payments, resulting in a crisis. The reading of Chaps. 4 and 5

together provides interesting insights into the perceived trade-offs between growth and stability.

The discussion next move to the decade of the 1980s has rightly noted the widely prevalent intentions to reform as expressed through several committees. However, it might be worthwhile to explore the reason for not acting on most of the recommendations of the official committees. One possibility is that the committees were reactive to the problems of individual elements of economic policies in a compartmentalised fashion. They did not consider the issues as part of grand strategy. The chapter rightly concludes that the high growth was unsustainable due to the persistence of distorted prices, and the fiscal and external payments imbalances. However, a more comprehensive view of the strategies of development, perhaps, could have avoided the imbalances which were clear and persisting. There may be lessons from this experience for the current challenges to public policy in 2012, opening up an important interesting area for research.

This brings us to a very objective presentation of the context and timing of the 1991 reforms. Of particular contemporary relevance is the phenomenon of fiscal deterioration coupled with high current account deficit. "Our interpretation of this result is that the external payments crisis would have occurred even in the absence of exogenous shocks, which merely hastened its arrival and offered a window of opportunity as the external payments crisis shook the polity much more than the brewing fiscal crisis" (p. 81). The subsequent chapter explores the reasons for continuing reforms in the era of coalition politics. By the very nature, the explanations for continuing reforms in an era of coalition are somewhat exploratory and speculative. The central theme is that the instrumental role of rapid growth for sorting out distributional conflicts in an orderly fashion has to be recognized by all the political parties in the coalition game, if the reform process is to continue. In this light, it will be useful to explore further the reasons for breakdown of momentum in the reform process in the recent past.

Let me emphatically state that Chap. 8 on the political economy of reforms is easily the most enlightening part of the book by virtue of the fact that it analyses in depth the political economy of reforms with an insightful analysis of the individual initiatives. This is an in depth contribution to the understanding of reforms process. For purpose of further research agenda, the classification of reform measures through individual initiatives is an excellent way of appreciating the political economy of reforms. The reform measures are classified into: (a) measures carried out by an agency other than central government, such as Reserve Bank of India; (b) measures within the discretionary powers of the government; and (c) measures that require legislative amendments (p. 105).

Professor Tendulkar and Professor Bhavani postulate that reforms can be fastest in category one, slow in category two, and extremely difficult in category three. In reality, has that been the case in recent years? Is it possible that there has been stalling of spirit of reforms in recent past even when exercising discretionary powers? An evaluation of decisions within existing legal framework, in terms of consistency with reform-agenda will be useful. Similarly, not only legislative

inaction but also legislative actions need to be assessed with reference to the agenda.

The next chapter poses and analyses several issues, viz., role of learning from other's experiences, external influences in the reform process, the importance of reformist leaders, the provocation of reform by crisis, and ideological churning in political parties. While all these do play a role, the ownership of reform is considered to be an important consideration. The Indian style of reforms is described as consensus building for ownership. The book argues and quotes Dr. Manmohan Singh to aver that a political consensus has been the bedrock of the reform process in India, but it was implicit rather than explicit. It is indicated that "such consensus is rarely stated in public, but has often been displayed in the execution of policy. This is important and essential" (p. 171). The validity of this statement in the current context and implications for way ahead would also be an important agenda for research.

An interesting debate in regard to the growth performance of India in recent years relates to the relative roles of external constraints and domestic constraints. The underlying theme in the chapter seems to be that the internal constrains imposed by the polity and society, and not the external factors continue to restrain growth and welfare in India. This is an important observation which may have to be revisited in the context of most recent experience with the slowdown in the growth in the Indian economy after the global financial crisis.

While Chap. 8 is the heart of the book, as stated earlier, the Chapter on "An Update" can be described as the soul of the book. The chapter captures developments since the release of 2007 edition and carries Professor Tendulkar's imprint, though the final version had to be completed by Professor Bhavani. The chapter starts with general statement about how rapid growth coupled with coalition politics seems to have brought about laxity on reforms and adoption of populist welfare measures. Various policy initiatives that have been taken and their consistency with goals of reforms are explained in detail. It concludes that "since the UPA government came into power in 2004, there have hardly been any big-ticket reforms" (p. 198). There is a forthright and insightful explanation of the changing balances between growth and welfare in the recent policy. It provides illustrations and points out that there is lack of genuine commitment on the part of the government to reform. A statement of great import for the future of reform is made in the last sentence of the chapter in the book. "Given coalition politics, lack of broad-based political consensus on big-ticket reforms, and an infirm government, further reforms will be hesitant and episodic only when growth derails" (p. 203).

A study of the progress in economic reform and the reasons for possible loss of confidence in the future of reform presented in the book could be supplemented in future by two other areas of study. First, whether the global financial crisis and its lessons should influence the destination of reform and the path of reform that we were considering five years ago. Second, the focus of the book was only central government but, whether the diverse performances in the state government are critical to understanding the future of reforms. It may be critical because the increasing role of government in physical and social infrastructure is essentially at

state level. Further, greater diversity in the political processes may warrant more attention to reform at state level.

The book provides an authentic and excellent exposition of economic policies, in particular reforms in the recent decades, in the context of political economy considerations. While it enhances the understanding of factors that initiated reforms and contributed to continuation of reforms for several years in different coalitions, it poses issues and prospects for reforms in future. While the first edition of the book ended with a somewhat optimistic note, the Update seems to indicate severe challenges for future. The book is informative and insightful, and will, undoubtedly, inspire research on several areas of economic policy in India. The book should be of great interest to economists, political scientists, policymakers and others interested in a study of Indian society in general and of economy in particular. Those who miss reading this book do so at their own peril.

**Acknowledgments** I have had the privilege and honour of working with Professor Tendulkar at the National Statistical Commission and in the Reserve Bank of India. This has given me the opportunity of fruitfully interacting with him on many issues and to learn many things.

# Chapter 3
# Assessment of Well-Being in Multidimensional Perspective in Post Reform India

**R. Radhakrishna, C. Ravi and B. Sambi Reddy**

**Abstract** This paper analyses the changes in Social Welfare and Inequality during post reform period in the framework of Atkinson Social Welfare Function. Our results suggest acceleration in the growth of social welfare at All India and broad expenditure groups of population. The acceleration of growth in Social Welfare was accompanied by worsening of inequality. This paper provides estimates of elasticity of poverty and welfare with respect to growth and inequality. It also evaluates the performance of states in poverty reduction. The results show substantial inter-state and inter social group variations in poverty reduction. In almost all the states relative poverty of Scheduled communities increased in the post reform period and relative poverty levels were higher for these communities in developed states including Punjab, Haryana and Kerala. Decomposition of poverty reduction between 1993/94 and 2009/10 and simulation exercises show that poverty reduction would have been substantially more, had all states achieved same growth of MPCE as that of All India and inequalities remained at 1993/94 level. This paper suggests an approach to pool two independent surveys data—NSS 61st round (2004/05) and NFHS-3 (2005/06) and provides estimates of multidimensional poverty considering income poverty, child malnutrition, and female chronic energy deficiency under alternative rules of aggregation. This paper also evaluates states performance in the reduction of multidimensional poverty and ranks the states on the basis of multiple deprivations.

**Keywords** Inequality · Multidimensional poverty · Multidimensional well-being · Multiple deprivations · Social welfare function

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## 3.1 Introduction

The measurement of economic welfare is generally based on the proposition that the welfare of an individual depends on the commodities consumed by the individual, which in turn, depends on the level of total expenditure and the prices that the individual faces. The social welfare approach to the measurement of economic welfare of a group involves the use of Social Welfare Function (SWF) for aggregation across individual welfare levels which involves normative judgments and presupposes prior agreement on the form of a SWF. Adopting the Social Welfare Approach proposed by Atkinson (1970) for the measurement of peoples' economic welfare, this paper analyses the trends in welfare in the post reform period for which more or less comparable NSS data on consumer expenditure are available. It also analyses the welfare levels of population subgroups of the rural and urban areas. The trend analysis enable us to examine whether there is a significant improvement in the economic welfare of all population sub groups of rural and urban areas in the post reform period and also whether the inequality worsened over time.

This paper makes use of the poverty lines and rural-urban, inter-state and inter-temporal price adjustments of the Expert Group on *Review the Methodology for Estimation of Poverty* (*Tendulkar Committee*, GoI, 2009) without entering into the debate on the poverty lines and evaluates the performance of the states in the welfare improvement; and the reduction of poverty and inequality in the post reform period. For poverty analysis, this paper uses price adjusted data of three NSS quinquennial rounds (1993/94, 2004/05 and 2009/10). The change in the incidence of All India poverty between 1993 and 2010 has been decomposed into the effects of rural-urban and inter-state differences in growth and inequality. For the inequality analysis, we make use of Atkinson inequality measure supplemented by Gini coefficient. Using inter-state data for 1993/94, 2004/05 and 2009/10, we investigate whether there is any systematic relationship between growth and poverty and also between growth and inequality. We also analyse relative poverty among social groups.

The measurement of poverty has largely dealt with economic deprivation in the income/expenditure space. There is an emerging view that poverty is an outcome of multiple deprivations and income poverty provides only a simplified view of poverty, and conceptualization of poverty should extend beyond what is captured by the money metric. Empirical studies demonstrate that elimination of income poverty may not, *pari passu*, provide freedom from other forms of deprivation. The income poverty line may not make adequate provision for the fulfilment of some of these basic needs. Hence this paper explores the possibility of analysing multidimensional poverty considering income/expenditure and nutrition dimensions by integrating the unit level NSS data on Consumer Expenditure, 2004/05 and unit level National Family Health Survey (NFHS) 2005/06 data on malnutrition. It also utilizes the other data sets on deprivations and ranks the states on the basis of multiple deprivations. This analysis is mainly driven by data availability.

## 3.2 Changes in Economic Welfare and Inequality

### *3.2.1 Unidimensional Measures*

The standard approach used to measure changes in welfare is to assume real per capita expenditure as a measure of welfare (Deaton 1980; McKenzie 1983). In this approach, the consumption basket of an individual is valued at base year prices and the real per capita expenditure of a group is arrived at by aggregating real expenditure on commodities of all individuals within that group. The change in real per capita consumption of the group, thus obtained, is considered as a measure of welfare change. However, this procedure ignores the distributional issues and implicitly assumes that welfare is cardinally measurable and the marginal utility of income is constant (Slesnick 1998). This restrictive assumption is unappealing. The social welfare approach overcomes this problem. The use of SWF for aggregating individuals' welfare involves normative judgments and presupposes prior agreement on the form of a SWF. The SWF proposed by Atkinson (1970) is widely used in the measurement of group welfare from individuals' welfare. This paper uses the Atkinson's Social Welfare Function for analysis of trends in welfare and inequalities.

### *3.2.2 Trends in Economic Welfare and Inequality: 1983–2010*

#### 3.2.2.1 Trends in Real MPCE

The NSS Reports of various rounds (periods) provide per person monthly expenditure on commodity groups for a large number of expenditure classes. These commodity expenditures are expressed at constant prices by using commodity group price indices.[1] The commodity real expenditures are aggregated to arrive at real expenditure for expenditure classes. The expenditure classes are grouped into three broad groups—bottom 30%, middle 40%, and top 30%. Two slightly over lapping periods are considered for comparative analysis.[2]

[1]The commodity group price indices, given in Ravi (2000) for NSS commodity groups separately for rural and urban areas of NSS rounds, compiled from disaggregated monthly wholesale price indices with weights based on NSS household consumption data have been updated using similar methodology.

[2]The NSS used Uniform Reference Period (URP) for the rounds of the first period—1983, 1986–87, 1987–88, 1988–89, 1989–90, 1990–91, 1992, 1993–94, 1994–95, 1995–96 and 1997; and Mixed Reference Period (MRP) for the rounds of the second period—1993–94, 1999–2000, 2000–01, 2001–02, 2003, 2004–05, 2005–06, 2006–07, 2007–08 and 2009–10. For a few rounds, NSS used both the reference periods. The absolute values of MPCE differ between the two. However, it is unlikely to affect their growth rates. While fitting the trend equation, some years belonging to the post reform period have been included for augmenting the degrees of freedom. The inclusion will not affect our comparative assessment.

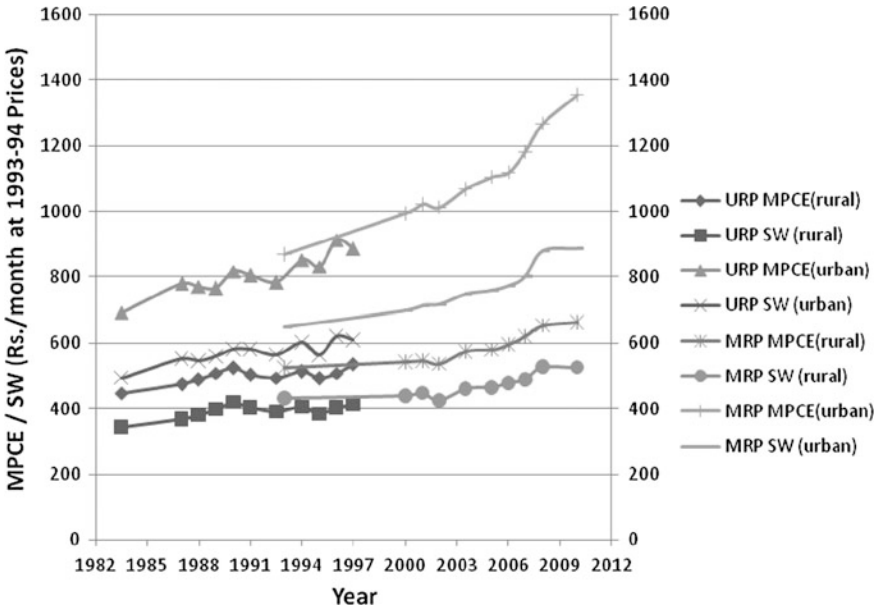


**Fig. 3.1** Trends in MPCE and social welfare

The time series data on real per capita consumption (MPCE) reveal significant improvement in economic welfare over the period considered in this paper-1983–2010 (Fig. 3.1). As may be observed from Table 3.1, during 1983 and 1997 (first period) the MPCE grew at an annual rate of 1.0% in rural areas and 1.62% in urban areas. During 1993/94–2009/10 (second period/post reform period), the growth rate accelerated to 1.73% in rural and 2.77% in urban (second period). It is evident that the growth rate picked up in the post reform period and the urban areas gained the most from higher growth.

Table 3.1 also provides the growth rate of the real monthly per capita expenditure for the expenditure groups for the two sub periods. Clearly, the growth rate of MPCE was higher in the second period for all expenditure groups. However, the difference between the two periods was modest for the bottom groups and comparatively very striking for the top groups. While the improvement in the growth rate was 0.10% point per annum for rural bottom group and 0.35 for urban bottom group, it was as high as 0.96 for rural top group and 1.32 for urban top group. It is evident that the growth in the post reform period was pro rich and urban groups had higher growth in both the periods.

#### 3.2.2.2 Trends in Social Welfare

As mentioned earlier, evaluation of welfare based on per capita expenditure ignores distribution changes and evaluation based on social welfare function overcomes this

**Table 3.1** Annual growth rates of per capita monthly expenditure (%) by broad expenditure groups

| Period | Bottom 30% | Middle 40% | Top 30% | All classes |
|---|---|---|---|---|
| Rural | | | | |
| 1983–97(URP) | 1.22*** | 0.93*** | 0.96*** | 0.99*** |
| 1993/94–2009/10 (MRP) | 1.32*** | 1.32*** | 1.92*** | 1.62*** |
| Urban | | | | |
| 1983–97(URP) | 1.36*** | 1.41*** | 2.00*** | 1.73*** |
| 1993/94–2009/10 (MRP) | 1.71*** | 2.25*** | 3.32*** | 2.77*** |

*Note* The growth rates derived from weighted regression estimated with square root of the number of households canvassed in NSS rounds as weights. While estimating the trend equation, an intercept dummy has been included to distinguish between annual and quinquennial NSS rounds. *URP* Uniform Reference Period; *MRP* Mixed Reference Period
***Significant at 1% level

limitation. We have evaluated the changes in the welfare using the Atkinson Social Welfare Function[3] given by

$$SW_{\varepsilon} = \left[\left[\frac{1}{n}\right]\sum_{i=1}^{n} y_i^{(1-\varepsilon)}\right]^{1/(1-\varepsilon)} \tag{3.1}$$

where $y_i$ ($i$ = 1, 2, 3, …, $n$) is total expenditure of the $i$th individual and $\varepsilon$ is the inequality aversion parameter. Inequality measure $A_{\varepsilon}$ is given by

$$A_{\varepsilon} = 1 - \xi/\mu \tag{3.2}$$

where $\xi = \left[1/n \sum_{i=1}^{n} y_i^{(1-\varepsilon)}\right]^{1/(1-\varepsilon)}$

Atkinson inequality measure shows the proportion of total income that can be saved if each individual receives representative income (equally distributed equivalent income) in such a way that over all social welfare remains constant.

The social welfare function defined in (3.1) can also be expressed as

$$SW_{\varepsilon} = \mu(1 - A_{\varepsilon}) \tag{3.3}$$

[3]In the Atkinson social welfare function, inequality aversion parameter ε can take both positive and negative values. When it takes the value '0' welfare is equal to μ i.e., mean expenditure. For all negative values of ε, welfare is against the poor in India. For all ε > 0, the welfare function favours the poor and in our inter-state analysis we have considered the value of ε at moderate level i.e., ε = 2.0, where consistency in welfare is observed (see Table 3.2). One can do the analysis for other values of ε also.

**Table 3.2** Annual growth rates of social welfare (SW)

| Period | ε= | | | | | |
|---|---|---|---|---|---|---|
| | 0.5 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 |
| Rural | | | | | | |
| 1983–97 (URP) | 1.01*** | 1.06*** | 1.10*** | 1.15*** | 1.20*** | 1.24*** |
| 1993/94–2009/10 (MRP) | 1.53*** | 1.48*** | 1.39*** | 1.37*** | 1.36*** | 1.36*** |
| Urban | | | | | | |
| 1983–97 (URP) | 1.57*** | 1.45*** | 1.41*** | 1.38*** | 1.35*** | 1.34*** |
| 1993/94–2009/10 (MRP) | 2.54*** | 2.17*** | 2.03*** | 1.93*** | 1.85*** | 1.79*** |

*Note* Same as in Table 3.1
***Significant at 1% level

where, μ is the mean income. In the extreme case of perfect equality $SW_\varepsilon = \mu$ i.e., mean of y. In (3.3), $\mu A_\varepsilon$ may be considered as the welfare loss due to inequality.

We have estimated social welfare for all the periods considered from the per person real expenditure of the NSS expenditure classes. The social welfare is observed to move closely with real per capita expenditure (Fig. 3.1). This is due to the fact that the real per capita expenditure was the main contributor to the changes in economic welfare as it compensated the welfare loss due to growing rural/urban, intra rural and urban inequality. However, the gap between MPCE and SW widened over time in urban areas in both the periods, more prominently in the post reform period which could be attributed to increased urban inequality.

The welfare measure shows an improvement in economic welfare over the two and a half decades. During 1983–97, the SW in rural areas increased at an annual rate of 1.01–1.24% depending on the value given to the inequality aversion parameter and the urban welfare index increased at an annual rate of 1.34–1.57% (Table 3.2). The growth rate tends to increase, though marginally, with an increase in the value of the inequality aversion parameter in rural areas suggesting a decline in rural inequality during 1983–97 and in contrast, it tends to decrease with an increase in the inequality aversion parameter in urban areas suggesting worsening of urban inequality in the later period.

During 1993/94–2009/10, the SW grew at a rate of 1.36–1.53% per annum in rural, and 1.79–2.54% per annum in urban areas. Clearly, the growth rate of SW was higher in the post reform period. As expected, in this period since inequality trend was positive in both rural and urban areas, the SW growth rate was lower at higher values of the inequality aversion parameter. It is worth observing that at very high value of the inequality aversion parameter i.e. as the SW approaches the Rawlisian Social Welfare Function, the growth rate of SW would be closer to that

of the MPCE of the bottom classes. On the whole, in the evaluation of social welfare if more weight is given to the welfare of the poor, undoubtedly the progress made by India in welfare improvement was modest and as will be seen later, it could have been better had the inequality did not worsen.

#### 3.2.2.3 Trends in Inequality

Table 3.3 as well as Fig. 3.2 confirms the pattern of inequality seen in Table 3.1. It shows that during 1983–97 the rural inequality trend was negative but statistically not significant; during 1993/94–2009/10 it was positive and statistically significant. The urban inequality registered a significant positive trend in both the periods, and its growth rate was markedly higher during 1993/4–2009/10. It is also worth noting that the rural-urban gap in the MPCE progressively widened during 1993/94–2009/10.[4] Quite clearly, worsening of intra rural/urban inequality and widening rural-urban disparity should be a cause of concern for India from the perspective of enhancing overall economic welfare.

## 3.3 Decomposition of Poverty Reduction Between 1993/94 and 2009/10

We examine some of the factors which contributed to the decline in poverty between 1993/94 and 2009/10. The potential impact of growth, had there been uniform growth rate of MPCE across states and between rural and urban areas are analysed using the parameter estimates of log-normal distribution fitted to the expenditure data of the states. We have assumed that per person total expenditure of a household (y) is distributed log-normally with mean $\theta$ and standard deviation $\lambda$. The mean $\mu$ of y, Gini-coefficient (G) and head count ratio (HCR) are given by

$$\mu = \exp(\theta + 0.5\,\lambda^2) \tag{3.4}$$

$$G = 2\,\varphi(\lambda/\sqrt{2}) - 1 \tag{3.5}$$

$$\mathrm{HCR} = \varphi(\log z - \theta)/\lambda \tag{3.6}$$

[4]Atkinson rural-urban inequality computed from unit level data of quinquennial surveys showed an increase in inequality between 1993/94 and 2004/05 and no change between 2004/05 and 2009/10. However, it showed an increase between 1993/94 and 2009/10 (see Table 3.7).

**Table 3.3** Annual growth rates of Atkinson inequality ($A_\varepsilon$)

| Period | ε= | | | | | |
|---|---|---|---|---|---|---|
| | 0.5 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 |
| Rural | | | | | | |
| 1983–97 (URP) | −0.17 | −0.19 | −0.39 | −0.44 | −0.50 | −0.51 |
| 1993/94–2009/10 (MRP) | 1.39*** | 1.09*** | 0.95*** | 0.83*** | 0.74*** | 0.65*** |
| Urban | | | | | | |
| 1983–97 (URP) | 1.07* | 0.84** | 0.75** | 0.67** | 0.60** | 0.55** |
| 1993/94–2009/10 (MRP) | 2.17*** | 1.86*** | 1.71*** | 1.58*** | 1.47*** | 1.57*** |

*Note* Same as in Table 3.1

***Significant at 1% level, **significant at 5% level, *significant at 10% level

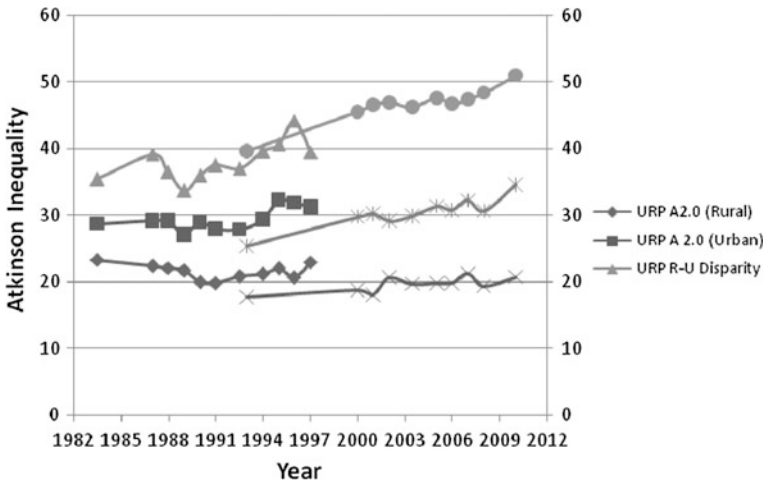


**Fig. 3.2** Trends in Atkinson inequality ($A_{2.0}$) and rural urban disparity

where, φ is cumulative distribution function of the standard normal deviate with mean 0 and variance 1; and z is poverty line.[5]

The parameters of the log-normal distribution are estimated for states with a break up on rural and urban from the NSS unit level data.[6] The fitted log-normal distributions are found to give a good fit for most of the states. The HCR of All India is estimated as weighted average with states population as weights. The

[5]In this paper we used the poverty lines of Expert Group (2009)/Planning Commission.

[6]The unit level households MPCE have been expressed at 1993/94 urban prices by adjusting for inter temporal, rural-urban and interstate price variations. The price adjustments have been made using Planning Commission's rural and urban poverty lines at current prices for all India and states. The procedure assumes uniform price index for rural/urban expenditure groups within a state.

**Table 3.4** Simulation results for poverty reduction (HCR %) between 1993/94 and 2009/10: all India and selected states

| Simulations | All India | Bihar | Uttar Pradesh | Maharashtra | Haryana | Punjab | Kerala |
|---|---|---|---|---|---|---|---|
| 1. MPCE grows at a uniform all India rate across and between rural and urban areas with inequalities and population distribution at the 1993/94 levels | 18.9 | 23.3 | 20.5 | 16.6 | 15.2 | 13.4 | 13.1 |
| 2. MPCE of states grows at observed rates between 1993/94 and 2009/10 but at a uniform all India rate between rural and urban areas within a state with inequalities and population distribution at the 1993/94 levels | 17.6 | 9.2 | 13.6 | 22.8 | 19.6 | 14.4 | 23.8 |
| 3. MPCE of states as well as rural and urban areas within a state grow at the observed rates between 1993/94 and 2009/10 with inequalities and population distribution at the 1993/94 levels | 16.0 | 8.2 | 10.9 | 21.8 | 19.8 | 13.4 | 24.3 |
| 4. Inequalities at 2009/10 with MPCE and population distribution at 1993/94 levels | −2.0 | −0.6 | −0.2 | −0.8 | −5.0 | −7.1 | −7.3 |
| 5. Observed reduction between 1993/94 and 2009/10 | 14.3 | 7.5 | 10.7 | 21.4 | 15.0 | 6.2 | 17.0 |

decline in HCR between 1993/94 and 2009/10 in the states as well as All India, estimated from the fitted distributions are found to be close to those directly computed from the unit level data.

Simulations are conducted by treating log-normal distribution estimated for 1993/94 and states population for 1993/94 as base. HCRs under alternative simulations are computed by replacing the MPCE of states with new MPCE corresponding to alternative scenarios. Tables 3.4 and 3.5 give the estimated poverty reduction under alternative growth scenarios and the decomposition of observed poverty reduction between 1993/94 and 2009/10. Table 3.4 also shows the inequality effect on poverty reduction.

**Table 3.5** Decomposition of poverty reduction between 1993/94 and 2009/10: all India and selected states

| All India/State | Poverty reduction between 1993/94 and 2009/10 due to | | | | | | |
|---|---|---|---|---|---|---|---|
| | Growth[a] | Inter-state differential growth In MPCE | Rural-urban disparity | Inequality | Rural-urban population distribution | Residual | Observed reduction |
| All India | 18.9 | −1.3 | −1.6 | −2.0 | −0.1 | −0.6 | 14.3 |
| Bihar | 9.2 | – | −1.0 | −0.6 | 0.0 | 0.1 | 7.5 |
| Uttar Pradesh | 13.6 | – | −2.7 | −0.2 | 0.0 | 0.0 | 10.7 |
| Maharashtra | 22.8 | – | −1.0 | −0.8 | −0.2 | 0.6 | 21.4 |
| Haryana | 19.6 | – | 0.2 | −5.0 | −0.2 | 0.4 | 15.0 |
| Punjab | 14.4 | – | −1.0 | −7.1 | 0.0 | −0.1 | 6.2 |
| Kerala | 23.8 | – | 0.5 | −7.3 | 0.0 | 0.0 | 17.0 |

[a]For All India, growth rate of MPCE is assumed to be uniform across the states and between rural and urban, and for the states it is assumed to be same between rural and urban at the observed (rural + urban) poverty of the state

We find the reduction in head count ratio would have been 18.9% points had the MPCE of all states as well as rural and urban increased at the same rate as that of the MPCE of All India (rural + urban) instead of the realized rate of 14.3% points. Hence the gain in poverty reduction under uniform growth would be 4.6% points. Since the MPCE (rural + urban) of all India is fixed in the simulations, some states whose MPCE growth was higher than that of All India have lower poverty reduction under uniform growth scenario than their observed poverty reduction between 1993/94 and 2009/10. The All India poverty reduction under uniform growth scenario is found to be higher than the observed one, even though its MPCE remains the same. This may be due to the fact that the states with low growth are found to have low MPCE and low inequality in 1993/94 (see Table 3.6). States with higher incidence of poverty such as Bihar, Chhattisgarh, Madhya Pradesh, Rajasthan and Uttar Pradesh are found to have higher reduction in poverty under uniform growth compared to their actual reduction between 1993/94 and 2009/10. States such as Haryana, Punjab and Kerala are the losers in poverty reduction under uniform growth. The loss is due to both reductions in their MPCE as well as their high inequality in 1993/94.

The last row of Table 3.4 shows the effect of changes in inequality between 1993/94 and 2009/10 on poverty reduction. Poverty reduction would have been higher had the inequalities remained at the 1993/94 levels. Poverty reduction in All India would have been higher by about 2% points had the inequalities of the states been at 1993/94 levels. The Gini-coefficient as well as Atkinson measure of inequality show substantial worsening of inequality between 1993/94 and 2009/10 in all states except Jammu and Kashmir and North Eastern states; inequality worsened, more significantly in Kerala, Punjab and Haryana[7] (Table 3.6). Consequently, the effect of the increase in inequality on poverty reduction is found to be about 7% points for Kerala and Punjab and 5% points for Haryana.

Table 3.5 gives the decomposition of poverty reduction between 1993/94 and 2009/10 derived from Table 3.4. Among the selected states, inequality aggravated poverty in all states and rural-urban disparity also aggravated poverty in all states except Kerala and Haryana. The inequality effect is more pronounced than that of rural-urban disparity. In Kerala and Haryana, the change in rural-urban disparity between 1993/94 and 2009/10 has positive effect on poverty reduction. This can be attributed to the decline in rural-urban disparity in these states during 1993/94 and 2009/10 (see Table 3.6).

[7]It may be pointed out that the interstate correlation between Atkinson inequality and Gini coefficient is found to be close to one. Moreover, both show similar changes in inequality between 1993/94–2004/05–2009/10 across states.

**Table 3.6** State wise inequality measures: all India and major states

| State | Atkinson inequality (%) (Aε = 2.0) | | | Gini coefficient (%) | | | Rural-urban disparity (ratio) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1993/94 | 2004/05 | 2009/10 | 1993/94 | 2004/05 | 2009/10 | 1993/94 | 2004/05 | 2009/10 |
| Andhra Pr. | 19.9 | 24.5 | 25.2 | 26.42 | 29.72 | 30.70 | 1.26 | 1.39 | 1.38 |
| Assam | 11.6 | 13.7 | 16.2 | 19.60 | 21.28 | 24.08 | 1.53 | 1.56 | 1.47 |
| Bihar | 14.7 | 12.7 | 15.7 | 21.29 | 20.90 | 23.12 | 1.29 | 1.35 | 1.35 |
| Chattisgarh | 14.1 | 23.7 | 19.1 | 21.85 | 29.62 | 26.58 | 1.40 | 1.68 | 1.53 |
| Gujarat | 17.7 | 23.2 | 22.5 | 24.29 | 29.13 | 29.06 | 1.30 | 1.42 | 1.37 |
| Haryana | 20.5 | 26.7 | 25.3 | 26.73 | 32.20 | 30.48 | 1.22 | 1.11 | 1.15 |
| Himachal Pr. | 19.1 | 22.3 | 22.9 | 26.09 | 28.93 | 29.29 | 1.51 | 1.46 | 1.31 |
| J &K | 16.9 | 14.9 | 16.8 | 24.38 | 22.63 | 24.20 | 1.52 | 1.20 | 1.15 |
| Jharkhand | 16.4 | 18.1 | 18.6 | 24.04 | 25.73 | 25.77 | 1.44 | 1.76 | 1.48 |
| Karnataka | 20.8 | 23.3 | 25.5 | 27.16 | 30.11 | 31.32 | 1.43 | 1.49 | 1.61 |
| Kerala | 22.2 | 31.7 | 32.9 | 28.09 | 35.18 | 36.63 | 1.22 | 1.21 | 1.20 |
| Madhya Pr. | 22.5 | 22.3 | 26.3 | 27.58 | 29.04 | 31.76 | 1.30 | 1.49 | 1.56 |
| Maharashtra | 27.0 | 29.3 | 28.2 | 31.41 | 33.95 | 33.52 | 1.59 | 1.58 | 1.66 |
| Odisha | 16.8 | 21.9 | 21.9 | 23.99 | 28.43 | 28.19 | 1.47 | 1.53 | 1.58 |
| Punjab | 16.8 | 23.7 | 25.6 | 24.10 | 30.01 | 31.45 | 1.01 | 1.22 | 1.14 |
| Rajasthan | 16.9 | 17.4 | 17.6 | 24.05 | 24.87 | 25.06 | 1.19 | 1.33 | 1.36 |
| Tamil Nadu | 24.4 | 26.7 | 24.9 | 29.85 | 32.65 | 30.51 | 1.32 | 1.53 | 1.41 |
| Uttar Pradesh | 19.2 | 20.4 | 21.2 | 26.10 | 27.45 | 28.17 | 1.24 | 1.33 | 1.51 |
| Uttarakhand | 16.3 | 18.2 | 37.6 | 24.29 | 25.97 | 41.44 | 1.30 | 1.28 | 0.78 |
| West Bengal | 19.5 | 23.5 | 22.1 | 26.59 | 30.13 | 28.91 | 1.36 | 1.57 | 1.63 |
| All India | 20.8 | 23.9 | 25.1 | 27.11 | 30.11 | 31.07 | 1.37 | 1.49 | 1.52 |

*Source* Computed by the authors

## 3.4 Decomposition of Atkinson Measure of Inequality

Decomposition of inequality measures the proportion of inequality explained by individual population characteristics or group of characteristics. Blackorby et al. (1981) and Cowell and Jenkins (1995) suggested methodologies for decomposition of Atkinson inequality.[8] Blackorby procedure can be explained by considering three income vectors, which have the same level of social welfare:

(a) $Y = (y_1, y_2, y_3, \ldots, y_n)$ actual observed income vector,
(b) $\xi^k = \{\xi_1^1, \xi_2^1, \xi_3^1, \ldots \xi_{n1}^1; \xi_1^2, \xi_2^2, \xi_3^2, \ldots \xi_{n2}^2; \ldots; \xi_1^g, \xi_2^g, \xi_3^g, \ldots \xi_{ng}^g\}$ each individual of a subgroup having same representative income as that of its sub-group i.e., there is no intra group inequality,
(c) $\xi = \{\xi, \xi, \xi \ldots \xi\}$ is a vector of individuals having the same representative income as that of all population i.e., there is no inequality at all.

Atkinson inequality measures the proportion of income saved by moving from (a) to (c). The intra group inequality $I_A(y)$ measures the proportion of income saved by moving from (a) to (b), where there is no intra group inequality and is given by

$$I_A(y)\left\{n\mu(y) - \sum n_k \xi^k\right\}/n\mu(y) \tag{3.7}$$

where $\xi^k = \left[1/n_k \sum y_i^{(1-\varepsilon)}\right]^{1/(1-\varepsilon)}$

The intergroup inequality $I_R(y)$ measures proportion of income saved moving from (b) to (c), where there is no inequality at all. It is given by

$$I_R(Y) = \left\{\sum n_k \xi^k - n\xi\right\} / \sum n_k \xi_k \tag{3.8}$$

Since the decomposition is not perfect additive, the residual exists. The total inequality I(y) is given by

$$1(y) = I_A(y) + I_R(y) - 1_A(y) \times I_R(y) \tag{3.9}$$

We have decomposed the total inequality for the years 1993/94, 2004/05 and 2009/10 by considering five population characteristics viz. (i) Sector (rural/urban binary), (ii) State (in all 30 States and UTs), (iii) Social Groups (ST, SC, OBC and Others), (iv) Type of Household Occupations (self-employed in agriculture in rural areas, self-employed in non-agriculture in rural areas, agricultural labour in rural areas, other labour in rural areas, self employed in urban areas, casual labour in urban areas, regular wage salaried employees in urban areas, Others in both rural and urban areas), and (v) demographic/household size. We have considered each characteristic separately.

[8]Atkinson Social Welfare Function is considered and total population is divided into mutually exclusive groups. For details see Blackorby et al. (1981), A New Procedure for the Measurement of Inequality within and among Population Subgroups, *The Canadian Journal of Economics,* Vol. 14, 665–685.

**Table 3.7** Decomposition of Atkinson inequality ($A_{2.0}$) within and between sub-groups under various sub-group formations—all India (percentage)

| Year | Within | Between | Interaction | Total | Between as a % of total |
|---|---|---|---|---|---|
| *Sub-groups: rural/urban* | | | | | |
| 1993/94 | 0.201 | 0.009 | −0.002 | 0.208 | 4.3 |
| 2004–05 | 0.231 | 0.010 | −0.002 | 0.239 | 4.2 |
| 2009/10 | 0.243 | 0.010 | −0.002 | 0.251 | 4.0 |
| *Sub-groups: states* | | | | | |
| 1993/94 | 0.208 | 0.009 | −0.002 | 0.208 | 4.3 |
| 2004–05 | 0.229 | 0.012 | −0.003 | 0.239 | 5.0 |
| 2009/10 | 0.237 | 0.018 | −0.004 | 0.251 | 7.2 |
| *Sub-groups: social groups* | | | | | |
| 1993/94 | 0.200 | 0.011 | −0.002 | 0.208 | 5.3 |
| 2004–05 | 0.223 | 0.020 | −0.004 | 0.239 | 8.4 |
| 2009/10 | 0.238 | 0.026 | −0.004 | 0.251 | 10.4 |
| *Sub-groups: demographic (household size)* | | | | | |
| 1993/94 | 0.197 | 0.013 | −0.003 | 0.208 | 6.3 |
| 2004–05 | 0.223 | 0.020 | −0.004 | 0.239 | 8.4 |
| 2009/10 | 0.229 | 0.028 | −0.006 | 0.251 | 11.2 |
| *Sub-groups: rural/urban and occupation* | | | | | |
| 1993/94 | 0.185 | 0.028 | 0.005 | 0.208 | 13.5 |
| 2004-05 | 0.213 | 0.033 | 0.007 | 0.239 | 13.8 |
| 2009/10 | 0.224 | 0.035 | 0.008 | 0.251 | 13.9 |

We have applied the above mentioned decomposition technique to unit level data on per person expenditure adjusted for price differences between rural and urban, interstate and inter temporal for the years 1993/94, 2004/05 and 2009/10. The results for the inequality aversion parameter $\varepsilon = 2.0$ are presented in Table 3.7. The overall inequality as well as intra group inequality which accounted a major part of it, increased between the three periods—1993/94, 2004/05 and 2009/10. Gini coefficient also showed similar increase in overall inequality (see Table 3.6). In all classifications adopted by us intergroup inequality contributed to only a small part of the overall inequality. However, the intergroup inequality contribution to overall inequality increased in all sub-group formations except for rural-urban. Among the various sub group formations, the contribution to overall inequality was higher by the group formation based on occupation in all the three periods. It should be noted that between group contributions to overall inequality of the various group formations are not additive. A finer formation of groups by simultaneously considering the above characteristics would have provided better insights.

## 3.5 Can Growth Explain Well-Being and Inequality?

We have examined interstate variations in monthly per capita real expenditure, social welfare, inequality and poverty by estimating fixed effects model using the price adjusted unit level data of the NSS consumer expenditure for the years 1993/94, 2004/05 and 2009/10. We have adopted poverty lines and used the price adjustment procedures of the Expert Group/Planning Commission in the modelling. The states have been grouped into seven regions[9] and regional dummies with Southern region as base have been used in the model and time dummies with 1993/94 as base have also been used to distinguish the three periods.

We have regressed log MPCE/SW/Inequality ($A_{2.0}$)/HCR on log per capita Gross State Domestic Product (GSDP).[10] The results are produced in Table 3.8. Firstly, the $R^2$ values show that the per capita GSDP explains interstate variations in MPCE, SW, Inequality ($A_{2.0}$) and HCR. Secondly, the growth elasticity of MPCE as well as SW is positive and significant. Clearly, higher per capita GSDP is associated with higher MPCE and Welfare (see also Fig. 3.3). Thirdly, growth elasticity of SW is found to be less than that of MPCE. This is expected since inequality is found to increase with growth. Fourthly, the coefficient of the dummies of Central, East and West are found to be negative and significant in the regression equations of log MPCE and log SW signifying that at a given per capita GSDP, these regions are associated with lower MPCE and SW than those of South. Fifthly, it can be inferred from the positive and significant coefficients of regional dummies of North East and Special Category Group that at a given level of per capita GSDP, SW is higher in North East which could be attributed to its lower inequality and in Special Category Group due to its higher MPCE at a given per capita GSDP as revealed by the positive and significant coefficient of the its dummy variable in the log MPCE regression. Finally, the coefficient of the 2009/10 dummy is positive and significant in the regressions of log MPCE and log SW which imply higher MPCE and SW at a given level of GSDP in 2009/10 as compared to 1993/94. The reasons for comparatively higher MPCE at a given GSDP in Special Category Group and in

[9]The regions are: (1) North-Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab and Uttarakhand, (2) Central Chhattisgarh, Madhya Pradesh, and Uttar Pradesh, (3) East-Bihar, Jharkhand, Odisha and West Bengal, (4) West Gujarat, Maharashtra and Rajasthan, (5) South-Andhra Pradesh, Karnataka, Kerala and Tamil Nadu, (6) North East-Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura and (7) Special Category-Goa, Delhi and Puducherry.

[10]More appropriate variables would have been mean and inequality in household incomes. However, relevant data on these variables do not exist. Omission of income inequality among the regressors may give rise to the endogeneity problem. It may result in downward bias in the estimates of the growth effects of MPCE and SW since income inequality may have a negative on MPCE and SW and ispositively correlated with per capita GSDP. On the other hand it may result in under estimation of the growth elasticity of poverty since income inequality worsens poverty. Data does not permit us to use more sophisticated econometric methods to address the problem of endogeneity.

**Table 3.8** Effect of GSDP on MPCE, SW and inequality ($A_{2.0}$) and poverty (HCR): results of regression

| Independent variables | Dependent variables | | | |
|---|---|---|---|---|
| | Log MPCE | Log SW | Log $A_{2.0}$ | Log HCR |
| Log GSDP | 0.19*** | 0.12*** | 0.27*** | −0.33** |
| Dummy: North[a] | 0.04 | 0.08** | −0.17*** | −0.27* |
| Dummy: Central[a] | −0.12** | −0.11** | −0.02 | 0.28 |
| Dummy: East[a] | −0.14*** | −0.11** | −0.11* | 0.27 |
| Dummy: West[a] | −0.12** | −0.07* | −0.16*** | 0.20 |
| Dummy: North-East[a] | −0.15*** | −0.03 | −0.56*** | −0.03 |
| Dummy: Special Category[a] | 0.12** | 0.16*** | −0.17** | −0.58*** |
| Dummy: 2004/05[b] | 0.05 | 0.05* | −0.02 | −0.12 |
| Dummy: 2009/10[b] | 0.10** | 0.12*** | −0.06 | −0.37 |
| Intercept | 4.77*** | 4.98*** | 1.33*** | 5.83*** |
| $R^2$ | 0.81 | 0.79 | 0.57 | 0.63 |

***Significant at 1% level, **significant at 5% level, *significant at 10% level
*Notes* [a]reference region is south, [b]reference period is 1993/94.
Number of observations in each regression is 87.

2009/10, although are important to know, they cannot be ascertained from our exercise.

The regression results of log $A_{2.0}$ show that growth elasticity of inequality is positive and significant. The coefficient of the North East dummy is negative and highly significant. This implies that at given per capita GSDP, North East is associated with very low level of inequality than the South. The coefficients of the dummies of West, Special Category Group are also negative and significant.

The last column of Table 3.8 provides the regression results for poverty. The growth elasticity of poverty as shown by the coefficient of per capita GSDP is −0.33. The coefficient of the Special Category Group dummy is found to be negative and highly significant, and that of North is negative and significant at 10%. These regions are associated with lower levels of poverty at a given level of per capita GSDP as compared to South. Also, the coefficients of the dummies of Central, East and West are found to be positive, but not significant.

There is an improvement in the values of $R^2$ when per capita GSDP is replaced by MPCE and expenditure inequality is added as a regressor in explaining interstate variations in poverty (Table 3.9). The regression results of log HCR shows that poverty elasticity with respect to MPCE is high at −3.49 and with respect of inequality was positive and high at 0.93. Despite high value poverty elasticity with respect to MPCE, its value with respect to GSDP is found to be low which can be attributed to the low value of elasticity of MPCE with respect to GSDP. The regression results of log $A_{2.0}$ presented in the last column of Table 3.9 shows that inequality has a positive association with MPCE.

States/Union Territories with higher level of MPCE such as Chandigarh, Kerala and Maharashtra had high inequality (Table 3.6, Fig. 3.3). This had contributed to

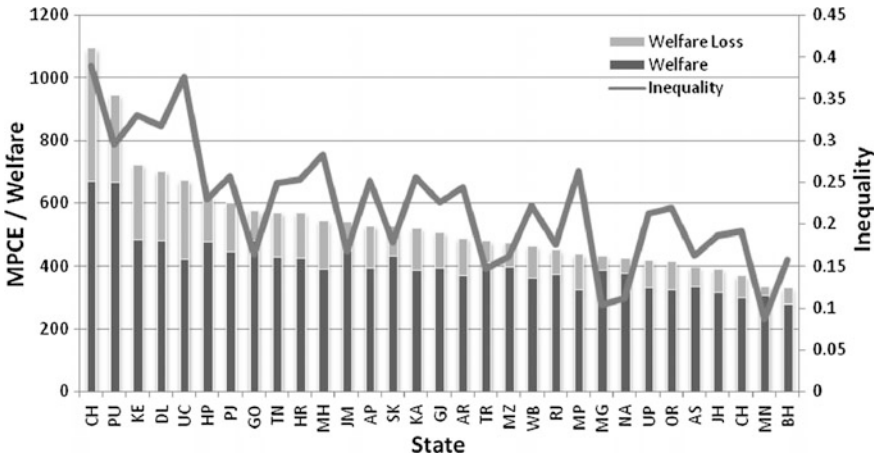


**Fig. 3.3** Levels of MPCE/Welfare and Inequality by States, 2009/10. *Note* MPCE = Welfare + Welfare Loss, for abbreviations see Table 3.14

**Table 3.9** Effects of MPCE on poverty and inequality $A_{2.0}$: results of regression

| Independent variable | Dependent variables | |
|---|---|---|
| | Log HCR | Log $A_{2.0}$ |
| Log MPCE | −3.49*** | 1.19*** |
| Log $A_{2.0}$ | 0.93*** | |
| Dummy: North[a] | 0.02 | −0.22*** |
| Dummy: Central[a] | −0.17 | 0.10 |
| Dummy: East[a] | −0.19 | 0.03 |
| Dummy: West[a] | −0.06 | −0.02 |
| Dummy: North-East[a] | −0.03 | −0.40*** |
| Dummy: Special Category[a] | 0.05 | −0.28*** |
| Dummy: 2004/05[b] | 0.11** | −0.06 |
| Dummy: 2009/10[b] | 0.11** | −0.15** |
| Intercept | 21.8 | −4.09 |
| $R^2$ | 0.90 | 0.68 |

***Significant at 1% level, **significant at 5% level
*Note* [a]Reference region is south, [b]Reference period is 1993/94. Number of observations in each regression is 87

significant loss in welfare in the three periods (see Fig. 3.3 for 2009–10). Quite clearly, growth of a state can reduce poverty faster if higher GSDP results in higher MPCE without aggravating inequality.

## 3.6 Performance of States in Poverty Reduction

We analyse the performance of states in poverty reduction between 199/94 and 2009/10 and examine whether there is any polarization tendencies among the states in terms of poverty level, performance rate in poverty reduction and growth. The progress made by the states in poverty reduction is measured by computing Performance Index (PI)[11]:

$$PI = \{Ln(P_{1993/94} - P_{min}) - Ln(P_{2009/10} - P_{min})\}/Ln(P_{max} - P_{min}) \qquad (3.10)$$

where, P stands for incidence of poverty and $P_{min}/P_{max}$ for minimum/maximum level of poverty incidence.

Table 3.10 provides state wise incidence of poverty in 1993/94, 2004/05 and 2009/10 and the values of the performance index. Figure 3.4 shows performance of the states/UTs in terms of poverty reduction between 1993/94 and 2009/10 and the poverty level in 2009/10. It is evident that Puducherry, Himachal Pradesh, Jammu and Kashmir, Kerala, Tamil Nadu, Goa, Sikkim and Andhra Pradesh had good performance. They also had lower incidence of poverty in 2009/10. Of these, Puducherry performance was the best in poverty reduction and had lowest incidence of poverty in 2009/10 (Fig. 3.4).

At the other extreme, Mizoram, Nagaland, Chhattisgarh, Delhi, Bihar, Madhya Pradesh, and Uttar Pradesh performed the worst in poverty reduction. These states except Delhi also had high incidence of poverty in 2009/10. It is worth noting that incidence of poverty worsened during 1993/94 and 2009/10 in Mizoram and remained at the same level in Nagaland.

Table 3.11 cross classifies the states on the basis of their ranking on growth and poverty reduction. It is interesting to observe that 17 of the 27 states fall on the diagonal cells. This shows positive relationship between growth and poverty reduction which is in line with poverty regression results discussed in Sect. 3.5. The positive outliers on poverty reduction are Arunachal Pradesh, Tamil Nadu, Jammu and Kashmir, Jharkhand and Meghalaya, and negative outliers are Gujarat, Haryana, Bihar, Chhattisgarh and Delhi. The states with low growth, performed poorly in poverty reduction between 1993/94 and 2009/10 and high incidence of poverty in 2009/10 are Assam, Madhya Pradesh, Manipur, and Uttar Pradesh. Though growth was moderate between 1993/94 and 2009/10 in Bihar and Chhattisgarh, their performance in poverty reduction was poor and their levels of poverty were high. Clearly, in these two states growth did not trickle down to the poor.

On the whole, there seems to be polarization tendencies in terms of growth, poverty reduction and poverty rate in 2009/10 between {Puducherry, Himachal Pradesh, Jammu and Kashmir, Kerala, Tamil Nadu, Goa, Sikkim and Andhra

[11]We have used the performance index proposed by Kakwani (1993) which takes into account the variations in the base poverty levels of the states and has some desirable properties.

**Table 3.10** State-wise poverty ratio and performance index: 1993/94, 2004/05 and 2009/10

| State | Poverty ratio (%) | | | Performance index (%) | | |
|---|---|---|---|---|---|---|
| | 1993/94 | 2004/05 | 2009/10 | 1993/94–2004/05 | 2004/05–2009/10 | 1993/94–2009/10 |
| Puducherry | 24.72 | 14.13 | 1.2 | 14.4 | 61.6 | 75.9 |
| Himachal Pradesh | 34.67 | 22.87 | 9.5 | 10.5 | 23.1 | 33.5 |
| J & K | 26.33 | 13.14 | 9.4 | 17.9 | 9.0 | 26.9 |
| Kerala | 31.26 | 19.72 | 12.0 | 11.6 | 13.0 | 24.6 |
| Tamil Nadu | 44.49 | 28.96 | 17.1 | 10.7 | 13.4 | 24.1 |
| Goa | 20.67 | 24.96 | 8.7 | −4.8 | 27.7 | 22.9 |
| Sikkim | 31.84 | 31.07 | 13.1 | 0.6 | 22.1 | 22.7 |
| Andhra Pradesh | 44.64 | 29.84 | 21.1 | 10.0 | 8.8 | 18.8 |
| Arunachal Pradesh | 54.55 | 31.06 | 25.9 | 14.0 | 4.6 | 18.5 |
| Karnataka | 49.50 | 33.40 | 23.6 | 9.8 | 8.7 | 18.5 |
| Meghalaya | 35.18 | 16.12 | 17.1 | 19.8 | −1.5 | 18.3 |
| Maharashtra | 47.73 | 38.10 | 24.5 | 5.6 | 11.1 | 16.6 |
| Tripura | 32.86 | 40.55 | 17.4 | −5.2 | 21.3 | 16.1 |
| Haryana | 35.94 | 24.07 | 20.1 | 10.1 | 4.6 | 14.6 |
| Uttarakhand | 32.07 | 32.74 | 18.0 | −0.5 | 15.1 | 14.6 |
| Gujarat | 37.77 | 31.75 | 23.0 | 4.3 | 8.1 | 12.4 |
| Odisha | 59.12 | 57.14 | 37.0 | 0.8 | 10.7 | 11.6 |
| Rajasthan | 38.28 | 34.39 | 24.8 | 2.7 | 8.2 | 10.9 |
| Jharkhand | 60.68 | 45.33 | 39.1 | 7.2 | 3.7 | 10.8 |
| West Bengal | 39.37 | 34.34 | 26.7 | 3.4 | 6.3 | 9.7 |
| Punjab | 22.40 | 20.9 | 15.9 | 1.8 | 7.0 | 8.8 |
| Manipur | 65.17 | 38.03 | 47.1 | 13.3 | −5.3 | 8.0 |
| Assam | 51.82 | 34.38 | 37.9 | 10.2 | −2.4 | 7.7 |
| Uttar Pradesh | 48.35 | 40.88 | 37.7 | 4.1 | 2.0 | 6.2 |
| Madhya Pradesh | 43.96 | 48.59 | 36.7 | −2.5 | 6.9 | 4.5 |
| Bihar | 60.45 | 54.45 | 53.5 | 2.6 | 0.4 | 3.0 |
| Delhi | 15.73 | 13.03 | 14.2 | 4.9 | −2.3 | 2.7 |
| Chhattisgarh | 50.89 | 49.39 | 48.7 | 0.7 | 0.3 | 1.1 |
| Nagaland | 20.40 | 9.03 | 20.9 | 21.6 | −22.2 | −0.6 |
| Mizoram | 11.75 | 15.31 | 21.1 | −7.0 | −8.3 | −15.3 |
| All India | 45.13 | 37.12 | 29.8 | 4.8 | 5.5 | 10.3 |

*Note* For computing Performance Index, the maximum poverty considered was 65.17% which was the incidence of poverty in Manipur in 1993/94 and minimum poverty was 1.2% which was the incidence of poverty in Puducherry in 2009/10. The states are arranged based on their performance in poverty reduction between 1993/94 and 2009/10

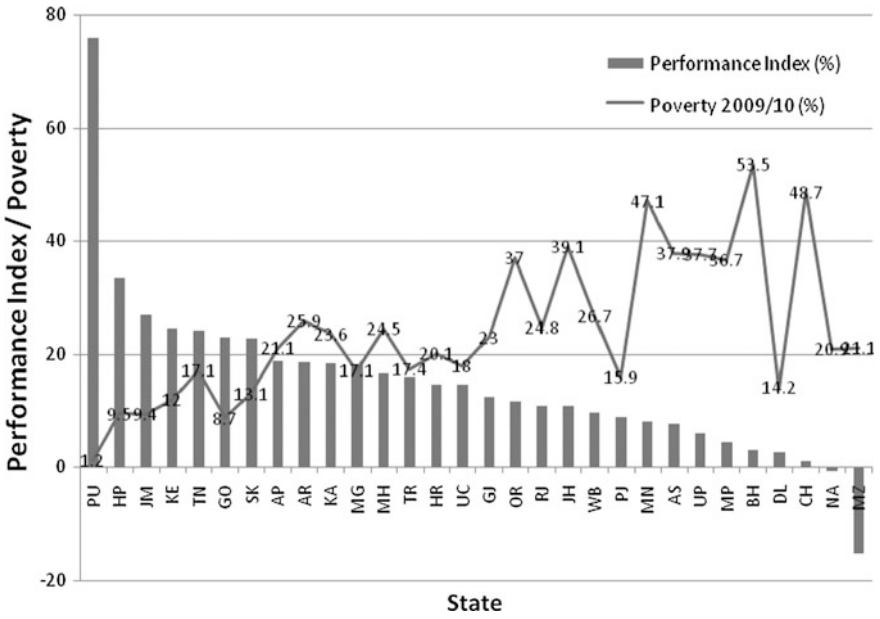


**Fig. 3.4** Performance of states in poverty reduction (1993–2010).
*Note* For abbreviations see Table 3.14

**Table 3.11** Classification of states by growth and poverty reduction

| Growth rate of per capita SGDP (1994–2010) | Performance in poverty reduction (1993–2010) | | |
|---|---|---|---|
| | High | Medium | Low |
| High | Andhra Pradesh (21.1), Goa (8.7), Karnataka (23.6), Kerala (12.0), Puducherry (1.2), Sikkim (13.1) | Gujarat (23.0), Haryana (20.1) | Nil |
| Medium | Arunachal Pradesh (25.9), Tamil Nadu (17.1) | Maharashtra (24.5), Odisha (37.0), Rajasthan (24.8), Uttarakhand (18.0), West Bengal (26.7) | Bihar (53.5), Chhattisgarh (48.7), Delhi (14.2) |
| Low | J & K (9.4) | Jharkhand (39.1), Meghalaya (17.1) | Assam (37.9), Madhya Pradesh (36.7), Manipur (47.1), Nagaland (20.9), Punjab (15.9), Uttar Pradesh (37.7) |

*Note* The figures in the parentheses are incidence of poverty in 2009/10. Annual growth rates of per capita SGDP and performance index in poverty reduction are ranked by descending order of magnitude and classified into three groups High, Medium and Low

Pradesh} and {Manipur, Assam, Uttar Pradesh, Madhya Pradesh, Bihar Jharkhand and Chhattisgarh}. As will be seen, the latter group of states had high incidence of multidimensional poverty as well as high levels of multiple deprivations.

## 3.7 Poverty Among Social Groups

We analyze the incidence of poverty (HCR) among the social groups—scheduled caste (SC) and scheduled tribe (ST), and non-scheduled castes and make a comparative assessment of poverty reduction in the post reform period. The incidence of poverty by social groups and household occupation are presented in Table 3.12. Firstly, we observe that poverty incidence was higher among scheduled households (SC and ST) as compared to non-scheduled households. The progress made in poverty reduction between 1993/94 and 2009/10 was comparatively lower for these scheduled groups. Secondly, poverty rates were higher for scheduled groups in all household occupations. It is worth noting that even in unskilled occupations such as agricultural labour in rural and casual labour in urban areas these social groups had higher incidence of poverty. The poverty gap between scheduled and non-scheduled social groups in each occupation could be due to differences in household characteristics (e.g. education, skills, household size, dependency, etc.), as well as discrimination in the labour market. Thirdly, in terms of incidence of poverty in both the periods 1993/94 and 2009/10 the position of scheduled caste households in rural areas was worse than scheduled tribe households in all occupations and in contrast, the position of scheduled caste household was worse in urban in all occupations. The rural-urban difference in the relative position of SC and ST households could be due to differences in household characteristics and/or discrimination in the labour market.

We decompose the difference in the incidence of poverty between scheduled and non scheduled groups into a part accounted by within differences in occupational groups and a part accounted by difference in the distribution of population across occupational groups.[12] The decomposition results are presented in Table 3.13. Evidently a major portion of the difference in poverty incidence between scheduled groups and non-scheduled groups was due to the differences in the incidence of poverty within an occupation in both the years. The contribution of the 'within occupation differences in poverty levels to the aggregate poverty gap' increased

[12]Decomposition of incidence of poverty gap between scheduled group (g) and non-scheduled group (n): $(p^g - p^n) = \sum s_i^g(p_i^g - p_i^n) + \sum p_i^g(s_i^g - s_i^n) - \sum(p_i^g - p_i^n)(s_i^g - s_i^n)$. The first term in this equation is 'within differences in occupational groups', the second term refers to 'population distribution effect of the scheduled group compared to non-scheduled group', and the last term is the interaction effect. Where, $p^g$ is the aggregate poverty level of gth scheduled group, and $p^n$ non-scheduled groups; and $p_i^g$ and $p_i^n$ are the poverty levels of scheduled and non-scheduled groups in ith occupation, and $s_i^g$ and $s_i^n$ are the population share in ith occupation of scheduled and non-scheduled groups respectively.

**Table 3.12** Poverty incidence among social groups by type of household and their performance in poverty reduction between 1993/94 and 2009/10

| Type of household | 1993/94 | | | | 2009/10 | | | | % Performance Index between 1993/94 and 2009/10 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Scheduled | | Non-scheduled | All HH | Scheduled | | Non-scheduled | All HH | Scheduled | | Non-scheduled | All HH |
| | ST | SC | | | ST | SC | | | ST | SC | | |
| *Rural* | | | | | | | | | | | | |
| Self employed in Non-Ag. | 57.0 | 51.5 | 41.5 | 44.1 | 35.3 | 37.1 | 24.9 | 28.0 | 15.7 | 10.8 | 19.5 | 16.5 |
| Agri. Labour | **75.5** | 73.4 | 66.8 | 70.4 | 61.7 | 50.5 | 45.7 | 49.4 | 5.9 | 11.1 | 11.6 | 10.7 |
| Other labour | 68.6 | 62.2 | 51.6 | 57.1 | 53.0 | 46.3 | 33.7 | 39.6 | 7.7 | 9.1 | 14.3 | 11.7 |
| Self employed in Agri. | 61.0 | 51.3 | 37.8 | 41.8 | 41.8 | 34.1 | 22.2 | 26.2 | 11.9 | 13.7 | 21.8 | 17.5 |
| Others | 44.3 | 41.7 | 30.7 | 33.6 | 16.9 | 23.7 | **11.6** | 14.4 | 43.8 | 22.0 | 71.0 | 49.2 |
| **All Households** | 65.1 | 62.2 | 44.0 | 50.1 | 47.3 | 42.3 | 28.0 | 33.3 | 9.7 | 12.1 | 16.4 | 13.8 |
| *Urban* | | | | | | | | | | | | |
| SE in Non-ag. | 49.2 | 54.5 | 31.1 | 33.8 | 37.0 | 37.4 | 19.6 | 22.0 | 8.7 | 11.4 | 18.0 | 15.8 |
| Re.Wage/Sal.earn | 28.7 | 35.8 | 17.5 | 20.4 | 14.4 | 19.8 | **9.3** | 11.1 | 32.1 | 22.2 | 50.5 | 43.8 |
| Casual lab | 63.4 | **73.8** | 60.2 | 64.2 | 61.0 | 53.8 | 43.5 | 47.1 | 1.1 | 8.9 | 9.5 | 8.9 |
| Others | 25.4 | 42.3 | 23.3 | 25.6 | 23.7 | 22.5 | 10.7 | 12.6 | 2.7 | 22.0 | 55.3 | 38.5 |
| **All Households** | 39.9 | 51.0 | 27.8 | 31.4 | 30.4 | 34.1 | 18.0 | 20.8 | 8.9 | 12.5 | 18.1 | 15.6 |

*Note* In computing the Performance Index in poverty reduction between 1993/94 and 2009/10, the maximum and minimum incidence of poverty are 75.5% and 11.6% in rural areas, and 73.8% and 9.3% in urban areas

**Table 3.13** Decomposition of poverty gap between scheduled and non-scheduled social groups in India

| Poverty difference due to | 1993/94 | | 2009/10 | |
|---|---|---|---|---|
| | Scheduled group | | Scheduled group | |
| | ST | SC | ST | SC |
| **Rural** | | | | |
| *Poverty gap between scheduled and non-scheduled social group households* | 21.1 | 18.2 | 19.3 | 14.3 |
| Percentage due to within difference in occupation groups | 76.5 | 50.9 | 86.4 | 66.7 |
| Percentage due to population distribution by Type of Household | 16.8 | 38.9 | 18.5 | 26.1 |
| Percentage due to interaction | −6.7 | −10.2 | 5.0 | −7.2 |
| Total | 100 | 100 | 100 | 100 |
| **Urban** | | | | |
| *Poverty gap between scheduled and non-scheduled social group households* | 12.1 | 23.2 | 12.4 | 16.1 |
| Percentage due to within difference in occupation groups | 86.0 | 78.7 | 92.2 | 79.9 |
| Percentage due to population distribution by Type of Household | −2.0 | 14.9 | −2.0 | 14.1 |
| Percentage due to interaction | −16.0 | −6.4 | −9.8 | −6.0 |
| Total | 100 | 100 | 100 | 100 |

between 1993/94 and 2009/10. Perhaps, concentration of scheduled households in low paying jobs in each occupation group might have contributed to the poverty gap within occupations, more so in rural areas. Table 3.13 shows a decline in poverty gap between both scheduled groups and non-scheduled group except urban ST group was noticed between 1993/94 and 2009/10. This finding is apparently contradicts the finding based on the performance index which showed better performance of non-scheduled groups in poverty reduction. It can be explained by the fact that higher weightage is given by the performance index to lower percentage point decline at lower incidence of poverty.

We also analyze the state wise picture in the incidence of poverty among social groups. The composition of poor by social groups varied across the states (Table 3.14).[13] In Punjab, in 2009/10, scheduled caste (SC) households constituted 71% of the poor, which was significantly higher than their share in Punjab population (39%); in Haryana, SC households constituted 55% of the poor where as their

[13]Since sample sizes are small even after pooling rural and urban NSS samples for STs in the states of Goa, Delhi, Kerala, Haryana, Jammu and Kashmir, Punjab and Puducherry; for SCs in the states of Goa, Sikkim, Mizoram, Arunachal Pradesh, Nagaland, and Meghalaya; and for OBCs in the states of Nagaland, Arunachal Pradesh, Mizoram, Meghalaya, these estimates are likely to be less reliable. Hence, we have not drawn any inference from these estimates in the text. However, these estimates are found to be close to those based on Modified Mixed Reference Period sample, giving some confidence to the estimates.

**Table 3.14** Social group composition of poor and population, 2009/10 (descending order of states by share of poor)

| State | Share (%) of SC in total | | State code | Share (%) of ST in total | | State code | Share (%) of OBC in total | | State code | Share (%) of Others in total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Poor | Popu. | | Poor | Popu. | | Poor | Popu. | | Poor | Popu. |
| Punjab (PJ) | 71.3 | 38.6 | MZ | 96.5 | 98.3 | TN | 65.5 | 75.7 | JM | 70.5 | 74.3 |
| Haryana (HR) | 54.9 | 28.9 | NA | 94.3 | 95.3 | KE | 63.9 | 62.4 | AS | 55.4 | 46.7 |
| Delhi (DL) | 45.8 | 21.2 | MG | 90.7 | 90.4 | BH | 58.9 | 57.4 | WB | 53.5 | 60 |
| Puducherry (PO) | 43.5 | 17.4 | AR | 70.3 | 71 | PO | 54.4 | 72.7 | UC | 46.7 | 58.8 |
| Himachal Pradesh (HP) | 42.9 | 27.1 | GO[a] | 41.4 | 23.7 | MN | 53.8 | 57.1 | GO | 31.8 | 55.9 |
| Uttar Pradesh(UP) | 34.7 | 25.1 | SK | 40.2 | 36.5 | AP | 53.8 | 49.2 | HP | 29.4 | 52.6 |
| West Bengal (WB) | 32.9 | 27.3 | MN | 38.5 | 35.3 | UP | 51.8 | 50.7 | MH | 26.8 | 42.5 |
| Tamil Nadu (TN) | 32.1 | 19.4 | CH | 38.4 | 29.7 | GJ | 45.4 | 37.4 | AR | 25.8 | 24.2 |
| Rajasthan (RJ) | 31.6 | 21.2 | JH | 38.1 | 29.4 | KA | 45.3 | 45.1 | TR | 19.6 | 25.8 |
| Bihar (BH) | 28.8 | 22.8 | TR | 37.5 | 30.7 | SK | 44.4 | 46.8 | KA | 19.5 | 27.9 |
| Odisha (OR) | 26.6 | 21.1 | OR | 36.6 | 21.8 | RJ | 41 | 46.1 | DL | 19.2 | 56.3 |
| Karnataka (KA) | 26.3 | 18.2 | GJ | 35 | 17.1 | JH | 35.4 | 38 | AP | 15.5 | 26.8 |
| Uttarakhand (UC) | 24.7 | 19.1 | MP | 32.8 | 20.1 | CH | 35.4 | 41.2 | OR | 14.5 | 24.7 |
| Tripura (TR) | 22.9 | 21.3 | RJ | 19.2 | 13.5 | MP | 33.9 | 40.6 | KE | 13.6 | 27.4 |
| Madhya Pradesh (MP) | 22.5 | 20.1 | MH | 18.6 | 9.5 | MH | 33.2 | 32.6 | HR | 13.1 | 40.1 |
| Andhra Pradesh (AP) | 21.8 | 18.9 | HP | 14.4 | 6.2 | HR | 29.7 | 30.2 | UP | 12.6 | 23.4 |
| Maharashtra (MH) | 21.4 | 15.3 | AS | 12.8 | 15.4 | DL | 27.7 | 20.9 | PJ | 10.9 | 44.3 |
| Goa (GO)[a] | 21.2 | 3.4 | AP | 9 | 5.1 | UC | 24 | 17.9 | MP | 10.9 | 19.2 |
| Kerala (KE) | 19.9 | 8.7 | KA | 8.9 | 8.8 | OR | 22.3 | 32.5 | BH | 10 | 17.8 |
| Jharkhand (JH) | 19.4 | 17.5 | DL[a] | 7.4 | 1.6 | AS | 20.4 | 25.9 | GJ | 9.4 | 34.6 |
| Chhattisgarh (CH) | 18.4 | 15.4 | WB | 6.5 | 5.6 | TR | 20 | 22.2 | MG | 9 | 8.3 |
| Sikkim (SK)[a] | 14 | 10.2 | UC | 4.6 | 4.1 | PJ | 17.1 | 16.4 | RJ | 8.2 | 19.3 |

(continued)

**Table 3.14** (continued)

| State | Share (%) of SC in total | | State code | Share (%) of ST in total | | State code | Share (%) of OBC in total | | State code | Share (%) of Others in total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Poor | Popu. | | Poor | Popu. | | Poor | Popu. | | Poor | Popu. |
| Assam (AS) | 11.4 | 12 | KE[a] | 2.6 | 1.5 | JM | 17 | 12.9 | CH | 7.7 | 13.6 |
| J &K (JM) | 11.2 | 9.6 | HR[a] | 2.3 | 0.8 | HP | 13.3 | 14.2 | JH | 7.2 | 15.1 |
| Gujarat (GJ) | 10.3 | 11 | BH | 2.3 | 2 | WB | 7.1 | 7.1 | MN | 4 | 4.6 |
| Manipur (MN) | 3.7 | 3.1 | JM[a] | 1.3 | 3.1 | GO | 5.5 | 17 | PO | 2.2 | 9.8 |
| Mizoram (MZ)[a] | 3.1 | 1.1 | TN | 1 | 1.2 | NA[a] | 2.5 | 1.7 | NA | 1.9 | 2.3 |
| Arunachal Pradesh (AR)[a] | 2.9 | 2.8 | UP | 0.9 | 0.9 | AR[a] | 0.9 | 2.1 | SK | 1.4 | 6.5 |
| Nagaland (NA)[a] | 1.3 | 0.8 | PJ[a] | 0.7 | 0.7 | MZ[a] | – | 0.1 | TN | 1.4 | 3.6 |
| Meghalaya (MG)[a] | 0.4 | 0.3 | PO[a] | – | 0 | MG[a] | – | 1.1 | MZ | 0.3 | 0.5 |
| All India (AI) | 27.6 | 20.3 | AI | 13.4 | 8.8 | AI | 41.9 | 41.8 | AI | 17.1 | 29.1 |

*Note* [a]States for which the NSS sample size is small

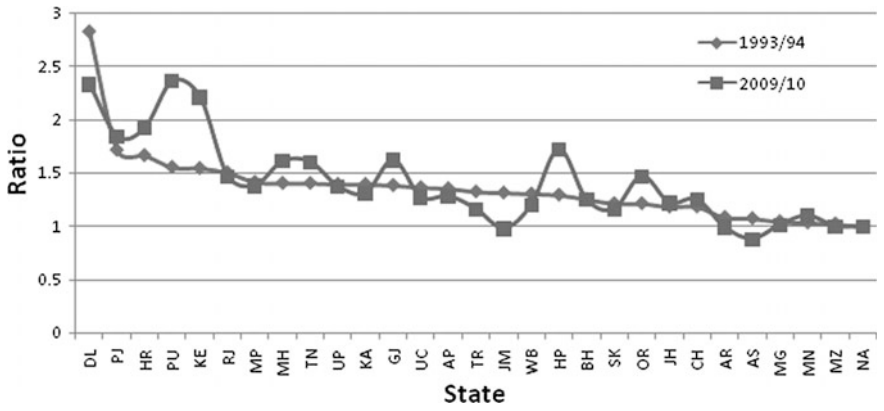


**Fig. 3.5** Relative poverty of SC/ST to all. 1993/94 and 2009/10.
*Note* For abbreviations see Table 3.14

share in population was 29%. Among the other states, the share of SC households was more than 30% in Himachal Pradesh, Delhi, Rajasthan, Uttar Pradesh, Tamil Nadu and Puducherry. A majority of these states are comparatively developed states. In the North Eastern states other than Assam, majority of the population belongs to STs and hence their share in poor was also very high. The ST households accounted for more than 30% of the poor in Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, Goa, and Gujarat. Other backward caste households accounted for more than 60% of the poor in Tamil Nadu and Kerala, 50–60% in Puducherry, Andhra Pradesh, and Uttar Pradesh. Other caste households accounted for 71% of the poor in Jammu and Kashmir, 50–60% in Assam and West Bengal and 30–50% in Puducherry, Goa and Uttarakhand. We can see some geographic concentration of the poor of a social group.

Figure 3.5 shows the relative poverty ratio defined as the ratio of poverty incidence of a social group (SCs and STs together) to the incidence of poverty among the population. It can be seen that the relative poverty in All India is found to be more than one (norm) for SC and ST households, and one for OBCs. The relative poverty ratio for SC and ST households together in 2009/10 was about 2.3 in Delhi, Puducherry and Kerala and little less than two in Punjab and Haryana. These are all very developed states of India. It is also evident from Fig. 3.5 that the relative poverty ratio increased between 1993/94 and 2009/10 in a number of states, particularly in the developed states such as Punjab, Kerala and Haryana.

## 3.8 Multidimensional Poverty

We have made an effort to measure multidimensional poverty by considering three types of deprivations of a household: income poverty, child malnutrition and female chronic energy deficiency in the spaces of income and nutrition by integrating two different sets of unit level data—NSS 61st round consumer expenditure data and the NFHS-3 data adopting the following procedure.

The NFHS data did not collect data on income/expenditure. However, it collected information on a household's possession of consumer durables and ownership of assets. Using this information a standard of living index (SLI) has been computed for each sample household of the NFHS. Correspondence between the poverty line and SLI poverty line has been established by equating the percentage of poor households below the poverty line computed from the NSS unit level data with the percentage of households below the SLI. Thus the percentage of households below the SLI poverty line will be equal to the percentage of households below the poverty line. Since the NFHS has covered only households with a woman aged between 15 and 49 years with at least one child aged below 5 years, we have considered the same group in the NSS unit level data.[14]

The proportion of poor households among the total rural/urban households with a woman aged between 15 and 49 years with at least one child aged below 5 years is estimated from the NSS consumer expenditure household unit level data by using state-specific poverty lines. Assuming that these poverty ratios are valid for NFHS households, the new poverty lines in terms of the Standard of Living Index (SLI) of NFHS-3 have been estimated from the distribution of NFHS households for all states with the rural and urban break-ups. All those households, whose SLI is less than the SLI poverty line, are considered as poor.

Two types of poverty measures, viz. union and intersection are estimated for All India and states with rural and urban break-up. The multidimensional as well as one-dimensional estimates of poverty are presented in Table 3.15. Firstly, the incidence of income poverty and child malnutrition among the households with a woman with at least a child aged below five years did not differ much at All India level but differed across states. Incidence of malnutrition was prominently higher than the incidence of income poverty in some of the developed states such as Gujarat, Haryana, Punjab, Himachal Pradesh, and Jammu and Kashmir both in rural and urban. Secondly, it is evident that multidimensional poverty measured as the proportion of households that are either poor or have at least a stunted child (union of income poverty and child malnutrition) estimated was 75.1% for rural All India and 54.0% for urban All India, is much higher than that of one dimensional poverty (either in the income or the nutrition space). If we also consider adult female malnutrition along with income poverty and child malnutrition, multidimensional

[14]Households with a women and a child below 5 years age constituted about a third of the NSS sample households. Incidence of poverty among these households was higher as compared to all households.

**Table 3.15** Multidimensional poverty in major states and all India (percentage)

| State | Poor HH among the HH with a woman and a child below 5 years age | HH with stunted child below 5 years | Chronic Energy Deficiency (CED) females | Union of households with | | Intersection of households with | |
|---|---|---|---|---|---|---|---|
| | | | | Poverty and child malnutrition | Poverty, child malnutrition and CED females | Poverty and child malnutrition | Poverty, child malnutrition and CED females |
| *Rural* | | | | | | | |
| Andhra Pradesh | 42.8 | 44.0 | 47.7 | 65.7 | 78.3 | 21.1 | 11.1 |
| Assam | 46.5 | 47.2 | 42.7 | 68.4 | 80.2 | 25.3 | 13.4 |
| Bihar | 68.9 | 65.2 | 49.3 | 85.5 | 90.2 | 48.6 | 26.4 |
| Chhattisgarh | 62.5 | 62.6 | 50.3 | 86.7 | 92.5 | 38.3 | 22.1 |
| Gujarat | 50.9 | 58.9 | 50.0 | 77.8 | 86.0 | 32.0 | 16.2 |
| Haryana | 31.4 | 53.6 | 39.7 | 64.1 | 74.3 | 20.9 | 11.1 |
| Himachal Pradesh | 34.7 | 41.5 | 35.1 | 57.7 | 71.6 | 18.5 | 8.3 |
| Jammu and Kashmir | 23.4 | 40.2 | 33.0 | 51.9 | 66.3 | 11.8 | 4.3 |
| Jharkhand | 60.9 | 54.4 | 49.7 | 81.3 | 90.5 | 34.1 | 18.5 |
| Karnataka | 51.0 | 42.2 | 43.0 | 70.4 | 79.7 | 22.7 | 11.8 |
| Kerala | 24.4 | 27.1 | 18.0 | 40.6 | 48.0 | 10.9 | 3.6 |
| Madhya Pradesh | 64.5 | 59.1 | 46.6 | 85.0 | 90.8 | 38.6 | 18.9 |
| Maharashtra | 56.0 | 46.2 | 48.7 | 72.5 | 83.8 | 29.8 | 18.3 |
| Odisha | 69.5 | 49.3 | 46.3 | 79.9 | 86.1 | 38.9 | 20.5 |
| Punjab | 26.7 | 43.7 | 23.5 | 53.9 | 63.4 | 16.4 | 5.6 |
| Rajasthan | 46.0 | 53.2 | 40.0 | 73.4 | 83.3 | 25.8 | 11.0 |
| Tamil Nadu | 44.5 | 33.3 | 33.5 | 60.6 | 69.7 | 17.1 | 8.2 |

(continued)

**Table 3.15** (continued)

| State | Poor HH among the HH with a woman and a child below 5 years age | HH with stunted child below 5 years | Chronic Energy Deficiency (CED) females | Union of households with | | Intersection of households with | |
|---|---|---|---|---|---|---|---|
| | | | | Poverty and child malnutrition | Poverty, child malnutrition and CED females | Poverty and child malnutrition | Poverty, child malnutrition and CED females |
| Uttar Pradesh | 54.5 | 58.9 | 40.5 | 79.9 | 86.5 | 33.5 | 16.3 |
| Uttarakhand | 47.6 | 54.0 | 35.8 | 71.5 | 78.7 | 30.1 | 12.4 |
| West Bengal | 49.7 | 51.6 | 49.9 | 71.1 | 82.2 | 30.2 | 17.5 |
| **All India** | **53.4** | **53.3** | **43.7** | **75.1** | **83.3** | **31.6** | **16.3** |
| *Urban* | | | | | | | |
| Andhra Pradesh | 32.2 | 37.4 | 22.4 | 53.5 | 61.9 | 16.1 | 5.0 |
| Assam | 29.7 | 30.5 | 27.9 | 44.9 | 58.6 | 15.2 | 6.6 |
| Bihar | 54.8 | 53.0 | 34.9 | 73.3 | 78.5 | 34.5 | 16.3 |
| Chhattisgarh | 40.6 | 41.0 | 36.0 | 60.8 | 70.2 | 20.9 | 11.0 |
| Gujarat | 24.1 | 48.0 | 26.3 | 57.1 | 66.2 | 15.0 | 5.1 |
| Haryana | 30.0 | 40.5 | 28.0 | 53.2 | 60.2 | 17.4 | 7.0 |
| Himachal Pradesh | 5.7 | 27.6 | 18.7 | 30.7 | 43.3 | 2.6 | 1.1 |
| Jammu and Kashmir | 16.3 | 27.7 | 12.6 | 33.7 | 40.1 | 10.4 | 2.7 |
| Jharkhand | 28.0 | 37.7 | 39.6 | 48.3 | 62.2 | 17.3 | 11.3 |
| Karnataka | 27.9 | 29.4 | 26.8 | 46.1 | 60.0 | 11.2 | 5.2 |
| Kerala | 21.3 | 23.8 | 10.5 | 39.7 | 45.1 | 5.4 | 0.8 |

(continued)

**Table 3.15** (continued)

| State | Poor HH among the HH with a woman and a child below 5 years age | HH with stunted child below 5 years | Chronic Energy Deficiency (CED) females | Union of households with | | Intersection of households with | |
|---|---|---|---|---|---|---|---|
| | | | | Poverty and child malnutrition | Poverty, child malnutrition and CED females | Poverty and child malnutrition | Poverty, child malnutrition and CED females |
| Madhya Pradesh | 45.2 | 48.0 | 33.2 | 65.2 | 73.5 | 28.0 | 11.4 |
| Maharashtra | 37.8 | 36.6 | 30.2 | 56.2 | 69.5 | 18.2 | 8.2 |
| Odisha | 45.4 | 35.6 | 28.1 | 58.6 | 67.1 | 22.4 | 8.6 |
| Punjab | 25.8 | 38.4 | 17.8 | 49.7 | 54.9 | 14.6 | 6.7 |
| Rajasthan | 42.8 | 38.9 | 39.9 | 60.2 | 75.8 | 21.6 | 9.7 |
| Tamil Nadu | 22.7 | 30.5 | 20.2 | 42.8 | 53.4 | 10.5 | 2.0 |
| Uttar Pradesh | 39.3 | 45.2 | 28.3 | 60.4 | 70.0 | 24.1 | 11.1 |
| Uttarakhand | 32.1 | 28.5 | 14.9 | 48.0 | 53.0 | 12.7 | 4.2 |
| West Bengal | 34.4 | 29.5 | 31.1 | 48.2 | 56.2 | 15.7 | 9.0 |
| **All India** | **33.8** | **38.1** | **27.6** | **54.0** | **64.2** | **17.9** | **7.7** |
| **All India (R + U)** | **48.1** | **49.2** | **39.2** | **69.4** | **78.4** | **28** | **14.1** |

*Source* Computed by the authors from unit level data of NSS 61st round (2004/05) and NFHS-3 (2005/06)

poverty measured as the proportion of households that are either poor or have a stunted child or women suffering from chronic energy deficiency (CED) were still higher level at 83.3% for rural India and 64.2% for urban India. Undoubtedly, overcoming income poverty does not ensure freedom from other forms of deprivation. Thirdly, the multidimensional poverty estimates show substantial differences across states. For instance, the union of income poverty, child malnutrition and chronic energy deficiency of women varied from 48.0% in Kerala, 63.4% in Punjab to 92.5% in Chhattisgarh, 90.8% in Madhya Pradesh, 90.5% in Jharkhand and 90.2% in Bihar. The very high incidence of multidimensional poverty in states such as Chhattisgarh, Bihar, Madhya Pradesh, Jharkhand, Odisha and Uttar Pradesh, suggest that universal coverage of households under poverty alleviation programmes is desirable or dimension-specific identification of poor for programmes meant for eliminating specific dimensional deprivation is desirable. Fourthly, intersection measure of multidimensional poverty which is the proportion of households that are poor as well as have a stunted child estimated was 31.6% for rural India and 17.9% in urban India, and those having in addition a chronic energy deficient women estimated was 16.3% for rural and 7.7% in urban. These figures show the approximate size of the hardcore poor in the multidimensional space, which necessitates priority attention in public intervention programmes. It is worth observing that all the poverty measures show that poverty in the multidimensional space is much higher in rural as compared to urban areas.

## 3.9 Ranking of States in Multiple Deprivations and Performance

### *3.9.1 Ranking of States in Multiple Deprivations*

We have ranked the states on an aggregate index of child deprivation, household amenities deprivation and a combined index of the two. The indicators considered for the child deprivation are: (i) malnutrition (underweight) of children below 3 years, (ii) infant mortality, (iii) live births not attended by trained functionaries, (iv) children not attending school in the age group 7–18 years, (v) prevalence of child labour (6–14 years), (vi) girls married below 18 years, and for household amenities deprivation were households without (i) electricity, (ii) safe drinking water, (iii) accesses to toilet facility, and (iv) living in a pucca house. Table 3.16 shows the ranking of states on each of the individual attribute. As expected the states with high incidence of poverty—Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh, Odisha and Uttar Pradesh ranked worse on all individual deprivation except for child labour and safe drinking water. In the case of child labour, except Uttar Pradesh the ranking of these states were not the worst. Bihar and Uttar Pradesh ranked better on safe drinking water. It is worth mentioning that in the comparatively higher per capita income states of Andhra Pradesh and West Bengal the incidence of child labour and the incidence of school dropouts were high. The

**Table 3.16** Ranking of states by incidence of deprivation

| State | Malnutrition (underweight) below 3 yrs | IMR per 1000 | Births not attended by trained person | Not attending school | Child labour | Girls married below 18 yrs | Households with no | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Electricity | Safe drinking water | Access to toilet | Pucca house |
| Andhra Pradesh | 10 | 18 | 4 | 13 | 27 | 23 | 11 | 9 | 19 | 9 |
| Arunachal Pradesh | 11 | 5 | 21 | 23 | 26 | 10 | 6 | 7 | 6 | 23 |
| Assam | 15 | 24 | 24 | 8 | 13 | 19 | 25 | 22 | 9 | 26 |
| Bihar | 25 | 20 | 25 | 27 | 11 | 29 | 27 | 8 | 25 | 20 |
| Chhattisgarh | 24 | 21 | 17 | 18 | 4 | 21 | 18 | 16 | 24 | 22 |
| Delhi | 7 | 9 | 8 | 11 | 7 | 6 | 1 | 1 | 3 | 1 |
| Goa | 5 | 1 | 2 | 8 | 5 | 2 | 4 | 14 | 7 | 10 |
| Gujarat | 23 | 17 | 9 | 14 | 21 | 17 | 13 | 12 | 17 | 11 |
| Haryana | 17 | 19 | 13 | 16 | 12 | 14 | 5 | 3 | 12 | 4 |
| Himachal Pradesh | 9 | 12 | 14 | 2 | 17 | 1 | 3 | 11 | 14 | 6 |
| J & K | 5 | 16 | 12 | 17 | 10 | 9 | 8 | 21 | 11 | 7 |
| Jharkhand | 26 | 15 | 27 | 25 | 14 | 26 | 26 | 24 | 27 | 21 |
| Karnataka | 16 | 14 | 5 | 10 | 22 | 22 | 12 | 15 | 20 | 17 |
| Kerala | 4 | 2 | 1 | 1 | 1 | 8 | 6 | 27 | 1 | 2 |
| Madhya Pradesh | 27 | 27 | 20 | 21 | 18 | 24 | 17 | 19 | 23 | 18 |
| Maharashtra | 14 | 6 | 6 | 7 | 19 | 16 | 16 | 18 | 16 | 14 |
| Manipur | 2 | 3 | 10 | 6 | 3 | 7 | 15 | 26 | 2 | 27 |
| Meghalaya | 21 | 22 | 23 | 5 | 6 | 13 | 20 | 25 | 10 | 25 |

(continued)

**Table 3.16** (continued)

| State | Malnutrition (underweight) below 3 yrs | IMR per 1000 | Births not attended by trained person | Not attending school | Child labour | Girls married below 18 yrs | Households with no | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Electricity | Safe drinking water | Access to toilet | Pucca house |
| Odisha | 18 | 26 | 16 | 22 | 23 | 18 | 23 | 20 | 26 | 19 |
| Punjab | 3 | 11 | 7 | 20 | 15 | 5 | 2 | 2 | 8 | 3 |
| Rajasthan | 18 | 23 | 18 | 24 | 25 | 27 | 21 | 17 | 22 | 12 |
| Sikkim | 1 | 6 | 11 | 4 | 2 | 15 | 10 | 6 | 5 | 8 |
| Tamil Nadu | 8 | 4 | 3 | 3 | 8 | 11 | 9 | 5 | 18 | 13 |
| Tripura | 13 | 8 | 15 | 12 | 9 | 20 | 19 | 23 | 4 | 24 |
| Uttar Pradesh | 22 | 25 | 26 | 25 | 20 | 25 | 24 | 4 | 21 | 16 |
| Uttarakhand | 12 | 12 | 19 | 15 | 16 | 4 | 14 | 13 | 15 | 5 |
| West Bengal | 18 | 9 | 22 | 19 | 24 | 28 | 22 | 10 | 12 | 15 |

*Note* State with rank 1 has lowest incidence of deprivation and state with rank 27 has highest incidence of deprivation

*Source* Compiled from NFHS-3, DLHS-2 and Government published data. Also, computed from NSS 64th and 66th rounds unit level data

**Table 3.17** Ranking of states based on inverse of deprivations, incidence of poverty, average real MPCE and real per capita GSDP

| State | Inverse of deprivations of | | | Inverse of poverty (2009/10) | MPCE (2009/10) at constant prices | Per capita real GSDP (2007–10) |
|---|---|---|---|---|---|---|
| | Children | HH | Combined | | | |
| Andhra Pradesh | 16 | 12 | 14 | 13 | 11 | 11 |
| Arunachal Pradesh | 17 | 8 | 13 | 18 | 15 | 13 |
| Assam | 19 | 25 | 20 | 23 | 23 | 25 |
| Bihar | 25 | 22 | 26 | 27 | 27 | 27 |
| Chhattisgarh | 20 | 22 | 20 | 26 | 25 | 17 |
| Delhi | 6 | 1 | 2 | 6 | 2 | 2 |
| Goa | 2 | 6 | 3 | 1 | 6 | 1 |
| Gujarat | 18 | 13 | 17 | 14 | 14 | 5 |
| Haryana | 15 | 3 | 9 | 12 | 8 | 4 |
| Himachal Pradesh | 7 | 5 | 7 | 3 | 4 | 9 |
| J & K | 10 | 10 | 10 | 2 | 10 | 23 |
| Jharkhand | 23 | 27 | 27 | 24 | 24 | 22 |
| Karnataka | 13 | 15 | 16 | 15 | 13 | 10 |
| Kerala | 1 | 7 | 1 | 4 | 1 | 3 |
| Madhya Pradesh | 25 | 21 | 25 | 20 | 19 | 21 |
| Maharashtra | 9 | 15 | 12 | 16 | 9 | 6 |
| Manipur | 3 | 18 | 8 | 25 | 26 | 24 |
| Meghalaya | 14 | 22 | 18 | 8 | 20 | 16 |
| Odisha | 22 | 26 | 24 | 21 | 22 | 20 |
| Punjab | 8 | 2 | 5 | 7 | 5 | 7 |
| Rajasthan | 24 | 20 | 22 | 17 | 18 | 18 |
| Sikkim | 5 | 4 | 4 | 5 | 12 | 12 |
| Tamil Nadu | 4 | 9 | 6 | 8 | 7 | 8 |
| Tripura | 11 | 18 | 15 | 10 | 16 | 19 |
| Uttar Pradesh | 27 | 17 | 23 | 22 | 21 | 26 |
| Uttarakhand | 12 | 10 | 11 | 11 | 3 | 15 |
| West Bengal | 21 | 14 | 19 | 19 | 17 | 14 |

*Note* Individual ranks of Table 3.18 are combined in using Borda Rule. Ranking of states based on Borda Rule is from least deprived (Kerala) to most deprived (Jharkhand) and ranking of states based on average MPCE/per capita GSDP are from highest to lowest and poverty from lowest incidence (Goa) to the highest (Bihar)

states Goa and Kerala were the least deprived in all aspects of child care, and have high levels of amenities. However, it is interesting to observe that Kerala ranked worst in safe drinking water and Gujarat ranks poorly on the incidence of malnutrition, infant mortality and child labour.

As expected the child and household amenities deprivations are negatively associated with (i) per capita MPCE and (ii) per capita GSDP and positively with (iii) poverty (Table 3.17). Rank correlation coefficients between inverse of deprivations with the poverty, MPCE and GSDP was 0.71, −0.78 and −0.81 respectively. It is evident that inverse of deprivation, inverse of poverty showed more or less similar ranking of states. However there are some outliers. It is observed that Gujarat, Haryana and Maharashtra though ranked high on per capita GSDP, they ranked in the middle level on the ranking based both on inverses of deprivations as well as incidence of poverty. Goa, Delhi and Kerala ranked high on inverse of deprivation as well as inverse of poverty. Tamil Nadu, Punjab and Himachal Pradesh would fall in the best category in all three aspects. The poor states Bihar, Chhattisgarh, Utter Pradesh, Madhya Pradesh and Jharkhand lacked both in economic and social development.

### *3.9.2 Ranking of States by Progress in Reduction of Multiple Deprivations*

In the preceding sub section, the states were ranked on their current status on multiple deprivations on the basis of quite a few indicators. We made an effort to rank the states on their performance in reducing multiple deprivations in the post reform period. We could not use the same set of indicators due to lack of comparable data between 1993/94 and 2009/10. The progress was assessed on the basis of three indicators viz., (i) incidence of income poverty; (ii) child malnutrition and CED of women together; and (iii) educational deprivation. Table 3.18 provides the ranking of the states on progress made in reducing income poverty, malnutrition, and educational deprivation as well as aggregate ranking of the states/UTs in reducing multiple deprivations in post reform period. Firstly, the ranking of the states on the three indicators differed. In reducing malnutrition Manipur, Jammu and Kashmir, Himachal Pradesh, Uttarakhand and Maharashtra performed better; and Arunachal Pradesh, Assam, Bihar, Haryana and Madhya Pradesh performed poorly. In reducing educational deprivation, Uttarakhand, Meghalaya, Nagaland, Maharashtra and Tamil Nadu performed better; and Bihar, Jammu and Kashmir, Andhra Pradesh and Arunachal Pradesh performed badly. In reducing income poverty as noted earlier, Himachal Pradesh, Jammu and Kashmir, Kerala, Tamil Nadu and Goa showed better performance; and Mizoram, Nagaland, Chhattisgarh, Delhi, Bihar, Madhya Pradesh and Uttar Pradesh had poor performance. Secondly, on overall ranking, the performance of Himachal Pradesh was the best followed by Kerala, Tamil Nadu, Uttarakhand and Maharashtra;and the performance of Bihar was the worst, followed by Madhya Pradesh, Jharkhand and Arunachal Pradesh.

**Table 3.18** Ranking of states by the percentage performance in poverty reduction, improved education and decline in malnutrition

| State | Income poverty decline 1993–2010 | Decline in child malnutrition (1998–2006) | | | Increase in literacy | | | Sum of ranks | Borda ranking |
|---|---|---|---|---|---|---|---|---|---|
| | | Child under weight | CED women | Borda ranking | NSS 1997–2008 | Census 2001–2011 | Borda ranking | | |
| Andhra Pradesh | 7 | 17 | 15 | 18 | 22 | 28 | 27 | 52 | 17 |
| Arunachal Pradesh | 8 | 29 | 29 | 29 | 15 | 27 | 24 | 61 | 24 |
| Assam | 22 | 24 | 28 | 27 | 4 | 25 | 12 | 61 | 24 |
| Bihar | 25 | 20 | 26 | 25 | 23 | 29 | 29 | 79 | 29 |
| Chhattisgarh | 27 | 7 | 18 | 12 | 7 | 16 | 10 | 49 | 15 |
| Delhi | 26 | 16 | 3 | 7 | 28 | 10 | 23 | 56 | 20 |
| Goa | 5 | 18 | 8 | 13 | 29 | 6 | 18 | 36 | 10 |
| Gujarat | 15 | 19 | 20 | 22 | 19 | 15 | 17 | 54 | 19 |
| Haryana | 13 | 27 | 25 | 27 | 17 | 18 | 18 | 58 | 21 |
| Himachal Pradesh | 1 | 5 | 13 | 4 | 24 | 5 | 12 | 17 | 1 |
| Jammu and Kashmir | 2 | 6 | 10 | 3 | 21 | 30 | 28 | 33 | 9 |
| Jharkhand | 18 | 21 | 24 | 24 | 11 | 26 | 21 | 63 | 27 |
| Karnataka | 9 | 15 | 14 | 15 | 10 | 22 | 16 | 40 | 12 |
| Kerala | 3 | 22 | 2 | 11 | 14 | 3 | 4 | 18 | 2 |
| Madhya Pradesh | 24 | 23 | 27 | 26 | 9 | 21 | 15 | 65 | 28 |
| Maharashtra | 11 | 2 | 16 | 4 | 12 | 7 | 5 | 20 | 5 |
| Manipur | 21 | 3 | 5 | 2 | 8 | 13 | 8 | 31 | 7 |

(continued)

**Table 3.18** (continued)

| State | Income poverty decline 1993–2010 | Decline in child malnutrition (1998–2006) | | | Increase in literacy | | | Sum of ranks | Borda ranking |
|---|---|---|---|---|---|---|---|---|---|
| | | Child under weight | CED women | Borda ranking | NSS 1997–2008 | Census 2001–2011 | Borda ranking | | |
| Meghalaya | 10 | 26 | 1 | 14 | 1 | 11 | 1 | 25 | 6 |
| Mizoram | 29 | 1 | 4 | 1 | 27 | 2 | 12 | 42 | 14 |
| Nagaland | 28 | 28 | 11 | 22 | 2 | 12 | 3 | 53 | 18 |
| Odisha | 16 | 4 | 17 | 9 | 6 | 19 | 11 | 36 | 10 |
| Punjab | 20 | 14 | 6 | 8 | 13 | 24 | 21 | 49 | 15 |
| Rajasthan | 17 | 8 | 21 | 15 | 25 | 23 | 26 | 58 | 21 |
| Sikkim | 6 | 25 | 9 | 19 | 16 | 4 | 7 | 32 | 8 |
| Tamil Nadu | 4 | 9 | 12 | 9 | 5 | 14 | 5 | 18 | 2 |
| Tripura | 12 | 12 | 23 | 20 | 20 | 1 | 8 | 40 | 12 |
| Uttarakhand | 14 | 11 | 7 | 4 | 3 | 9 | 1 | 19 | 4 |
| Uttar Pradesh | 23 | 13 | 22 | 20 | 18 | 17 | 18 | 61 | 24 |
| West Bengal | 19 | 10 | 19 | 15 | 26 | 20 | 25 | 59 | 23 |

*Note* State with rank 1 has highest and state with rank 29 has lowest performance in decline in deprivations of poverty, malnutrition and education. The individual ranks of progress made in decline in malnutrition (under weight of children and CED of Women); increase in literacy from NSS and Census data; and then the individual ranks of performance in deprivations—income poverty, malnutrition and education are combined using Borda Rule. The overall Ranking of states based on Borda Rule is from best preformed state (Himachal Pradesh) to worst performed (Bihar)

**Table 3.19** Classification of states by performance index in the reduction of multiple deprivations and current level of multiple deprivations

| Level of deprivations (rank) | Performance in reduction of multiple deprivations (1993–2010) | | |
|---|---|---|---|
| | High | Medium | Low |
| Low | Himachal Pradesh, Kerala, Tamil Nadu, Manipur, Sikkim, Jammu and Kashmir | Goa, Punjab, Delhi, Haryana | Haryana |
| Medium | Uttarakhand, Maharashtra, Meghalaya | Karnataka, Tripura, Andhra Pradesh, Gujarat | West Bengal, Arunachal Pradesh |
| High | Nil | Orissa, Chhattisgarh | Rajasthan, Assam, Uttar Pradesh, Jharkhand, Madhya Pradesh, Bihar |

Table 3.19 cross classifies the states/UTs by their ranking on current level of deprivation and by the ranking on the reduction of deprivation. As can be seen, out of 27 states, 16 states had fallen on the diagonal cells revealing that the states which made better progress in the reduction of deprivation had lower current level of deprivation. It may be noted that the basic source data underlying the indicators show that even in the base year, the better performing states had comparatively low incidence of multiple deprivation. It is clear from Fig. 3.6 that Himachal Pradesh, Kerala, Tamil Nadu, Uttarakhand and Maharashtra emerged as the best performing

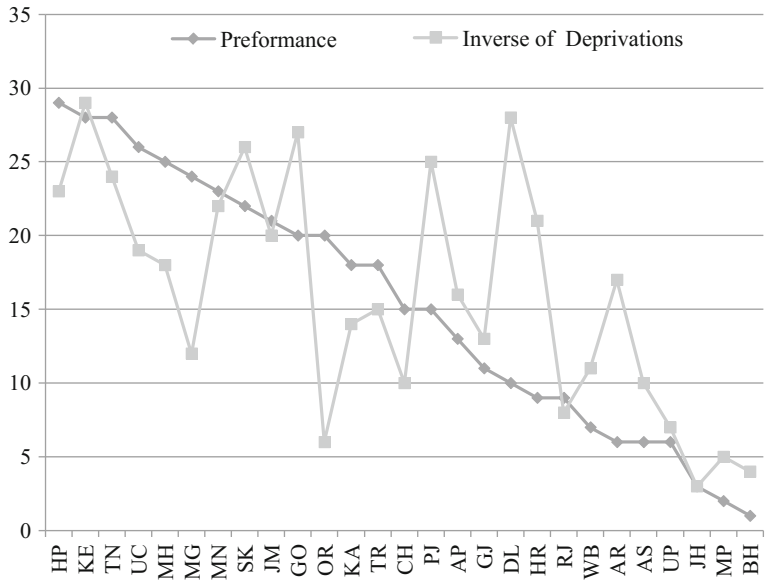


**Fig. 3.6** Ranking of states by performance in multiple deprivations and current level of deprivations

states in the post reform period in reducing multiple deprivations and with a low current levels of multiple deprivations and on the other extreme Bihar, Madhya Pradesh, Jharkhand and Uttar Pradesh emerged as the worst performing states in the reduction of multiple deprivations as well as high current levels of multiple deprivations. While there is an appreciation of the success stories of Kerala and Tamil Nadu are well known, the success stories of Himachal Pradesh and Uttarakhand are less known.

## 3.10 Conclusion

The well-being of India as reflected in the aggregate social welfare improved significantly in the last two decades. All expenditure groups experienced higher growth in monthly per person real expenditure (MPCE) in the second period (1993–2010) than in the first period (1983–97). The top 30% and middle 40% expenditure groups in urban and the top 30% expenditure group in rural gained the most. Consequently, the improvement in aggregate social welfare was accompanied by worsening of inequality. The rising inequality is a cause of concern.

Modelling of interstate variations in monthly per person real expenditure, social welfare (SW), inequality ($A_{2.0}$) and incidence of poverty (HCR) revealed that per capita GSDP had a positive and significant effect on MPCE, SW, and $A_{2.0.}$ The elasticity of poverty with respect to per capita GSDP was estimated at −0.33, with respect to MPCE at −3.5, and with respect to inequality at 0.93. The low value of elasticity with respect to per capita GSDP could be attributed to low value of elasticity of MPCE with respect to GSDP (0.19) as well as positive association of growth with inequality. The decomposition of poverty reduction between 1993/94 and 2009/10 showed that poverty reduction would have been substantially more had all states, and rural and urban areas experienced the uniform growth in MPCE as that of All India, and the inequalities remained constant at 1993/94 levels.

Cross tabulation of states on the basis of their ranking on growth and on poverty reduction showed, out of 27 states, 17 had fallen in the diagonal cells, thus confirming the positive effect of growth on poverty reduction. The positive outliers which had better performance of poverty reduction at their given per capita GSDP growth were Arunachal Pradesh, Tamil Nadu, Jammu and Kashmir, Jharkhand and Meghalaya. On the other hand negative outliers such as Gujarat, Haryana, Bihar, Chhattisgarh and Delhi had poor performance in poverty reduction given their per capita GSDP growth rate. The positive outliers could be due to lower inequality and/or association of higher level of MPCE at a given per capita GSDP. It should be noted that though Gujarat and Haryana witnessed high growth in the post reform period, their progress in poverty reduction was moderate. The higher per capita GSDP in these states might not have resulted in higher per capita expenditure, particularly in the case of Gujarat.

Decomposition of Atkinson inequality showed that overall intra and inter-group inequalities increased between 1993/94 and 2009/10. Further, the results revealed

that inter occupation group inequality accounted for a higher portion of the overall inequality in 1993/94, 2004/05 and 2009/10, and its contribution to over all inequality showed a marked increase in the post reform period. Similarly, inter-group inequality among social sub groups also accounted a part of the overall inequality and its contribution to over all inequality also increased.

Incidence of poverty by occupation and social group showed that poverty levels were higher for scheduled (ST/SC) groups as compared to non-scheduled groups in all occupation groups both in rural and urban areas. It should be noted that even in unskilled occupations such as rural agricultural labour and urban casual labour, poverty levels were higher among the scheduled social groups. Our decomposition analysis of the poverty gap between the scheduled and non-scheduled social groups showed that intra occupation group differences in poverty levels accounted for more than three fourth of the overall gap between the scheduled (SC/ST) and non-scheduled social groups. The differences in the incidence of poverty between the scheduled and non-scheduled social groups within an occupation group could be due to the differences in household characteristics as well as discrimination in the labour market.

Scheduled social group households accounted for a bulk of the poor in some selected states. In 2009/10, SCs accounted for 70% of the poor in Punjab, 54% in Haryana and 40% or more in Delhi, Puducherry, Kerala and Himachal Pradesh; and STs accounted for more than 30% in North Eastern states, Chhattisgarh, Jharkhand, Odisha, Gujarat and Madhya Pradesh. What is worrying is that relative poverty of SCs and STs was high in the most developed states—Delhi, Puducherry, Punjab, Kerala and Haryana. More worry some is the increase in the relative poverty of SCs and STs during 1993/94–2009/10 in the developed states of Punjab, Haryana and Kerala.

The estimated incidence of multidimensional poverty in the spaces of income/expenditure and malnutrition was significantly higher than the incidence of income poverty. For instance, in rural areas while 53% of the households with a woman and a child aged below 5 years were below the poverty line in 2004/05 (income poor); 75% households were poor in the union of poverty and child malnutrition, of them only 42% were income poor. It is evident that elimination of income poverty would not eliminate malnutrition.

This paper demonstrated the need to go beyond the income space in the social welfare evaluation, particularly in comparative assessment of poverty reduction in the multidimensional space. When the states were ranked on the basis of income poverty reduction between 1993/94 and 2009/10, Puducherry, Himachal Pradesh, Jammu and Kashmir, Kerala, Tamil Nadu and Goa (in the descending order) emerged as the best performers; when the domain of social assessment was expanded to include reduction of malnutrition and educational deprivation, a slightly different set of states viz, Kerala, Tamil Nadu, Himachal Pradesh, Jammu and Kashmir and Uttarakhand (in the descending order) emerged as the best performers. When we expanded further the domain of social evaluation by considering the current level of multiple deprivations i.e., by considering both progress in reduction of multiple deprivations as well as current level of multiple deprivations,

Himachal Pradesh, Kerala and Tamil Nadu ranked high on social welfare evaluation; and Bihar, Madhya Pradesh and Jharkhand ranked low on it.

On the whole, India witnessed improvement in economic welfare and made progress in income poverty reduction. However, the reduction in income poverty would have been significantly higher had the growth been even. Our paper establishes that growth between 1993/94 and 2009/10 was accompanied by (i) worsening of inequality; (ii) growing relative poverty of SCs and STs; (iii) sluggish growth with bad performance in poverty reduction in states with high incidence of poverty; (iv) unacceptably high incidence of multidimensional poverty; and (v) prevalence of child labour even in comparatively developed states such as Andhra Pradesh, Gujarat and West Bengal. These negative factors act as a barrier in achieving inclusive growth.

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## References

Atkinson, A. B. (1970). On the measurement of inequality. *Journal of Economic Theory, 2*, 244263.

Blackorby, C., Donaldson, D., & Aceersperg, M. (1981). A new procedure for the measurement of inequality within and among population subgroups. *The Canadian Journal of Economics, 14*, 665–685.

Cowell, F. A., & Jenkins, S. P. (1995). How much inequality can we explain? A methodology and an application to the United States. *The Economic Journal, 105*, 421–480.

Deaton, A. (1980). *Measurement of welfare: Theory and practical guidelines*. Washington D.C., USA: The World Bank.

Kakwani, N. (1993). Performance in living standards: An international comparison. *Journal of Development Economics, 41*, 307–336.

McKenzie, G. W. (1983). *Measuring economic welfare*. Cambridge: Cambridge University Press.

Ravi, C. (2000). Complete demand systems, welfare and nutrition: An application to Indian consumption data. Hyderabad, India: Centre for Economic and Social Studies.

Slesnick, D. T. (1998). Empirical approached the measurement of welfare. *Journal of Economic Literature, 36*, 2018–2165.

# Part II
# Poverty and Inequality

# Chapter 4
# What Kinds of Economic Inequality Really Matter?

**Thomas E. Weisskopf**

**Abstract** The chapter discusses the major reasons why economic inequality should be a source of concern and the forms of inequality that are principally implicated. It considers ten different arguments as to why inequality matters—two of them moral, two political, three economic, and three social. In each case it discusses the economic variable(s) whose unequal distribution is at issue, whether economic class inequality or ethnic group inequality is most salient, and what part(s) of the unequal distribution are the most problematic—i.e., is the problem primarily poverty at the lower end, privilege at the upper end, bipolarization, or the entire distribution?

**Keywords** Political economy · Economic inequality

**JEL Classification** Z13

## 4.1 Introduction

For a long time economists concerned about the distribution of economic well-being in real-world societies have focused on poverty—generally defined as insufficient economic resources to attain a minimal standard of living—as the key problem to be documented, understood, and addressed. Since the end of the colonial era, national governments and international institutions like the World Bank have viewed the alleviation and ultimate eradication of poverty as an important policy objective. Even in affluent countries such as the United States, poverty lines are defined, the extent of poverty below those lines is measured, and campaigns to reduce poverty are launched—e.g., the "War Against Poverty" in the U.S. by the Lyndon Johnson Administration in the 1960s. It surely makes sense to accord high priority to reduction of the immense suffering associated with poverty, especially when it is as widespread as in many developing countries.

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For a long time too, most economists and policy-makers have seen sustained economic growth as providing the surest means to reducing poverty. History certainly shows that sustained economic growth has in the past done a great deal to reduce poverty—initially in the West, then in non-Western countries such as Japan and South Korea, and lately in "emerging nations" like China and India. In recent decades, it is true, concern has grown over the extent to which economic growth actually alleviates poverty; and the term "inclusive growth" has arisen to focus attention on policies to assure that growth does in fact do so. Up until recently, however, concern about poverty has not been matched by concern about economic inequality more generally. In other words, the focus has been on absolute economic deprivation (whether one falls short of a subsistence standard) rather than relative economic deprivation (where one stands in relation to others in one's society). If economic growth is accompanied by a widening economic gap between rich and poor, this has generally not been seen as a problem so long as the growth also reduces the proportion and the numbers of the very poor.[1]

In recent years, however, attitudes toward economic inequality seem to be changing. In late 2010, the then Managing Director of the IMF—a bastion of mainstream economic thinking—declared that "Lurking behind [globalization is] a large and growing chasm between rich and poor—especially within countries. An inequitable distribution of wealth can wear down the social fabric. More unequal countries have worse social indicators, a poorer human development record, and higher degrees of economic insecurity and anxiety" (Strauss-Kahn 2010). Concern about the "large and growing chasm between rich and poor" has been stimulated in part by an accumulation of evidence that in recent decades economic inequality has increased substantially in a great many countries around the world.[2] It is not only that the poorer strata—e.g., the bottom 10 or 20%—are receiving smaller shares of total income and wealth. There is also much evidence of a burgeoning share for the very richest stratum (see Piketty and Saez 2011), which has contributed to a growing sense that inequality at the upper end of the distribution confers excessive power on the very rich, with problematic consequences for the well-being of a society. Although this point of view has been expressed and discussed more fully in relatively affluent countries, where evidence on the growth of a super-rich class at the top of the income distribution is more extensive, it would seem to be just as applicable to less affluent developing countries, where a class of super-rich is also often to be found.

In a recent paper (Weisskopf 2011) I reviewed a variety of arguments that have been advanced to suggest that people would be better off if the distribution of key economic resources in a society were less unequal. In this paper I would like to develop this line of analysis further by addressing an issue to which too little attention has heretofore been devoted, namely: what kinds of economic inequality

[1]There have of course always been some economists who stress the importance of economic inequality—notably Amartya Sen.

[2]See the data compiled by the World Bank and by the U.N. University's World Institute for Development Economics Research, on-line at http://data.worldbank.org/topic/poverty and http://www.wider.unu.edu/research/Database/en_GB/database/, respectively.

really matter? I begin in Sect. 4.2 by distinguishing various forms that economic inequality can take. In Sect. 4.3 through 6 I discuss a series of moral, political, economic, and social arguments that have been made for reducing inequality; in each case I seek to identify the particular form of economic inequality that is implicated in the argument. In Sect. 4.7, I conclude with a summary of the results and a brief discussion of their implications.

## 4.2 Forms of Economic Inequality

The various arguments for reducing economic inequality turn out to reflect concerns about distinct kinds of inequality that can differ in several dimensions.

The first dimension is the economic variable or variables whose unequal distribution is at issue. The potential variables of interest include (a) income, (b) consumption, (c) wealth, and (d) access to goods and services provided by governmental or non-governmental organizations(hereafter "public services")—in particular, those that provide capability building services such as health care, sanitation, and education. In most cases it is the amount of the variable accruing to an individual that is most critical, but in some cases the endowment of the individual's household or family is more important.

The second dimension involves the nature of the distributional entity whose unequal possession of an economic variable is the source of concern. Most often this is the individual person or household. In this case differences among them in possession of the relevant economic variable can be described as differences of economic class,[3] and the population may be divided into a hierarchy of classes, each of which is defined by a pre-specified range of values for the relevant economic variable. (The range can be defined in absolute or in relative terms, i.e., as fractiles) Alternatively, the distributional entity of interest may be a group of people who share a pre-defined characteristic, independently of their economic status. Such groups may be defined ethnically (e.g., by race, caste, tribe, religion, native language) or geographically (by politico-administrative or topographical region). In this paper I will consider only ethnically defined groups, because concern about inter-ethnic inequality is generally much weightier than concern about inter-regional inequality[4]—if only because ethnic

[3]I am using the term "class" in this paper simply as a short-hand for the alternative to "group" as a distributional entity. In sociological and/or Marxist analyses, of course, classes are themselves defined as groups of people that share certain important characteristics.

[4]To paraphrase Sen (1992, p. 117, fn.), we are interested in inequality between different groups not so much because of intrinsic interest in group differences but because of what such differences can tell us about inequality as between individuals placed in different groups. Sen (1992, pp. 121–22) goes on to note that "The way a person is viewed in a society with racial disparity may be deeply influenced by his or her visible racial characteristics, and that can act as a barrier to functioning possibilities in many circumstances. Distinctions of caste similarly have influences of their own…".

identity is difficult or impossible to alter, while regional identity can be altered through migration. Inter-group inequalities—as well as inequalities across separate hierarchical classes of individuals—are most readily measured by assigning to each group the group median[5] for the variable at issue,[6] which sets up a frequency distribution with a number of observations equal to the number of groups.

The third dimension addresses the part (or parts) of an unequal distribution on which concern is focused. I think one can usefully distinguish four distinct configurations of inequality, as follows:

(a) Accentuated inequality at the lower end of the distribution. This configuration involves a predominant concern with the extent of poverty conceived of in relative terms—i.e., in relation not to a pre-specified poverty line, but to the societal median. It is motivated by Sen's distinction between income and capability: "*Relative* deprivation in the space of *incomes* can lead to *absolute* deprivation in the space of *capabilities*" (Sen 1992, p. 115).[7] In the case of class distributions for any given economic variable $x$, it can be measured analogously to a head count measure of poverty by the number (or proportion) of people falling below $y^*x_m$, where $x_m$ is the societal median value of $x$, and $y$ is a pre-specified fraction no higher than—say—50%. Or it can be measured analogously to a gap measure of poverty as the total deficit in $x$ under $y^*x_m$ of those in the head count, taken as a share of societal total $x$. The distributive share of the bottom 5 or 10% of the population provides a very rough indicator of the latter measure. In the case of group distributions one would want to focus on the number of ethnic groups whose median falls below the overall median, as well as the proportionate extent to which each group median falls short.

(b) Accentuated inequality at the upper end of the distribution. This configuration involves a predominant concern with what one might best characterize as "privilege," in opposition to poverty, also conceived of in relative terms. Just

[5]For some purposes it may be preferable to work with the mean rather than the median. In the rest of the paper I will mention only the median, but it should be understood that one might wish to use the mean instead.

[6]For some purposes it is useful to measure also the degree of inequality within each group—on the premise that, *ceteris paribus*, greater within-group inequality (which implies greater likelihood of overlap of individuals in different groups) reduces the salience of differences in group means. This is the logic of a "multidimensional polarization index" proposed by Zhang and Kanbur (2001), which is defined as the ratio of a measure of between-group inequality to a weighted average of measures of within-group inequality. I believe, however, that it is mainly differences in group medians that drive concern about group inequalities.

[7]Sen (1992, pp. 115–16) elaborates on this point as follows: "In a country that is generally rich, more income may be needed to buy enough commodities to achieve *the same social functioning*, such as 'appearing in public without shame'. The same applies to the capability of 'taking part in the life of the community'. These general social functionings impose commodity requirements that vary with what *others* in the community standardly have."

as absolute deprivation with respect to capabilities is linked to relative deprivation with respect to economic resources, so absolute advantage with respect to power, influence and autonomy in a society is linked to relative advantage in terms of economic resources. For class distributions a head count of people with more than some very high level of $x$ would not be very informative, since it is their aggregate economic power that is the major source of concern. Thus it would be best to use a gap-like measure—i.e., the total surplus in $x$ above $z*x_m$ of those who have at least that amount of $x$, taken as a share of societal total $x$, where $z$ is a pre-specified multiple of at least—say—10. Indicators such as the distributive share of the top 1% of the population provide a very rough approximation of this measure. For group distributions accentuated inequality can be measured by the proportionate extent to which the medians of the highest-placed ethnic groups exceed the overall median.

(c) Inequality in the form of a weak middle of the distribution. This configuration reflects concern about what recent literature has labelled "polarization," or more specifically "bipolarization,"[8] which means that the size of the "middle class" is small in comparison with the sizes of the upper and lower classes in the distribution. In the case of class distributions one would need to pre-specify a middle range of values of the variable $x$ at issue, from $(1 - v)*x_m$ to $(1 + v)*x_m$, where $v$ takes on a value—say—between 25 and 50 %. The extent of bipolarization could then be measured by the ratio of the head count of those outside that middle range to the head count of those within it, or—probably less informatively, because it would be dominated by the upper class—the share of total x accruing to those outside the middle range. The distributive share of the middle quintile or the share of the middle four deciles of the population provides rough approximations of the latter measure. In the case of group distributions, one would compare the number of group medians relatively distant from the overall median to the number of group medians relatively close to it.

(b) Inequality spread over the full distribution. This configuration of "entirety" represents distributions that do not show, to any significant extent, the particular attributes encompassed by the three configurations listed above. It can be measured—if imperfectly—by any of the traditional measures of overall inequality, such as the Gini coefficient. Such measures can be applied either to economic class distributions or to ethnic group distributions, even though the number of different pre-defined ethnic groups is bound to be far, far smaller than the number of individuals (or families) in the relevant population.

[8]See Motiram and Sarma (2011) and the references therein. Note that bipolarization is closely related to the notion of bimodality in a distribution.

In the following four sections I will discuss in turn the major moral, political, economic, and social arguments that have been made for limiting economic inequality,[9] characterizing each argument in terms of the societal objective to which the reduction of inequality is expected to contribute. In each case my aim is to determine what form(s) of inequality are at issue.

## 4.3 Moral Arguments

Moral arguments about economic inequality involve value judgments about what constitutes fairness in the distribution of economic resources or well-being. People differ greatly with respect to what they consider a fair distribution; there is widespread agreement, however, on the importance of the following two objectives for a good society:

### *4.3.1 Ensure that All Members of the Society[10] Are Treated as Equally Worthy of Respect*

At first glance this objective might seem to be largely a matter of law and jurisprudence. But no matter how fair and comprehensive the law may be, how one is treated depends a great deal on one's economic resources; and it may well depend also on one's ethnic group membership. People with far fewer economic resources than the societal average are likely to be disrespected and disfavoured in a variety of ways, whereas people with far more resources than the societal average will tend to be treated with undue deference and granted undue favours. And people belonging to an ethnic group stigmatized by entrenched antecedent disdain or disparagement are likely to be viewed by many members of other groups as inherently less worthy and less deserving.[11]

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[9]One major economic argument for reducing inequality that I do not consider in this paper is that growing inequality generates macroeconomic instability, by stimulating the growth of an increasingly fragile financial services industry. This argument has been advanced rather persuasively to explain the global financial crisis that began in 2008; see Kumhof and Rancière (2011) and Galbraith (2012). But an essential ingredient of the explanation is inadequate regulation of the financial sector, and it is not clear that this was itself a consequence of growing inequality, or that growing inequality necessarily entails an out-of-control financial sector.

[10]Determination of exactly who should be considered a "member" of any given society is an important, but difficult, issue that I will not try to resolve here.

[11]Furthermore, differences in economic and social status are closely linked to differences in how much control one has over one's own life. As John Quiggin (2010, p. 165) has observed, autonomy is largely a zero-sum good within a given society: high status confers personal autonomy and low status deprives one of it.

The economic variables whose distribution is at issue here are primarily wealth, and secondarily income and access to public services, all of which largely determine the economic resources that a person can bring to the table. Inter-individual (or inter-family) inequality is obviously very important for the way in which people are treated. But membership in an ethnic group at or near the bottom, or the top, of the wealth distribution of group medians can also significantly affect people's treatment, since the social status of a particular group—which surely affects the respect accorded to its members, even independently of their economic status—is likely to be highly correlated with the median wealth of that group. The configuration of distributional inequality that is most damaging to the assurance of respect for all citizens is surely accentuated poverty at the lower end, for individual poverty constitutes the biggest obstacle to equal treatment. But accentuated privilege at the upper end is also relevant, since privilege can in many ways be translated into unequally favourable treatment.

### *4.3.2 Promote Equality of Opportunity for All Citizens*

The opportunities available to young men and women, as they grow up and become adult citizens, depend both on their family background and on the nature of their residential community. This is because the acquisition of productive characteristics and skills by an individual child depends significantly on the richness of upbringing that parents can offer her/him as well as on the quality of the quasi-public resources —such as neighbours, peers and schools—that local communities can offer to children. Highly unequal family economic resource endowments result in corresponding inequalities of opportunity for young men and women, both directly via the effect of family endowments on the quality of parent upbringing and indirectly via the effect of family endowments on the choice of local community in which their children grow up. Unequal opportunity resulting from unequal family resources limits in turn the degree of intergenerational social and economic mobility. Widespread diffusion of good-quality public services in areas such as education and medical care can help to reduce the inequalities of opportunity faced by children in families of different resource endowments, but the extent of private family economic resources will still play a big role in determining the extent of the opportunities to which a child has access. It is therefore no surprise that an accumulation of empirical evidence suggests that the degree of social and economic mobility in a society is inversely correlated with the degree of economic inequality.[12]

[12]See, for example, Wilkinson and Pickett (2009), Chap. 12; they conclude that (p. 169): "Bigger income differences seem to solidify the social structure and decrease the chances of upward mobility. Where there are greater inequalities of outcome, equal opportunity is a significantly more distant prospect." Krueger (2012, p. 4 and Fig. 7) reports on cross-country evidence that higher inequality is associated with higher intergenerational earnings elasticity (i.e., lower mobility).

Over and above the inequality of opportunity attributable to inequality in economic resources, unequal opportunity may well also result from overt or covert discrimination against members of an ethnic group that has been historically marginalized by group-based negative discrimination. Even the ending of such negative discrimination—through various laws designed to eliminate current discriminatory practices—may well prove insufficient to ensure equal opportunity, because decisions made in a non-discriminatory market context are unable to overcome past negative discrimination when there is a tendency toward clustering and social segregation in associational behaviour, whereby members of a particular ethnic group prefer to intermarry, to live in the same residential neighbourhoods, and to join the same community institutions (see Loury 1987). These parental and community influences convey advantages or disadvantages that cannot be equalized by market forces; so full equality of opportunity may well require that compensatory steps be taken to reduce economic disparities between groups and thereby provide more equal access to important non-market resources and social networks.

The economic variable whose distribution most strongly affects inequality of opportunity is family wealth, since it is accumulated wealth that is most critical in determining what kind of upbringing, what kind of residential community, and what kind of education parents can offer to their children. Family wealth is surely the most important determinant of opportunity, but ethnic group membership can also play a role—especially in the case of ethnic groups at or near the bottom of the of the distribution of group median wealth, who may well suffer from past or present discrimination, and ethnic groups at or near the top of the of the distribution, who may well benefit from historically generated advantages independent of their family wealth. The distribution of access to good-quality public services can also be significant, but only to the modest (for reasons noted above) extent that it is not highly correlated with the distribution of wealth. The configuration of inequality that is most critical to the promotion of equal opportunity for all citizens is the entire distribution, for unequal opportunity is generated by privilege as well as by poverty—and indeed by inequality in any part of the distribution.

## 4.4 Political Arguments

Most people would agree that it is desirable for a society to be fairly cohesive, such that people have a real sense of community and common purpose with one another as fellow members of the larger society. Likewise, few would disagree that it is desirable that a society be fairly democratic, so that each citizen has the opportunity to influence governmental decision-making. Only if there is such cohesion and democracy will a political system—and the power that it vests in the government—be broadly respected as legitimate. Consider therefore each of the following societal objectives:

### 4.4.1 Promote Social Cohesion

As the historian Tony Judt has written, "Inequality is corrosive…it rots societies from within…it illustrates and exacerbates the loss of social cohesion" (quoted at the conclusion of Strauss-Kahn 2010). Many people will not have a sense of community with their fellow citizens if there are significant economic and social differences among individuals that are not readily attributable to differential effort or desert. Likewise, social cohesion will be difficult to sustain if there are substantial economic and social differences among ethnic groups—especially disparities in the extent to which different groups are represented in powerful and prestigious decision-making positions. The achievement of a high degree of social cohesion thus depends upon the limitation of economic and social inequalities across both individuals and ethnic groups.

The distributions of all of the economic variables under consideration—income, consumption, wealth, and access to public services—affect social cohesion, because they all affect social as well as economic status. The configuration of inequality in these variables that is most critical to the promotion of social cohesion is arguably the degree of bipolarization, because the prospects for community and common purpose are undermined if the economic status of a large proportion of the population is far above the median and that of another large proportion is far below it. By the same token, if there are significantly-sized ethnic groups whose economic status is far above the societal median and/or far below it, social cohesion becomes much more difficult to sustain.[13]

### 4.4.2 Promote Democratic Vitality

The integrity of a political system is undermined if many citizens are unable to participate meaningfully in a democratic process of decision-making. The first prerequisite for democratic decision-making is surely to have a functioning system of free elections for public office and a set of democratic institutions that allow for fair competition among candidates with different views on the policy issues of the day. Once the basic elements of a democracy are established in a society, the biggest potential threat to democratic vitality is arguably the extent to which political decisions can be influenced by people who are capable of deploying enormous economic resources in the political arena—whether to finance election campaigns, lobbying efforts, or outright bribery. The experience of the United States over the past three decades testifies to the political consequences of a growing and now vastly disproportionate share of wealth held by a very small fraction of the population at the top of the distribution: it has become increasingly

[13]Anderson (2002) has argued persuasively that making the group composition of the societal elite more broadly representative of the population as a whole is the single most important rationale for positive discrimination in favour of historically marginalized groups.

evident that a tiny proportion of the population thereby wields tremendously disproportionate political power (see Mann and Ornstein 2012). Great wealth passed on across generations not only limits social mobility; it also can lead to a hereditary aristocracy antithetical to democracy. Although laws regulating campaign finance, lobbying and bribery obviously play a big role in determining the extent to which wealth can be used to influence public policy, those laws are themselves subject to the influence of politically powerful individuals and organizations that they finance.

The economic variable whose distribution most strongly affects the influence of the very rich on politics is obviously wealth (and the income it directly generates), for even high salaries do not provide a comparable surplus of funds that can be deployed in the political arena. Economic class differences among individuals are much more salient than economic differences across ethnic groups, since the capacity to use wealth to influence politics seems unlikely to depend on the ethnic identity of a wealthy person. The configuration of wealth inequality that is most critical to the strength of democracy is clearly the extent to which wealth is concentrated at the upper end of the distribution. If the lack of a strong economic middle class actually inhibits democracy, bipolarization would also make a difference.[14]

## 4.5 Economic Arguments

It is often believed that greater economic inequality is associated with faster economic growth. In fact, the relevant empirical evidence suggests that greater income inequality is not correlated with higher economic growth rates, either across countries during the same time period or within countries over time (see Alesina and Rodrik 1994 and Bruno et al. 1999). This is not really surprising, for there are a number of ways in which economic inequality can impede economic efficiency and growth. Reducing inequality can promote greater efficiency and growth by contributing to the achievement of the following objectives:

### *4.5.1 Improve the Development and Allocation of Human Resources*

Innate talent—as distinct from acquired skill—can reasonably be assumed to be equally distributed across different socioeconomic classes as well as across different ethnic groups. But class and group differences have a significant influence on an individual's prospects for developing talents and acquiring skills.

[14]Many observers of political development have suggested that a large middle class is an essential prerequisite for a vital democracy, and there is indeed evidence of positive correlation between the two. But it is not clear that such correlation cannot be explained largely by an effect of democracy on the size of the middle class or, more likely, by other factors that act simultaneously to promote both a middle class and a more vital democracy.

The greater the degree of economic inequality among individuals, the less likely it is that full advantage can be taken of people's innate capacities to make productive contributions. Many poor people with considerable innate talent and ability will be consigned to a poor education and to jobs of little responsibility, and the barriers to advancement that they face are likely to reduce their motivation to work hard to develop their talents and apply their skills. Moreover, lack of adequate economic resources may well adversely affect the nutrition and health as well as the education of the poor. At the other end of the socioeconomic spectrum, many rich people with little innate talent and ability will nonetheless be able to get a good education and gain access to positions of responsibility in society. Furthermore, if some groups are far better represented than others in the upper echelons of a society, then many members of the poorly represented groups may lack sufficient incentive (due to doubt about their ability to succeed) or sufficient opportunity (due to lack of access to useful connections) to develop and apply their capacity to make productive contributions. Such constraints on truly meritocratic human resource allocation are likely to result in a significant loss of economic potential.

The economic variable whose distribution most strongly affects the ability of people to develop their talents and apply their skills is family wealth, since it is accumulated wealth that is most critical in determining what kind of upbringing and what kind of education parents can offer to their children. The distribution of access to good-quality public services is also independently significant, to the extent that it is not highly correlated with wealth distribution. The configuration of distributional inequality that is most damaging to the development and allocation of human resources is surely accentuated poverty at the lower end. But accentuated privilege at the upper end is also relevant, since it provides undeserved opportunities for advancement to the well-off. In this context economic inequality among individuals would appear to be more salient than such inequality across ethnic groups. However, to the extent that ethnic group membership—independently of wealth—is a source of discriminatory processes of selection for education, employment or promotion, then group inequality is also a source of concern with respect to human resource development and allocation.

### *4.5.2 Reduce Economically Costly Tensions and Conflict*

Social and political tensions linked to economic inequality can have an adverse effect on economic efficiency and economic growth in several ways. People who are economically deprived are at times driven to challenge the established order by a variety of disturbing and sometimes violent means—such as strikes, protests, sabotage, and crime. The resultant instability can render property rights less secure and thereby depress investment and productivity growth; it may also give rise to costly efforts to combat disturbances and pay for security systems, prisons, etc. Furthermore, a high degree of inequality is likely to generate suspicions that growth-oriented reforms will only benefit the rich at the expense of the poor,

thereby intensifying popular opposition to much-needed reforms.[15] This is especially true of reforms that increase the scope of market forces and enlarge the private sector, which may well increase allocational efficiency and/or economic dynamism, but which also tends to distribute the resultant gains in a disequalizing fashion—absent systematic efforts to limit economic inequality.

Social and political tensions, and the problems they can raise, are especially likely to be generated by economic inequalities across different ethnic groups. That is because such inequalities are sometimes attributable to—and more often perceived as explained by—discrimination against members of less-well-off groups. As a consequence, intergroup inequalities in a society are considerably more likely to evoke strong feelings about the unfairness of the social order, and they are considerably more likely than inter-class inequalities to lead to social and political conflict. Moreover, a high degree of inequality across ethnic groups fortifies suspicions on the part of members of relatively deprived groups that growth-oriented reforms will benefit more advantaged and powerful groups at their expense, thereby generating opposition to such reforms.

The distributions of all of the economic variables under consideration—income, consumption, wealth, access to public services—affect social tensions and conflict, because they all affect relative economic and social status. Because of the strong feelings associated with inequalities across ethnic groups, such inequalities are likely to be even more critical with respect to social tensions and conflict than inequalities among individuals. The configuration of inequality in these variables that is most critical to the avoidance of tensions and conflict is probably accentuated poverty at the lower end, since the poor are likely to be more concerned by their own economic deprivation than by the economic prosperity if the rich. Accentuated privilege at the upper end, however, may well also be of some significance, since it tends to fortify the belief that the economic abundance enjoyed by the rich is aggravating the economic deprivation of the poor.

### 4.5.3 *Promote Cooperative Solutions to Coordination Failures*[16]

In many situations it is not possible to write contracts governing all aspects of the behaviour of parties involved in production and distribution, and under these circumstances markets alone cannot be counted upon to generate the most economically efficient outcomes. Markets fail to coordinate activities efficiently (a) when there are inherently common resources to be exploited (e.g., fish populations on open waters), (b) when there are important strategic complementarities in

[15]This point has been well made in the Indian context by, among many others, Chaudhuri and Ravallion (2006).

[16]My discussion in this section draws heavily on Bardhan et al. (2000), as well as on Bardhan (2005).

investment (e.g., basic research and development, or infrastructural services that can benefit many different enterprises), (c) when residual income rights are not aligned with control rights over an activity (e.g., when land control rights are such that actual cultivators do not receive much of the gains from improvements in agricultural productivity), and (d) when contracts are incomplete or unenforceable, as is often the case in labour and credit markets.

Institutional and policy changes that address such coordination problems are often difficult to achieve, because they are bound to involve winners and losers, and compensatory side payments to the losers are difficult to guarantee *ex ante* and to effectuate *ex post*. Productivity-enhancing cooperative institutional and policy changes are especially difficult to bring about in contexts of asymmetrical bargaining power linked to an unequal distribution of wealth—and even more so if the richer and poorer parties are also divided largely along lines of ethnic identity. Richly endowed private parties, such as large landholders, can gain from a cooperative solution to the production and distribution of capital-complementing inputs —e.g., large-scale irrigation works to supply water—but such parties also often have private exit options that are at least as attractive—e.g., alternative water sources such as tube wells. In contexts of high inequality, therefore, well-endowed elites will be tempted to forego cooperative community-wide or governmental solutions to coordination in favour of more profitable private solutions.[17]

Over and above the specific kinds of incentive problems just discussed, a high degree of inter-individual and/or inter-group inequality may well impede economic performance more generally by obstructing the development of productivity-enhancing norms and institutions that attenuate problems of coordination failure. Ordinary market transactions, as well as complex multi-party economic projects, work much more smoothly the more that the individuals and groups involved can count on one another's honesty, trustworthiness, and cooperative behaviour. In the absence of widespread norms of trust and cooperation, substantial resources must be devoted to monitoring, supervision, and contract enforcement in order to assure that the terms of a market transaction are respected or that inter-related economic activities are well coordinated. But it is difficult to develop and maintain norms of trust and cooperation in a society characterized by (a) large economic disparities between the rich and the poor and/or (b) multiple ethnic groups whose differences in economic and social status lead members of particular groups to distrust members of other groups.

[17]As Bardhan et al. (2000) point out, there are some respects, in which greater wealth inequality is likely to enhance allocative efficiency. Most importantly: wealthy agents can afford to be considerably more risk-neutral than non-wealthy agents, so egalitarian wealth transfers will generally shift control over productive risk-taking to more risk averse agents likely to choose a level of risk that is socially less efficient. Yet in cases where a higher concentration of assets would contribute to greater efficiency, the assets will be worth more to the wealthy than to the non-wealthy; and the wealthy should be able to acquire the assets they need, since their access to credit markets is not constrained. It follows that extra-market wealth-redistributive policies are likely to be needed only when greater efficiency calls for the shifting of assets from rich to poor.

The economic variable primarily at issue here is wealth, and in particular often land ownership. The configuration of distributional inequality that is most likely to impede cooperative solutions to coordination problems is accentuated inequality among individuals at the upper end of the distribution, which is the prime source of asymmetrical bargaining power. However, inequality across the entire distribution can contribute to the suspicion and distrust that undermine cooperative norms, and this applies to inequality both among individuals and among groups.

## 4.6 Social Arguments

In several ways economic inequalities tend to generate significant social costs that are not reflected in conventional measures of economic well-being. Greater economic equality can reduce such social costs by contributing to the achievement of the following objectives:

### *4.6.1 Improve the Health Status of Much of the Population*

Better health—e.g., lower infant mortality and greater longevity—is for obvious reasons correlated with higher income and wealth, so the worst health outcomes in any society are to be found among the lower economic classes. But there is a plausible theoretical argument, as well as some contested statistical evidence, to the effect that the average quality of health in a population varies negatively with the overall degree of economic inequality—independently of the extent of poverty (measured in absolute terms).[18]

The argument focuses on stress as a key intermediate variable (see Wilkinson and Pickett 2009, Chaps. 3 and 4). Chronic stress compromises the immune and cardiovascular systems and thereby increases vulnerability to many diseases. Stress is increased by low social status as well as by poor quality of early childhood experience. There is evidence that the kinds of stress which have the greatest effect on a person's stress level are "social evaluative threats", such as threats to self-esteem or social status, in which others can negatively judge one's performance.[19] Differentials in individual or family income and wealth have a significant impact on whether people feel valued and appreciated, rather than disrespected or

[18]See Wilkinson and Pickett (2009), Chaps. 6 and 13. Jencks et al. (2000, 2009), among others, find the statistical evidence inconclusive.

[19]A good example of the impact of social evaluative threats is provided by Hoff and Pandey (2004), who showed that when high and low caste children in rural India were unaware of the caste differences between them, they performed equally well when asked to solve a series of puzzles; but when they were made aware of the differences, the performance of children from low castes was substantially lower.

stigmatized. Differentials in the social status of one's ethnic group have a similar significant impact. Increased economic inequality and social hierarchy thus serve to raise competitive stakes and personal anxieties about one's worth, exacerbating stress levels and associated pathologies for people in all except perhaps the very highest strata of society.

It also stands to reason that the ability of a society to limit the spread of disease and other public health problems is impaired to the extent that a relatively poor segment of the population lacks access to good nutrition and health facilities. However, the severity of this problem cannot readily be attributed to the extent of (relative) inequality; it can be alleviated by reducing absolute poverty and/or by improving public health services for the poor.

The distributions of all of the economic variables under consideration—income, consumption, wealth, and access to public services—affect social as well as economic status and therefore also health outcomes. Because status insecurity is especially likely to result from differential treatment based on ethnicity, inequalities across ethnic groups are likely to be at least as critical—and perhaps more critical—than inequalities among individuals in affecting health outcomes. The configuration of inequality that is most relevant to health outcomes is the entire distribution, since differentials in any part of it imply differentials in status that can generate stress.

### *4.6.2 Promote a Better Quality of Life by Reducing the Over-Valuation of Purchasing Power*

First highlighted by Hirsch (1977), "positional goods" are products or services that are inherently limited in supply, so that their acquisition by any given individual depends not simply on that individual's own resources, but on how those resources compare with the resources of other individuals interested in acquiring them. Examples include an apartment in a desirable building, a house in a desirable neighbourhood, and an education at a top-tier school.[20] Any product whose value to the consumer depends at least in part on distinguishing him/her from other consumers not able to acquire it—for example, a house that is larger, or a car that is flashier, or jewellery that is rarer than most others—also has some positional character, because the ability to acquire it depends on how one's ability to pay for it ranks among all those who desire it. Such examples make it clear that positional goods are a matter of concern mainly for the higher income classes of a society, and for those who aspire to join their ranks.

[20]Even if subsidies limit the cost of attending school, a family's purchasing power has a significant influence on children's chances of admission to a top-tier school because it affects the quality of the parental upbringing and the residential community, as well as the prior schooling and examination coaching, that the family can finance.

Positional goods lead people to over-value purchasing power, because more of it not only increases one's ability to acquire ordinary (non-positional) goods, but improves one's rank in the competition for positional goods. Yet the putative improvement in rank is most likely to prove illusory, because the desire to improve one's relative position tends to drive all prospective consumers of a positional good into a competition in which the generation of more and more purchasing power ends up just maintaining one's relative position—a kind of "arms race" that increases nobody's chances of acquiring the good (see Frank 2011, Chap. 5).

That those who can afford to compete in arms races for positional goods simply end up paying more for such goods hardly constitutes a significant social problem. The valuation of extra income or wealth for adding to relative as well as to absolute purchasing power, however, can indeed generate significant social costs, because it systematically favours individual private solutions over more efficient collective responses to social needs that often pose significant coordination problems. For example, it leads the rich to overvalue the loss of purchasing power they suffer when paying taxes and thus to undervalue public facilities that can be financed from taxes, which can thwart socially optimal choice with respect to the supply of public services in areas such as health, education, transportation and security. If all of the rich had to pay somewhat more taxes, each individual rich person would not suffer any loss of access to positional goods; but they would all gain from better public facilities. For another example, to the extent that people are interested in positional goods, they will over-value their wage or salary income relative to better working conditions, fewer work hours per week, or more vacation time; but the higher income they earn will bring little advantage in the competition for positional goods, and they will forfeit the possibility of trading some income for better working conditions or more leisure.

In general, the over-valuation of purchasing power for positional reasons imparts a bias against non-material amenities whose provision depends to a significant extent on collective decision-making and public regulation or provision—e.g., clean air, clean water, healthy recreational opportunities, safe working environments, as well as leisure time. A reduction in inequality can help to mitigate the social costs of undersupply of such amenities by reducing the intensity of competition for positional goods among those who can afford it. Probably the most efficient way to achieve this is to establish or expand progressive taxation of consumption expenditures, since that would most directly affect incentives to compete for positional goods among those most able to do so.

The economic variables at issue in the over-valuation of purchasing power include wealth and income, but consumption is most fully implicated. Since it is consumption among those who are relatively well-off that most affects the competition for positional goods, it is inequalities at the upper end of the distribution that are of primary concern. And it is economic class inequality, not ethnic group inequality, which matters, because the ability to compete for positional goods and the likelihood of over-valuing purchasing power is hardly likely to depend on a person's ethnicity.

### 4.6.3 *Promote Greater Ecological Sustainability*

It is now widely understood that economic growth around the world is slowly but surely warming the earth, with potentially dire long-run consequences, because of rapidly growing emissions of greenhouse gases associated with predominant use of fossil fuels as a source of energy. In the coming decades it will be increasingly necessary to reduce emissions of such gases, which will have to be achieved by some combination of reduced growth in the demand for energy and reduced dependence on fossil fuels as a primary source of energy. These requisites of ecological sustainability put a premium on shifts of production and consumption away from energy-intensive material goods and toward less energy-intensive goods and non-material amenities, including in particular leisure time.

Economic inequality can make it more difficult to develop an ecologically sustainable level and pattern of economic activity in several ways. First, as noted in the previous section, high-end inequality is likely to lead to a bias against non-material amenities whose provision depends largely on collective decision-making and public regulation or provision; and ecological sustainability is precisely such an amenity. Controlling emissions of greenhouse gases poses a classic collective action problem—at the international as well as the national level; and government regulation (whether by taxes and subsidies or by quantitative controls) will clearly be required to address the challenge.

A second way in which inequality poses an obstacle to ecological sustainability is that it tends to encourage ever higher levels of consumption via a "demonstration effect" (a term first used by Duesenberry 1949; see also Nurkse 1953). When the consumption levels and patterns of the rich are widely publicized to the general public, they exert a considerable influence on those who can afford in some degree to emulate them. (Those who are poor, in absolute or relative terms, will of course have good reason and justification to try to consume more, without any outside encouragement.) The kinds of consumption that are most likely to be well-publicized are those that are advertised by profit-making firms, so the non-material amenities enjoyed by the rich will have much less of a demonstration effect than the marketed goods and services they buy. Thus the demonstration effect will operate mainly on the middle or (more significantly) the upper middle economic classes, stimulating them to consume at higher levels and with less regard to non-material amenities that are comparatively energy-non-intensive.

Finally, the need to promote ecological sustainability speaks to the debate between those who advocate economic growth as the best way to reduce poverty and those who argue that some kind of redistribution from rich to poor is the best way to do so. If we rely on economic growth to reduce poverty by raising living standards across the board, with little or no change in the degree of inequality, then there will be more production and consumption—and more energy use and environmental destruction—than if poverty is reduced by policies that have the effect of shifting some consumption from the rich to the poor in the context of a lower overall growth rate. Distributional considerations are likely in any event to loom

large in the formulation of an ecologically sustainable energy policy. That is because people are unlikely to cooperate in the effort to reduce energy and fossil fuel use if the economic burden of their lesser availability is not seen to be widely and fairly shared. It will be hard to generate public support for the substantial changes needed to cope with global warming if the rich are able to continue enjoying an environmentally costly lifestyle while the poor bear a disproportionate burden of higher energy costs.

The economic variable of primary concern with respect to ecological sustainability is clearly consumption; insofar as greater wealth and income does not get translated into consumption, it is not of ecological concern. What matters is inequality of consumption among individuals, not across groups, since the likelihood of over-valuing purchasing power and the strength of the demonstration effect does not depend on a person's ethnicity. And the configuration of distributional inequality that is most at issue is accentuated privilege at the upper end, which is most likely to stand in the way of the kinds of regulatory policies needed to reduce emissions of greenhouse gases.

## 4.7 Conclusion

In this paper I have considered both the reasons why economic inequality can be a matter for concern and the forms of inequality that are principally at issue. The major reasons for concern about economic inequality are reflected in the ten different arguments—two of them moral, two political, three economic, and three social—that I have addressed in the preceding four sections of the paper. These arguments differ with respect to the form of inequality that is the source of concern, along three dimensions: (a) the economic variable(s) whose unequal distribution is at issue; (b) the relevant distributional entity, i.e., whether economic class inequality or ethnic group inequality is most salient; and (c) what part(s) of the unequal distribution are the most problematic, i.e., is the problem primarily poverty at the lower end, or privilege at the upper end, or bipolarization; or is the entire distribution implicated?

Table 4.1 sets out the results of my analysis in the form of a matrix, with a row for each of the ten arguments for reducing inequality and three columns in which the form(s) of inequality relevant for each argument are shown. Inequality factors printed in bold font are more significant than those that are not. The economic variable whose distribution is most often at issue is clearly wealth, which figures in nine of the ten arguments; but each of the other three variables is relevant for roughly half of the arguments. Economic class differences are salient to every argument; but ethnic group differences are also salient in six of them. The configuration of inequality that is most often implicated is privilege. Poverty, as well as the entire distribution, each figure in three arguments; bipolarization figures in just one.

In showing the form(s) of economic inequality that are most relevant for each argument, the inequality factors shown in the cells of Table 4.1 also point to the

**Table 4.1** Results of the analysis

| | Economic variables | Distributional entity | Inequality configurations |
|---|---|---|---|
| Moral arguments | | | |
| 1. Equal respect | Wealth; income; access | Class and group | Poverty; privilege |
| 2. Equal opportunity | Wealth (esp. family); access | Class; group | Entirety |
| Political Arguments | | | |
| 1. Social cohesion | All variables | Class and group | Bipolarization |
| 2. Democratic vitality | Wealth | Class | Privilege |
| Economic arguments | | | |
| 1. Human resource dev't | Wealth (esp. family); access | Class; group | Poverty; privilege |
| 2. Conflict reduction | All variables | Group; class | Poverty; privilege |
| 3. Cooperative solutions | Wealth (esp. land) | Class; group | Privilege; entirety |
| Social arguments | | | |
| 1. Improved health | All variables | Group; class | Entirety |
| 2. Improved quality of life | Consumption; wealth, income | Class | Privilege |
| 3. Ecological sustainability | Consumption | Class | Privilege |

kinds of inequality reducing policies that would be needed to improve societal well-being in the way suggested by the argument. Quite different policies are required to reduce privilege than to reduce poverty; different policies are called for to reduce class inequality than to reduce group inequality; and of course the appropriate policy for reducing economic inequality will also depend on which economic variable(s) are primarily at issue. A careful examination of alternative policies to achieve the objectives expressed by each of the arguments for reducing economic inequality is beyond the scope of this paper. What I have tried to show here is simply that optimal choice of policies to reduce economic inequality should be informed by specification of the particular societal objectives that one is trying to achieve through the reduction of inequality.

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I am very grateful for the opportunity to contribute this paper in honour and in memory of the late Professor Suresh Tendulkar. I first came to know him in the late 1960s, when both he and I began our academic careers at the Delhi unit of the Indian Statistical Institute. He joined the ISI faculty after completing his Ph.D. at Harvard University, and I joined that faculty as a two-year visitor upon completion of my Ph.D. at M.I.T. After returning to the U.S., I followed his career for many years from afar.

In 2010 I had a welcome opportunity to renew contact with Suresh: I was helping the University of Michigan's Centre for South Asian Studies organize a conference on "Inequalities in India"

under a grant from the Trehan Foundation. Well aware of his pioneering work on poverty in India, I invited him to prepare a paper for the conference; and I began an intensive year-long correspondence with him (mostly by e-mail) in which we exchanged ideas and discussed our somewhat different perspectives on economic inequality. The diligence with which he pursued our correspondence, and the insightful observations that he brought to bear on the questions under discussion, greatly increased my own understanding of key issues related to poverty and inequality—all the more so because of our differing viewpoints. The opportunity to deliberate on these issues with someone so knowledgeable and so caring served not only to improve my own contribution to the conference (held in Mumbai in March 2011); it also stimulated me to develop and refine my ideas on inequality further in preparing the present paper.

## References

Alesina, A., & Rodrik, D. (1994). Distributive policies and economic growth. *Quarterly Journal of Economics, 109*, 465–490.

Anderson, E. A. (2002). Integration, affirmative action, and strict scrutiny. *NYU Law Review, 77*, 1195–1271.

Bardhan, P. (2005). *Scarcity, conflicts, and cooperation*. Cambridge, MA: MIT Press.

Bardhan, P., Bowles, S., & Gintis, H. (2000). Wealth inequality, wealth constraints and economic performance (Chap. 10). In: A. Atkinson & F. Bourguignon (Eds.), *Handbook of income distribution*. Amsterdam: Elsevier.

Bruno, M., Ravallion, M., & Squire, L. (1999). *Equity and growth in developing countries: Old and new perspectives on the policy issues.* World Bank policy research working paper 1563, November 30.

Chaudhuri, S., & Ravallion, M. (2006). Partially awakened giants: Uneven growth in China and India (Chap. 6). In: L. A. Winters & S. Y. Yusuf (Eds.), *Dancing with giants: China, India and the global economy*. Washington, D.C.: The World Bank.

Duesenberry, J. S. (1949). *Income, saving and the theory of consumer behavior*. Cambridge, MA: Harvard University Press.

Frank, R. (2011). *The Darwin economy: Liberty, competition, and the common good*. Princeton, NJ: Princeton University Press.

Galbraith, J. K. (2012). *Inequality and instability: A study of the world economy just before the great crisis*. Oxford: Oxford University Press.

Hirsch, F. (1977). *The social limits to growth*. London: Routledge & Kegan Paul.

Hoff, K., and Pandey P. (2004), *Belief systems and durable inequalities: An experimental investigation of Indian caste*. World Bank policy research working paper No. 3351, June 25.

Jencks, S. F., Cuerdon, T., Burwen D. R., Fleming B., Houck P. M., Kussmaul A. E., Nilasena D. S., Ordin D. L., & Arday D. R. (2000). Quality of medical care delivered to Medicare beneficiaries: A profile at state and national levels. *JAMA*, *284*(13), 1670–1676.

Jencks, S. F., Williams, M. V., & Coleman, E. A. (2009). Rehospitalizations among Patients in the Medicare Fee-for-Service Program. *New England Journal of Medicine*, *360*(14), 1418–1428.

Krueger, A. (2012). *The rise and consequences of inequality in the United States.* Available online at: http://www.whitehouse.gov/sites/default/files/krueger_cap_speech_final_remarks.pdf

Kumhof, M., & Rancière, R. (2011). Leveraging inequality. *Finance and Development, 2010*, 28–31.

Loury, G. (1987). Why should we care about group inequality. *Social Philosophy and Policy, 5*, 249–271.

Mann, T. E., & Ornstein, N. J. (2012). *It's even worse than it looks: How the American constitutional system collided with the new politics of extremism*. New York: Basic Books.

Motiram, S., & Sarma, N. (2011). *Polarization, inequality and growth: The Indian experience.* Working Paper No. 11, Indira Gandhi Institute of Development Research, Mumbai.

Nurkse, R. (1953). *Problems of capital formation in underdeveloped Countries*. Oxford: Blackwell.

Piketty, T., & Saez, E. (2011). Top incomes in the long run of history. *Journal of Economic Literature, 49*, 3–71.

Quiggin, J. (2010). *Zombie economics: How dead ideas still walk among us*. Princeton, NJ: Princeton University Press.

Sen, A. (1992). *Inequality reexamined*. Cambridge, MA: Harvard University Press.

Strauss-Kahn, D. (2010). *Human development and wealth creation*. Online at: http://www.imf.org/external/np/speeches/2010/110110.htm

Weisskopf, T. E. (2011). Why worry about inequality in the Booming Indian economy? *Economic and Political Weekly, 46*, 41–51.

Wilkinson, R., & Pickett, K. (2009). *The spirit level: Why more equal societies almost always do better*. London: Allen Lane.

Zhang, X., & Kanbur, R. (2001). what difference do polarization measures make: An application to China. *Journal of Development Studies, 37*, 85–98.

# Chapter 5
# Variable Populations and the Measurement of Poverty and Inequality: A Selective Overview

**S. Subramanian**

**Abstract** The present paper is a selective overview, very considerably based on work in which the author himself has been involved, of the difficulties which can arise in the measurement of poverty and inequality when one compares populations of differing size. The paper begins with certain problems attending the measurement of poverty when the overall population size is fixed but the numbers of the poor are permitted to vary: one discovers a certain commonality of outcomes between Derek Parfit's quest for a satisfactory theory of wellbeing and the economist's quest for a satisfactory measure of poverty. Complications arising from both the poverty and inequality rankings of distributions when the aggregate size of the population is allowed to vary are also investigated. It is suggested in the paper that, from the perspectives of both logical consistency and ethical appeal, there are problems involved in variable population comparisons of poverty and inequality which deserve to be taken note of and enquired into.

**Keywords** Poverty · Inequality · Total principle · Average principle · Fixed population axioms · Variable population axioms · Impossibility theorems

**JEL Classification** I30 · I32 · J19 · O15

## 5.1 Introduction

A substantial part of Professor Suresh Tendulkar's research effort has been devoted to the assessment of poverty and inequality in well-defined spatial and temporal settings. This paper has been written in the belief that it would be appropriate, in recalling Professor Tendulkar's scholarly career and paying tribute to it, to review

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certain conceptual difficulties underlying the measurement of deprivation and disparity.

More specifically, there are a number of issues revolving around the measurement of poverty and inequality which arise from a consideration of certain problems addressed by the philosopher Derek Parfit in the field of population ethics (see, in particular, Parfit 1984). This article is an extended essay which presents a unified treatment of the themes just mentioned. What is attempted is an overview of the subject, but one which is selectively biased toward earlier work in which the present writer (either individually or in collaboration) has himself been involved. The paper on offer unsurprisingly draws heavily—and often enough quite directly—on the author's own work, notably Subramanian (2000, 2002b, 2005a, b, 2006, 2010, 2011a, b) and Hassoun and Subramanian (2011). Of related interest are the essays by, among others, Kundu and Smith (1983), Bossert (1990), Paxton (2003), Chakravarty et al. (2006), Kanbur and Mukherjee (2007) and Hassoun (2010). It is hoped that the paper will justify the view that there are certain distinctive and non-trivial problems in the measurement of poverty and inequality which deserve special attention when we are dealing with comparisons of distributions across variable populations, and that it would be of use to have a self-contained, if selective, summary of these issues all in one place. This is the basic motivation underlying the paper.

This essay will have three principal parts to it. The first part—which is motivationally very different in spirit from the subsequent two parts—will deal with the problem of poverty measurement when the overall population size is fixed but the population of the poor is allowed to vary. One discovers a striking set of analogies between Parfit's quests for a satisfactory 'theory of beneficence'—he called it Theory X—and economists' quest for a satisfactory measure of poverty. Once the analytical links between the two enterprises are established, it becomes relatively easy to see that some of Parfit's celebrated results in population ethics, such as his Repugnant Conclusion, and his critiques of the 'total' and 'average principles' in Utilitarianism, can be replicated within the domain of poverty measurement. This leads to the (arguable) inference that there is a commonality of failure shared by Parfit's search for a reasonable Theory X and the search for a reasonable real-valued representation of poverty.

The second part of the essay will deal with the problems posed by poverty comparisons across variable populations: here it is not just the poor population but the entire population that is allowed to vary in size. Axioms for poverty measurement are typically laid down for fixed populations, and the bridge between fixed and variable populations is invariably established through the postulation of the so-called 'Replication Invariance Axiom', which is widely believed to be a perfectly routine, straightforward, and innocuous restriction. However, closer scrutiny suggests that Replication Invariance is not as ethically unexceptionable as it may appear to be. In particular, if additions to the non-poor population are required not to make a difference to the extent of measured poverty, then the combination of such a 'Population Focus Axiom' with the Replication Invariance Axiom, in the presence of a number of other canonical fixed and variable

population properties such as Monotonicity, Transfer, Maximality, and Poverty Growth, can be shown to lead to rather elementary impossibility results. Variable populations can thus be a source of difficulty for both the ethical acceptability and logical coherence of poverty measures. The origin of the difficulty can be traced to the (implicitly) inconsistent stance displayed by prevailing measurement approaches to a 'Focus Axiom' or 'Constituency Principle', an issue which deserves some discussion. In particular, the second part of this paper will deal with the tendency, which is widely manifest in the poverty measurement literature, to defer to an 'Income Focus Axiom', while denying the (similar) demands of a 'Population Focus Axiom'. The conflicting claims of Replication Invariance and Population Focus are more proximately reflected in the conflicting claims of a headcount ratio and an aggregate headcount as the appropriate indicator of the prevalence of poverty. The second part of the present essay will also deal with this issue of 'fractions *versus* whole numbers', and will consider the possible merits of a 'compromise candidate' which combines the headcount ratio and the aggregate headcount in a 'mixed' indicator of the incidence of poverty—an indicator which, arguably, mitigates the problems associated with each of the 'uncontaminated' indicators alluded to earlier.

The third part of the essay will focus on variable populations and inequality measurement. Two very useful properties of inequality measurement are Replication Invariance (which underlies the construction of the Lorenz curve and is, indeed, at the basis of partial comparisons of distributions such as those facilitated by Stochastic Dominance criteria) and the Normalization Axiom, which views all distributions in which a single person appropriates the entire income as reflecting the same (and maximal) extent of inequality. The latter property makes it particularly easy to express the inequality value for an $n$-person distribution in terms of the equivalent share of the poorer of two persons in a classical two-person cake-sharing problem. Unfortunately, it can be shown in a variable population context, that under certain well-defined conditions Replication Invariance and Normalization are mutually incompatible. Some possible ways out of the difficulty (such as via a dilution of the Transfer Axiom) will be explored.

The paper ends with a summary and conclusions.

## 5.2 Preliminaries: Concepts and Definitions

### *5.2.1 Notation*

What follows is a presentation of some formal elements of terms and concepts that are of relevance for the measurement of poverty and inequality.

$N$ will stand for the set of positive integers, $R$ for the set of real numbers, and $S$ for the set of positive real numbers. For every $n \in N$, $\mathbf{X}_n$ will stand for the set of non-decreasingly ordered non-negative $n$—vectors $\mathbf{x} = (x_1, \ldots x_i, \ldots, x_n)$, where the

typical element $x_i$ of $\mathbf{x}$ stands for the income of person $i$ in a community of $n$ persons. The set of all conceivable income distributions is then given by $\mathbf{X} \equiv \cup_{n \in N} \mathbf{X}_n$. For every $\mathbf{x} \in \mathbf{X}$, N($\mathbf{x}$) will designate the set of individuals whose incomes are represented in the vector $\mathbf{x}$, $n(\mathbf{x})$ for the dimensionality of the vector $\mathbf{x}$, and $\mu(\mathbf{x})$ for the mean of the incomes in the vector $\mathbf{x}$. For future reference, we define three distinguished subsets of $\mathbf{X}$: the collection. $\mathbf{X}^*$ of zero vectors, the collection of $\hat{\boldsymbol{X}}$ '*extremal* distributions' in which all but the richest individual receive zero income while the richest person appropriates the entire income of the society, and the collection $\tilde{\boldsymbol{X}}$ of equally distributed income vectors: $\mathbf{X}^* = \{\mathbf{x} \in \mathbf{X} | \, x_i = 0 \; \forall i \in N(\mathbf{x})\}$, $\hat{\mathbf{X}} \equiv \{\mathbf{x} \in \mathbf{X} | x_i = 0 \, \forall \, i \neq n(\mathbf{x}) \, \& \, x_{n(\mathbf{x})} > 0\}$, and $\tilde{\boldsymbol{X}} = \{\mathbf{x} \in \mathbf{X} \mid x_i = \mu(\mathbf{x}) \; \forall i \in N(\mathbf{x})\}$. *The poverty line*, which is a level of income such that any person with income less than this level will be certified to be *poor*, is designated by $z$. For all $\mathbf{x} \in \mathbf{X}$ and $z \in S$, $Q(\mathbf{x}; z)$ will stand for the set of poor individuals whose incomes are represented in the income vector $\mathbf{x}$; $q(\mathbf{x}; z)$ for the cardinality of $Q(\mathbf{x}; z)$; $\mathbf{x}^P_z$ for the vector of poor incomes in $\mathbf{x}$; $R(\mathbf{x}; z)$ for the set of non-poor individuals whose incomes are represented in $\mathbf{x}$; $r(\mathbf{x}; z)$ for the cardinality of $R(\mathbf{x}; z)$ and $\mathbf{x}^P_z$ for the vector of non-poor incomes in $\mathbf{x}$.

A *poverty measure* is a mapping $P$: $\mathbf{X} \times S \rightarrow R$ such that, for every $\mathbf{x} \in \mathbf{X}$ and $z \in S$, $P(\mathbf{x}; z)$ specifies a real number which is supposed to reflect the extent of poverty associated with the regime $(\mathbf{x}; z)$.

An *inequality measure* is a mapping I:$\mathbf{X} \rightarrow R$ such that, for every $\mathbf{x} \in \mathbf{X}$, I($\mathbf{x}$) specifies a real number which is supposed to reflect the extent of inequality associated with the income vector $\mathbf{x}$.

### 5.2.2 Axioms for the Measurement of Poverty

Stated in what follows are a set of fixed-population axioms for poverty measures which have gained a fair amount of consensus in the literature.

*Income Focus* (*Axiom IF*). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $n(\mathbf{x}) = n(\mathbf{y})$ and $\mathbf{x}^P_z = \mathbf{y}^P_z$, then $P(\mathbf{x}; z) = P(\mathbf{y}; z)$.

*Anonymity* (*Axiom A*). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $\mathbf{y} = \Pi\mathbf{x}$ where $\Pi$ is some appropriately dimensioned permutation matrix, then $P(\mathbf{x}; z) = P(\mathbf{y}; z)$.

*Monotonicity* (*Axiom M*; see Hassoun and Subramanian 2011). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $n(\mathbf{x}) = n(\mathbf{y})$, and $x_i = y_i \; \forall \; i \in N(\mathbf{x}) \backslash \{j\}$ for some $j$ satisfying $j \in Q(\mathbf{y}; z)$ & $x_j > y_j$, then $P(\mathbf{x}; z) < P(\mathbf{y}; z)$.

*Transfer* (*Axiom T*; see Hassoun and Subramanian 2011). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $n(\mathbf{x}) = n(\mathbf{y})$, and $x_i = y_i \; \forall \, i \in N(\mathbf{x}) \backslash \{j,k\}$ for some $j, k$ satisfying $j \in Q(\mathbf{y}; z)$, $k \in R(\mathbf{x}; z), x_j = y_j + \delta, x_k = y_k - \delta$, and $0 < \delta \leq (y_k - y_j)/2$, then $P(\mathbf{x}; z) < P(\mathbf{y}; z)$.

Income Focus requires measured poverty to be insensitive, other things equal, to increases in non-poor incomes. Anonymity requires the poverty measure to be

invariant with respect to permutations of incomes across individuals, so that personal identities do not matter, and this serves as a justification, in cross-section and time-series comparisons of distributions, for seeing one distribution as being derived from another through a population increment or decrement. Monotonicity demands that, other things equal, an increase in a poor person's income should reduce poverty. Transfer (as stated in this paper) is a weak endorsement of equality which requires that a rank-preserving progressive transfer of income from a non-poor person to a poor person, which continues to keep the non-poor person non-poor, should reduce poverty: this is weaker than the Weak Downward Transfer Axiom of Donaldson and Weymark (1986).

Following are some variable-population axioms for poverty measurement.

*Replication Invariance* (*Axiom RI*). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $\mathbf{y}$ is a $k$-replication of $\mathbf{x}$, where $k$ is any positive integer, that is, if $\mathbf{y} = (\mathbf{x}, \mathbf{x}, \ldots., \mathbf{x})$ and $n(\mathbf{y}) = kn(\mathbf{x})$, then $P(\mathbf{x}; z) = P(\mathbf{y}; z)$.

*Replication Scaling* (*Axiom RS*; see Subramanian 2002b). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in \boldsymbol{S}$, if $\mathbf{y}$ is a $k$-replication of $\mathbf{x}$, where $k$ is any positive integer, that is, if $\mathbf{y} = (\mathbf{x}, \mathbf{x}, \ldots., \mathbf{x})$ and $n(\mathbf{y}) = kn(\mathbf{x})$, then $P(\mathbf{y}; z) = kP(\mathbf{x}; z)$.

*Weak Poverty Growth* (*Axiom WPG*; see Subramanian 2002b). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $\mathbf{x}^R_z = \mathbf{y}^R_z$, $r(\mathbf{x}; z) \geq 1$, $\mathbf{x}^P_z = (x, x, \ldots, x)$ for any $x \geq 0$, $\mathbf{y}^P_z = (x, x, \ldots, x)$, and $q(\mathbf{y}; z) = q(\mathbf{x}; z) + 1$, then $P(\mathbf{x}; z) < P(\mathbf{y}; z)$.

*Non-Poverty Growth* (*Axiom NPG*; see Kundu and Smith 1983). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $\mathbf{y} = (\mathbf{x}, x)$ for any $x \geq z$, then $P(\mathbf{x}; z) > P(\mathbf{y}; z)$.

*Weak Population Focus* (*Axiom WPF*). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $\mathbf{y} = (\mathbf{x}, x)$ for any $x \geq z$, then $P(\mathbf{x}; z) \leq P(\mathbf{y}; z)$.

*Population Focus* (*Axiom PF*; see Hassoun and Subramanian 2011). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $\mathbf{y} = (\mathbf{x}, x)$ for any $x \geq z$, then $P(\mathbf{x}; z) = P(\mathbf{y}; z)$.

*Comprehensive Focus* (*Axiom CF*; see Subramanian 2011b). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $\mathbf{x}^P_z = \mathbf{y}^P_z$, then $P(\mathbf{x}; z) = P(\mathbf{y}; z)$.

*Maximality* (*Axiom MX*; see Subramanian 2011b). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$ and $z \in S$, if $\mathbf{x} \in \mathbf{X}^*$ and $\mathbf{y} \notin \mathbf{X}^*$, then $P(\mathbf{x}; z) \geq P(\mathbf{y}; z)$.

Replication Invariance is widely perceived to be a very undemanding and reasonable property, which prescribes that measured poverty should depend only on the relative, not the absolute, frequency of incomes in a distribution: it is at the basis of Lorenz and Stochastic Dominance comparisons of income distributions, and constitutes a virtually universally accepted property of poverty measures, whereby poverty is measured in *per caput* terms. Replication Scaling, by contrast, calls for measured poverty to register a $k$-fold increase whenever an income distribution undergoes a $k$-fold replication. Weak Poverty Growth is a weakened version of a property called Poverty Growth introduced by Kundu and Smith (1983): the latter condition requires that poverty should increase whenever there is an addition to the poor population,

while the former requires that if all the poor in a population that has at least one non-poor person should have the same income, then an addition of a poor person with the same income as the rest of the poor should cause poverty to rise. The Non-Poverty Growth Axiom, due to Kundu and Smith (1983), requires that the addition of a non-poor person to the population should cause poverty to decline: implicit in this requirement seems to be an acceptance of the view that the prevalence of poverty is appropriately captured by the *proportion* of a population in poverty. The Weak Population Focus Axiom, however, is diametrically opposed in spirit to the Non-Poverty Growth Axiom: it reflects the requirement of what Hassoun (2010) calls the No Mere Addition property, whereby poverty ought not to be seen to decline with the addition of a non-poor person to the population. The Population Focus Axiom is a strengthened version of Hassoun's 'No Mere Addition' Axiom: it reflects what Paxton (2003) calls the Poverty Non-Invariance property, whereby poverty remains unchanged by the addition of a non-poor person to the population. Comprehensive Focus—also called Strong Focus in Subramanian (2002b)—subsumes both the Income Focus and the Population Focus Axioms, by requiring that poverty ought to remain unchanged following on an increase in either the income of a non-poor person or the size of the non-poor population. Maximality is the requirement that poverty is never greater than when every person in a community has zero income: this is compatible, for instance, with a zero-one normalization of the poverty measure, with the upper-bound of unity reserved for the situation in which every person has zero income (such as would be the case if, following the normalization procedure resorted to by Pattanaik and Sengupta (1995), one were to identify the poverty measure with the proportion of the population in poverty when every person has zero income).[1]

### 5.2.3 *Some Well-Known Measures of Poverty*

*The Headcount Ratio H*. For all $\mathbf{x} \in \mathbf{X}$ and $z \in S$:

$$\mathrm{H}(\mathbf{x}; z) \equiv \mathrm{q}(\mathbf{x}; z)/n(\mathbf{x}).$$

[1]Axioms for variable population poverty comparisons are less commonly present in the literature than axioms for fixed population comparisons. Here—following on the suggestion of one of the Editors of this special issue—are some simple numerical examples which should help to illustrate the import of these axioms. In everything that follows, we shall take it that the poverty line is given by $z = 2$. Suppose $\mathbf{x} = (1, 3)$ and $\mathbf{y} = (1, 1, 3, 3)$, then it is clear that $\mathbf{y}$ is just a 2-replication of $\mathbf{x}$, and Replication Invariance requires that $P(\mathbf{x}; z) = P(\mathbf{y}; z)$, whereas Replication Scaling requires that $P(\mathbf{y}; z) > P(\mathbf{x}; z)$. If $\mathrm{x} = (1, 3)$ and $\mathbf{y} = (1, 1, 3)$, then Weak Poverty Growth requires that $P(\mathbf{x}; z) < P(\mathbf{y}; z)$. If $\mathbf{x} = (1, 3)$ and $\mathbf{y} = (1, 3, 4)$, then Non-Poverty Growth requires that $P(\mathbf{x}; z) > P(\mathbf{y}; z)$. If $\mathbf{x} = (1, 3)$ and $\mathbf{y} = (1, 3, 4)$, then Weak Population Focus requires that $P(\mathbf{x}; z) \leq P(\mathbf{y}; z)$, while Population Focus requires that $P(\mathbf{x}; z) = P(\mathbf{y}; z)$. If $\mathbf{x} = (1, 3)$ and $\mathbf{y} = (1, 5, 7)$, then Comprehensive Focus requires that $P(\mathbf{x}; z) = P(\mathbf{y}; z)$. Finally, if $\mathbf{x} = (0, 0)$ and $\mathrm{y} = (0, 0, 3)$, then Maximality requires that $P(\mathbf{x}; z) \geq P(\mathbf{y}; z)$.

The headcount ratio is just the proportion of the population in poverty.

*The Income-Gap ratio I* (see Sen 1976). For all $\mathbf{x} \in \mathbf{X}$ and $z \in S$:

$$I(\mathbf{x}; z) \equiv 1 - \mu^{\mathrm{P}}(\mathbf{x}; z)/z,$$

where $\mu^{\mathrm{P}}(\mathbf{x}; z)$ is the average of poor incomes in the vector $\mathbf{x}$. The income-gap ratio is just the proportionate shortfall of the average income of the poor from the poverty line, or the proportionate poverty gap per poor person.

*The Per Capita Income-Gap Ratio R* (see Sen 1976). For all $\mathbf{x} \in \mathbf{X}$ and $z \in S$:

$$\begin{aligned} R(\mathbf{x}; z) &\equiv q(\mathbf{x}; z)(z - \mu^{\mathrm{P}}(\mathbf{x}; z))\,/n(\mathbf{x})z = \left(\frac{q(x; z)}{n(x)}\right)(1 - \mu^{\mathrm{P}}(\mathbf{x}; z)\,/z) \\ &= H(\mathbf{x}; z)I(\mathbf{x}; z) \end{aligned}$$

The per capita income-gap ratio is the proportionate poverty gap per person in the general population, and is given by the product of the headcount and the income-gap ratios.

*The Sen Index of Poverty S* (see Sen 1976). For all $\mathbf{x} \in \mathbf{X}$ such that $\mathbf{x}$ is a non-decreasingly ordered vector of incomes, and $z \in S$:

$$S(\mathbf{x}; z) \equiv [2/(q(\mathbf{x}; z) + 1)z] \sum_{i \in Q(\mathbf{x}; z)} (z - x_i)(q(\mathbf{x}; z) + 1 - i).$$

For indefinitely large values of $q$(x, $z$), Sen's index can be approximated by the expression

$$S(\mathbf{x}; z) = H(\mathbf{x}; z)\,[I(\mathbf{x}; z) + (1 - I(\mathbf{x}; z))G^{\mathrm{P}}(\mathbf{x}_z^{\mathrm{P}})],$$

where $G^{P}(\mathbf{x}_z^{\mathrm{P}})$ is the Gini coefficient of inequality in the distribution of poor incomes in the vector $\mathbf{x}$: the Sen measure, therefore, can be written as a composite function of the incidence of poverty (as captured by the headcount ratio), the depth of poverty (as captured by the income-gap ratio), and the severity of poverty (as captured by the interpersonal inequality in the distribution of poor incomes).

*The Foster-Greer-Thorbecke$P_\alpha$ Family of Measures* (see Foster et al. 1984). For all $\mathbf{x} \in \mathbf{X}$ and $z \in S$:

$$\mathrm{P}_\alpha(\mathbf{x}; \mathrm{z}) \equiv \left(\frac{1}{\mathrm{n}(\mathbf{x})}\right) \sum_{i \in Q(\mathbf{x}; z)} \left(\frac{\mathrm{z} - \mathrm{x_i}}{\mathrm{z}}\right)^{\alpha}, \alpha \geq 0$$

Certain distinguished members of the $P_a$ family are the following:
For all $\mathbf{x} \in \mathbf{X}$ and $z \in S$:

$$P_0(\mathbf{x};z) = H(\mathbf{x};z);$$

$$P_1(\mathbf{x};z) = R(\mathbf{x};z);$$

$$P_2(\mathbf{x};z) = H(\mathbf{x};z)\,[I^2(\mathbf{x};z) + (1 - I(\mathbf{x};z))^2 C^{\mathrm{P}}(\mathbf{x};z)],$$

where $C^P(\mathbf{x};\ s)$ is the squared coefficient of variation in the distribution of poor incomes; and in the limit, as $\alpha$ becomes indefinitely large, $P_\alpha(\mathbf{x};\ z)$ mimics a Rawlsian 'maximin' criterion, whereby the income distributions are ranked solely by the income share of the poorest individual.

As is well-known—see Sen (1976) and Foster, Greer and Thorbecke (1984)—the headcount ratio (that is to say $P_{\mathrm{O}}$ or $H$) violates the Monotonicity and Transfer Axioms, the income-gap ratio ($I$) and the per capita income-gap ratio (that is to say $P_1$ or $R$) satisfy Monotonicity while violating Transfer, and the Sen Index ($S$) and $P_2$ satisfy both Monotonicity and Transfer. Indeed, the measure $P_\alpha$ satisfies Monotonicity for all $\alpha > 0$ and Transfer for all $\alpha > 1$. The failure of the headcount ratio to satisfy Monotonicity, and the failure of the income-gap ratio and its per capita version to satisfy Transfer, were a substantial part of the motivation underlying Sen's (1976) effort to identify a more complete measure that was capable of satisfying these properties: the Sen index, and members of the $P_\alpha$ family for values of $a$ exceeding unity, are examples of such relatively sophisticated indices of poverty.

### 5.2.4 Axioms for the Measurement of Inequality

Some of the axioms for inequality measures are direct counterparts of corresponding axioms for poverty measurement: while the same nomenclature will be adopted for both sets of axioms, the inequality-related axioms will be differentiated from the poverty related ones by means of a starred designation (so that, for instance, Axiom A* will stand for the Anonymity Axiom as applied to inequality measures, while Axiom A will stand for the Anonymity Axiom as applied to poverty measures). First, we present some standard fixed-population axioms for inequality measures.

*Anonymity* (*Axiom A**). For all $\mathbf{x}$, $\mathbf{y} \in \mathbf{X}$, if $\mathbf{y} = \Pi\mathbf{x}$ where $\Pi$ is some appropriately dimensioned permutation matrix, then $I(\mathbf{x}) = I(\mathbf{y})$.

*Transfer* (*Axiom T**). For all $\mathbf{x}, \mathbf{y} \in \mathbf{X}$, if $n(\mathbf{x}) = n(\mathbf{y})$ and $x_i = y_i \forall \in i\ N(\mathbf{x}) \backslash \{j, k\}$ for some $j$, $k$ satisfying $x_j = y_j + \delta$, $x_k = y_k - \delta$, and $0 < \delta \leq (y_k - y_j) / 2$, then $I(\mathbf{x}) < I(\mathbf{y})$.

*Weak Transfer* (*Axiom WT**). Axiom WT* is derived from Axiom T* by replacing the consequent $I(\mathbf{x}) < I(\mathbf{y})$ in the statement of Axiom T* by the weak inequality $I(\mathbf{x}) \leq I(\mathbf{y})$.

*Scale Invariance* (*Axiom SI*). For all $\mathbf{x}, \mathbf{y} \in \mathbf{X}$, if $\mathbf{y} = \boldsymbol{\lambda}\mathbf{x}$ where $\lambda$ is any positive scalar, then $I(\mathbf{x}) = I(\lambda\mathbf{x})$.

Anonymity, in inequality measurement as in poverty measurement, requires the measure to be invariant with respect to personal identities. Transfer requires the inequality measure to register a decline in value whenever a rank-preserving progressive transfer of income between two persons occurs. Weak Transfer is a less demanding requirement, by which inequality should merely not increase following on a progressive rank-preserving transfer of income between two individuals. It is widely held that fulfilment of the Transfer Axiom is a necessary condition for any inequality measure to qualify *as* an inequality measure (though this view is sometimes disputed, as in the work of Chateauneuf and Moyes 2006). Out of deference to the general view that prevails in this matter, one could call an inequality measure $I$: $\mathbf{X} \rightarrow R$ *a proper measure of inequality* if and only if for all $\mathbf{x} \in \mathbf{X}$, $I(\mathbf{x})$ satisfies Axiom T*. We could call an inequality measure $I$: $\mathbf{X} \rightarrow R$ *a threshold measure of inequality* if and only if for all $\mathbf{x} \in \mathbf{X}$, $I(\mathbf{x})$ satisfies Axiom WT* but not Axiom T*. Finally, Scale Invariance requires an inequality measure to be seen in the light of a purely *relative* measure, namely that any uniform scaling up or down of an income vector should leave the extent of measured inequality unchanged.

Next, we present a few variable population inequality axioms.

*Replication Invariance* (*Axiom RI**). For all $\mathbf{x}, \mathbf{y} \in \mathbf{X}$, if $\mathbf{y}$ is a $k$-replication of $\mathbf{x}$, where $k$ is any positive integer, that is, if $\mathbf{y} = (\mathbf{x}, \mathbf{x}\ldots\ \mathbf{x})$ and $n(\mathbf{y}) = kn(\mathbf{x})$, then $I(\mathbf{x}) = I(\mathbf{y})$.

*Upper Pole Monotonicity* (*Axiom UPM*; see Subramanian 2010, 2011a). For all $\mathbf{x}, \mathbf{y} \in \mathbf{X}$, if $\mathbf{x} \in \hat{\boldsymbol{X}}$ and $\mathbf{y} = (\mathbf{x}, x)$, where $x$ is the income of the richest individual in the income vector $\mathbf{x}$, then $I(\mathbf{y}) < I(\mathbf{x})$.

*Lower-Bound Normalization* (*Axiom LBN*). For all $\mathbf{x} \in \tilde{\mathbf{X}}$, $I(\mathbf{x}) = 0$.

*Weak Upper-Bound Normalization* (Axiom WUBN; see Subramanian 2010, 2011a). For all $\mathbf{x}, \mathbf{y} \in \mathbf{X}$, if $\mathbf{x} \in \hat{\mathbf{X}}$ and $\mathbf{y} = (\mathbf{x}, 0)$, then $I(\mathbf{y}) \leq I(\mathbf{x})$.

*Upper-Bound Normalization* (*Axiom UBN*; see Subramanian 2010, 2011a). For all $\mathbf{x}, \mathbf{y} \in \mathbf{X}$, if $\mathbf{x} \in \hat{\boldsymbol{X}}$ and $\mathbf{y} = (\mathbf{x}, 0)$, then $I(\mathbf{y}) = I(\mathbf{x})$.

Replication Invariance requires the inequality measure to depend only on the relative, not the absolute, frequency of incomes in a distribution. Upper Pole Monotonicity and Upper-Bound Normalization are properties introduced by Subramanian (2010, 2011a), and deal with what ought to be seen to be happening to inequality in an 'extremal' distribution (one in which all but the richest individual have no income at all) due to the addition of a person at either end of the distribution. Axiom UPM advances the reasonable requirement that inequality should be seen to be diluted when a person, with the same income as that of the richest individual in an extremal distribution, joins the population. Asymmetrically, however, the Upper-Bound Normalization Axiom requires measured inequality to be invariant to

the addition of a person with zero income to an extremal distribution. Axiom UBN is analogous to its Lower-Bound counterpart: Lower-Bound Normalization requires that the extent of inequality should be assessed at zero when there is a perfectly equal division of income in a society, and this same value (of zero) is reserved for *all* distributions—irrespective of their dimensionality—when income is perfectly equally divided amongst the population. In a similar spirit, Axiom UBN requires that no matter what the dimensionality of an income vector is, as long as inequality is as bad as it possibly could be (given the size of the population), that is, as long as a single person appropriates the entire income of a society, the addition to the population of another person with zero income ought to make no difference to the extent of measured poverty. The notion of normalization with respect to the limits that can be achieved in relation to the constraints describing any given situation is well captured in the following apparently flippant passage from Carroll's *Through The Looking-Glass* [quoted also in Subramanian (2010)]:

> "I like the Walrus best", said Alice: "because he was a *little* sorry for the poor oysters."
>
> "He ate more than the Carpenter, though", said Tweedledee. "You see he held his handkerchief in front, so that the Carpenter couldn't count how many he took: contrariwise."
>
> "That was mean!" Alice said indignantly. "Then I like the Carpenter best—if he didn't eat so many as the Walrus."
>
> "But he ate as many as he could get", said Tweedledum.
>
> This was a puzzler.[2]

### 5.2.5 *Some Well-Known Real-Valued Measures of Inequality*

Following are the expressions for a set of inequality measures which are widely known in the literature (and which will therefore not be discussed here). All these measures satisfy the fixed-population properties of Anonymity, Transfer and Scale Invariance, and the variable population properties of Lower-Bound Normalization, Replication Invariance and Upper Pole Monotonicity (see Subramanian 2011a).

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[2]For readers who are relatively unfamiliar with axioms for variable population inequality comparisons, here, again, are a few simple arithmetical examples designed to illustrate the import of the axioms. Suppose $\mathbf{x} = (1, 3)$ and $\mathbf{y} = (1, 1, 3, 3)$, then since $\mathbf{y}$ is just a 2-replication of $\mathbf{x}$, Replication Invariance will demand that $I(\mathbf{x}) = I(\mathbf{y})$. If $\mathbf{x} = (0, 0, 3)$ and $\mathbf{y} = (0, 0, 3, 3)$—that is, $\mathbf{y}$ has been derived from $\mathbf{x}$ (an extremal distribution) by the addition of a person with the same income as that of the richest individual in $\mathbf{x}$—then Upper Mole Monotonicity will require that $I(\mathbf{y}) < I(\mathbf{x})$. If $\mathbf{x} = (3, 3, 3, 3)$—that is, $\mathbf{x}$ is a perfectly equal distribution of incomes—then Lower-Bound Normalization will require that $I(\mathbf{x}) = 0$. Finally, if $\mathbf{x} = (0, 0, 3)$ and $\mathbf{y} = (0, 0, 0, 3)$—that is, $\mathbf{y}$ has been derived from $\mathbf{x}$ (an extremal distribution) by the addition of a person with zero income—then Upper-Bound Normalization will require that $I(\mathbf{y}) = I(\mathbf{x})$.

*The Squared Coefficient of Variation* ($C^2$). For all $\mathbf{x} \in \mathbf{X}$:

$$C^2(\mathbf{x}) = (1/n(\mathbf{x})\mu^2(\mathbf{x})) \sum_{i \in N(\mathbf{x})} x_i^2 - 1.$$

*Theil's Inequality Index* ($T$). For all $\mathbf{x} \in \mathbf{X}$:

$$T(\mathbf{x}) = (1/n(\mathbf{x})) \sum_{i \in N(\mathbf{x})} \left(\frac{x_i}{\mu(\mathbf{x})}\right) \log\left(\frac{x_i}{\mu(\mathbf{x})}\right).$$

*The Gini Coefficient of Inequality* ($G$). For all $\mathbf{x} \in \mathbf{X}$:

$$G(\mathbf{x}) = \frac{n(\mathbf{x}) + 1}{n(\mathbf{x})} - \left(\frac{2}{n^2(\mathbf{x})\mu(\mathbf{x})}\right) \sum_{i \in N(\mathrm{x})} (n(\mathbf{x}) + 1 - i)x_i,$$

Where individual incomes have been arranged in non-decreasing order, viz. $\mathbf{x}_i \leq \mathbf{x}_{i+1}$, i = 1, …, n(**x**) − 1.

*The Atkinson Family of Ethical Inequali`ty Indices* ($A_\lambda$). For all $\mathbf{x} \in \mathbf{X}$:

$$A_\lambda(\mathbf{x}) = 1 - \left[\frac{1}{n(\mathbf{x})\mu(\mathbf{x})} \sum_{i \in N(\mathbf{x})} x_i^\lambda\right]^{\frac{1}{\lambda}}, \lambda \in (0, 1).$$

For future reference—see Subramanian (2011a)—we also provide the expressions for the normalized versions of the above inequality measures, obtained by dividing each of the measures by the maximum value it can attain (which happens when the distribution is an extremal one); these normalized versions are distinguished by supplying each of the respective measures with a star superscript, so that:

$C^{2*} = \left(\frac{1}{n-1}\right)C^2$,
$T^* = (1/\log n)T$ ,
$G^* = \left(\frac{n}{n-1}\right)G$, and
$A_\lambda{}^* = [1/\,(1 - n^{\frac{\lambda-1}{\lambda}})]A_\lambda$.

(Notice that, since there is no ambiguity, we have taken the liberty of writing $C^2$ for $C^2(\mathbf{x})$, $n$ for $n(\mathbf{x})$, and so on.)

## 5.3 Parfit's 'Theory X' and Poverty Measurement: Some Parallels

A major concern in Parfit's (1984) book *Reasons and Persons* is with what he calls the 'awesome' question of 'how many people should there ever be?'. This leads him to a consideration of how to assess the well-being of populations of alternative sizes: some satisfactory theory of beneficence is required to address the question of how many people there should ever be, and he calls such a theory of population ethics, assuming it exists and can be discovered, 'Theory X'. Theory X is a theory of the 'good', as captured in what Parfit (1984; p. 381) refers to as '…the level of happiness, or … the quality of life, or… the share per person of resources. We should assume that, in my examples, these three correlate, rising and falling together.' Parfit's quest for Theory X is informed by the notion that a proper reckoning of well-being should combine information on the following ingredients: the quantity of well-being, the quality of well-being, and the extent of inequality, if any, in the inter-personal distribution of well-being.

It is striking that Sen's (1976) seminal quest for a satisfactory measure of income poverty, which could be seen as a theory of the 'bad', was informed by precisely the considerations that motivated Parfit's Theory X. Recall from the preceding section that, for 'large' numbers of the poor, Sen's poverty index is given by: $S = HI + H\,(1 - I)G^{P.}$ Viewing poverty as an aspect of 'ill-being', it seems reasonable to interpret $HI$ as signifying the quantity of ill-being, $I$ as signifying the quality of ill-being, and $G^P$ as signifying inequality in the inter-personal distribution of ill-being. In essential respects, it can be claimed, Sen's quest for a measure of the 'bad' is reflected in Parfit's quest for a measure of the 'good'. It is interesting to note that Parfit, at the end of his book, concedes his inability to come up with a satisfactory version of Theory X: '…though I failed to find such a theory, I believe that, if they tried, others could succeed' [Parfit (1984); p. 443]. The present author (Subramanian 2006, on which this section is heavily dependent), has demonstrated that it is not just the motivation underlying the Parfit and Sen enterprises that share commonalities, but also their respective outcomes. This is explicated, in what follows, with the help of a number of elementary examples. In all these examples (unless otherwise stated), we shall, for specificity, take it that $z = 100$ and $n = 1$ million.

Consider first the ordered income $n$-vectors $\mathbf{x}^1 = (99, \ldots..., 99)$ and $\mathbf{y}^1 = (0, \ldots..., 0)$ One would be normally disposed to imagine that $\mathbf{x}^1$ is, from a poverty point of view, and in terms of both the quantity and quality of deprivation, a superior distribution to $\mathbf{y}^1$. Yet, this judgment is denied by the headcount ratio of poverty, which takes account of neither the quantity nor quality of poverty, concerned, as it is, solely with the proportion of the population in poverty: $H(\mathbf{x}^1; z) = H(\mathbf{y}^1; z) = 1$.

Next, consider the ordered $n$-vectors $\mathbf{x}^2 = (0, 99, \ldots..., 99)$ and $\mathbf{y}^1 = (0, \ldots..., 0)$ Again, our normal disposition would be to see $y^1$ as being poverty-wise worse than $x^2$ from both a quantity and quality perspective on poverty; but again, this judgment would be denied by the poverty measure $P_{\alpha \to \infty}$, since—in terms of the maximin

criterion which focuses only on the income-share of the poorest individual—$P_{\alpha\rightarrow\infty}(\mathbf{x}^2; z) = P_{\alpha\rightarrow\infty}(\mathbf{y}^1; z)$.

Now consider the pair of ordered income $n$-vectors $\mathbf{x}^3$ = (0, 100, ….., 100) and $\mathbf{y}^1$ = (0, ….., 0) In $\mathbf{x}^3$ one person out of a million is subjected to extreme deprivation, while in $\mathbf{y}^1$ every single one of one million persons is subjected to extreme deprivation; yet, poverty as measured by the income-gap ratio $I$ will certify that the two distributions are poverty-wise indistinguishable, for $I(\mathbf{x}^3; z) = I(\mathbf{y}^1; z) = 1$. If this example militates against one's moral intuition in the matter, the following example does even more violence to one's sense of the rightness of things. If $\mathbf{y}^2$ = (0.01, ….., 0.01), then measuring poverty by the income-gap ratio would compel us to judge that there is more poverty in the distribution $\mathbf{x}^3$ than in the distribution $\mathbf{y}^2$, since $I(\mathbf{x}^3; z)(= 1) > I(\mathbf{y}^2; z)(= 0.9999)$. The trouble arises from the fact that the measure $I$ is concerned solely with a 'quality' view of deprivation: it reflects a shortcoming which Parfit associates with what he calls the 'Average Principle', a shortcoming that is well-illustrated by Parfit's (1984; p. 406) 'Two Hells' Example (which, with suitable contextual adaptation, is reflected in the examples of the income vectors $\mathbf{x}^3$ and $\mathbf{y}^2$):

> *The Two Hells*. In *Hell One*, the last generation consists of ten innocent people, who each suffer great agony for fifty years. The lives of these people are much worse than nothing. They would all kill themselves if they could. In *Hell Two*, the last generation consists not of ten but of ten million innocent people, who each suffer agony just as great for fifty years minus a day.

It is not only average utilitarianism but also total utilitarianism which falls foul of Parfit's requirement of a satisfactory theory of well-being. The difficulty with what he calls the 'Total Principle' is illustrated by the following example. Consider the income $n$-vectors $\mathbf{x}^3$ = (0, 100, ….., 100) and $\mathbf{y}^3$ = (99.9999, ….., 99.9999). One would imagine that the very slight sacrifice of 0.0001 unit of income which each of 999,999 people have to make in order to redeem the extreme deprivation of the poorest person in $\mathbf{x}^3$ would be well worth the transition from $\mathbf{x}^3$ to $\mathbf{y}^3$; yet, in terms of a view of poverty which is concerned only with its total quantity, as measured by the product of the headcount and income-gap ratios—which is the per capita income-gap ratio $R$ as also the Sen index of poverty $S$ (because there is no inequality in the distribution of poor incomes in either $\mathbf{x}^3$ or $\mathbf{y}^3$)–we would be obliged to declare that $R(\mathbf{x}^3;z)[=S(\mathbf{x}^3;z)] = R(\mathbf{y}^3;z)[=S(\mathbf{y}^3;z)](=10^{-6})$.This result is a version of what Parfit calls the Repugnant Conclusion yielded by the exclusive concern of classical utilitarianism with the 'Total Principle'. Restated in a poverty context, the Repugnant Conclusion would read something like this: 'As long as there is invariance in the total quantity of deprivation that obtains, there is really no moral distinction to be drawn between a situation in which a single person suffers the most extreme deprivation and one in which a sufficiently large number of individuals experience very mild deprivation.'

The Repugnant Conclusion, it turns out, is a feature of the entire $P_\alpha$ family of poverty indices, for finite integral values of $\alpha$ exceeding unity. To see this, consider a situation in which $n = 10^\alpha$ (where $\alpha$ is a finite integer greater than one), and we

have the income $n$-vectors $\mathbf{x}^3$ = (0, 100, ….., 100) and $\mathbf{y}^4$ = (90, ….., 90). Again, and for the same reasons that were advanced in favour of $\mathbf{y}^3$ over $\mathbf{x}^3$, one imagines one would be inclined to favour $\mathbf{y}^4$ over $\mathbf{x}^3$ from a poverty point of view. However, it can be verified that for all finite integral values of $a$ exceeding one, $P_\alpha(\mathbf{x}^3; z) = P_\alpha(\mathbf{y}^4; z)(= 1/n)$.

The very elementary examples employed above suggest that none of the poverty indices considered in this paper—the headcount ratio, the income-gap ratio, the per capita income gap-ratio, the Sen index of poverty, or the entire Foster-Greer-Thorbecke $P_\alpha$ family of indices—escapes conflicting with one's reasonable moral intuition, in specific cases, on the poverty ranking of distributions. The ingredients of Parfit's Theory X have, by and large, been the ingredients of standard measures of poverty advanced in the literature. Just as Parfit points to the inadequacies of the Total and Average Principles, and the possibility of a Repugnant Conclusion, in the context of variable population wellbeing comparisons, so one encounters analogous and problematic versions of the Total and Average Principles, and a version of the Repugnant Conclusion, in the context of poverty comparisons across poor populations of variable size (even when the aggregate population is of fixed dimension). Parfit's verdict of a failure in his quest for Theory X would thus also appear to hold for the economist's quest for a satisfactory real-valued measure of poverty.

A different set of problems, again with close links to difficulties which have been noted in the literature on population ethics, arises when we resort to poverty comparisons across populations of variable aggregate size, an issue to which we now turn.

## 5.4 Variable Population Poverty Comparisons

Virtually all extant measures of poverty emphasize a *headcount ratio*, rather than an *aggregate headcount*, view of poverty. This, in turn, is because virtually all extant measures of poverty either explicitly or implicitly endorse the Replication Invariance Axiom or deny the Population Focus Axiom, even as they accept the Income Focus Axiom. To see the relationship between the headcount ratio and Replication Invariance, and the relationship between the aggregate headcount and Population Focus, note first that, under any $k$-fold replication of an income distribution, the headcount ratio will remain unaffected, while the aggregate headcount will register a $k$-fold increase; and, second, with an addition to the non-poor population, the aggregate headcount will remain unaffected, while the headcount ratio will register a decline. It would appear to be inconsistent to find merit in the Income Focus Axiom and none in the Population Focus Axiom; when this inconsistency is sought to be rectified by requiring poverty indices to also satisfy Population Focus, then we find—unsurprisingly perhaps, but also disquietingly—that Population Focus in conjunction with other axioms which traditionally emphasize a headcount

ratio view of poverty leads to incoherence and impossibility. This section, which relies heavily on Subramanian (2002b, 2011b), Hassoun (2010) and Hassoun and Subramanian (2011), presents a small set of very elementary impossibility theorems which point to the difficulties inherent in variable population poverty comparisons.

**Proposition 5.1** *There exists no anonymous poverty measure* $P$: $X \times S \rightarrow R$ *which satisfies Replication Invariance (Axiom RI), Weak Poverty Growth (Axiom WPG), and Weak Population-Focus (Axiom WPF).*

*Proof* Let the poverty line be $z$, and let $x$ and $y$ be two levels of income such that $x \geq z<y$. Consider the income distributions $\mathbf{a} = (x, y)$, $\mathbf{b} = (x, y, y)$ and $\mathbf{c} = (x, x, y, y)$. By Axiom WPG, $P(\mathbf{b}; z) < P(\mathbf{c}; z)$, and by Axiom RI, $P(\mathbf{c}; z) = P(\mathbf{a}; z)$, whence $P(\mathbf{b}; z) < P(\mathbf{a}; z)$—which, however, is contradicted by $P(\mathbf{a}; z) \leq P(\mathbf{b}; z)$, as dictated by Axiom WPF.

**Proposition 5.2** *There exists no anonymous poverty measure* $P$: $X \times S \rightarrow R$ *which satisfies Maximality (Axiom MX), Weak Poverty Growth (Axiom WPG), and Weak Population Focus (Axiom WPF).*

*Proof* Let the poverty line be $z$, and let $x$ be a level of income satisfying $x \geq z$. Consider the income distributions $\mathbf{a} = (0, \ldots..., 0)$, $\mathbf{b} = (a, x)$ and $\mathbf{c} = (\mathbf{b}, 0)$. We now have: $P(\mathbf{c}; z) > P(\mathbf{b}; z)$ by Axiom WPG, and $P(\mathbf{b}; z) \geq P(\mathbf{a}; z)$ by Axiom WPF, whence $P(\mathbf{c}; z) > P(\mathbf{a}; z)$—which, however, is contradicted by $P(\mathbf{a}; z) \geq P(\mathbf{c}; z)$, as dictated by Axiom MX.

**Proposition 5.3** *There exists no anonymous poverty measure* $P$: $\mathbf{X} \times S \rightarrow R$ *which satisfies Monotonicity (Axiom M), Replication Invariance (RI), and Population Focus (Axiom PF).*

*Proof* Let the poverty line be $z$, and let $x$ and $y$ be two levels of income such that $0 \leq x<z < y$. Consider the income distributions $\mathbf{a} = (x, x, \ldots., x, x)$, $\mathbf{b} = (x, x, \ldots., x, y)$ and $\mathbf{c} = (x, x, \ldots., x)$, with $n(\mathbf{a}) = n(\mathbf{b}) = n(\mathbf{c}) + 1$. Let $\mathbf{d} = (\mathbf{a}, \ldots., \mathbf{a})$ be a fourth income vector such that $n(\mathbf{d}) = n(\mathbf{c})n(\mathbf{a})$. It is easy to see that, also, $\mathbf{d} = (\mathbf{c}, \ldots., \mathbf{c})$, with $n(\mathbf{d}) = n(\mathbf{a})n(\mathbf{c})$. By Axiom RI, one must have $P(\mathbf{a}; z) = P(\mathbf{d}; z)$ and $P(\mathbf{d}; z) = P(\mathbf{c}; z)$, whence $P(\mathbf{a}; z) = P(\mathbf{c}; z)$; this, coupled with $P(\mathbf{a}; z) > P(\mathbf{b}; z)$ as dictated by Axiom M, leads to $P(\mathbf{c}; z) > P(\mathbf{b}; z)$—which, however, falls foul of what Axiom PF implies, namely $P(\mathbf{c}; z) = P(\mathbf{b}; z)$.

**Proposition 5.4** (***Corollary to Proposition 5.3***). *There exists no anonymous poverty measure* $P$: $X \times S \rightarrow R$ *which satisfies Transfer (Axiom T), Replication Invariance (RI), and Population Focus (Axiom PF).*

*Proof* . The proof follows, given Proposition 5.3, from the fact that Axioms T and PF together imply Axiom M. To see this, imagine a situation in which $z$ is the poverty line, $n$ is a positive integer, $\Delta$ is a positive scalar, and **x, y, u** and **v** are four income vectors satisfying $x = (x_1, \ldots., x_n)$; $y = (y_1, \ldots., y_n)$, with $y_i = x_i \, \forall i \neq j$ for some $j \in Q(\mathbf{x}; z)$ and $y_j = x_j + \Delta$; $\mathbf{u} = (\mathbf{x}, z + \Delta)$; and $\mathbf{v} = (\mathbf{y}, z)$. By Axiom PF, $P(\mathbf{v}; z) = P(\mathbf{y}; z)$ and by Axiom T, $P(\mathbf{u}; z) > P(\mathbf{v}; z)$, whence $P(\mathbf{u}; z) > P(\mathbf{y}; z)$, which, together with $P(\mathbf{u}; z) = P(\mathbf{x}; z)$ as implied by Axiom PF, leads to $P(\mathbf{x}; z) > P(\mathbf{y}; z)$—

which, precisely, is what is dictated by Axiom M. We have shown that Axioms T and PF in conjunction imply Axiom M; from Proposition 5.3, we know that there exists no anonymous poverty measure $P$: $X \times S \rightarrow R$ which simultaneously satisfies Axioms M, RI and PF; it follows that there exists no anonymous poverty measure $P$: $\mathbf{X} \times S \rightarrow R$ which simultaneously satisfies Axioms T, RI and PF.■

Propositions 5.1 and 5.2 are based on results available in Subramanian (2002b) and Subramanian (2011b) respectively, while Propositions 5.3 and 5.4 are available in Hassoun (2010) and Hassoun and Subramanian (2011). The impossibility results stated and proved above are fairly straightforward ones, and require little in the way of complicated reasoning to comprehend. The implications of these results, however, are of some significance for the measurement of poverty. In particular—and as argued in Hassoun (2010) and in Subramanian (2011b)—it would appear that there are at least two possible views one may take of what one calls 'a measure of poverty'. Under the first view, one measures 'how poor a society is'; under the second view, one measures 'how much poverty there is in a society'. The latter view would deem all information relating to the status of the nonpoor population as being irrelevant for a measure of poverty, but not so the former. The latter view, that is, would defer to a Focus Axiom or what, in more general terms, Broome (1996) refers to as a 'Constituency Principle' of population ethics: the principle that, in comparing the 'goodness' of alternative states of the world, one takes account only of how good the states are for the *relevant constituency of individuals*, namely those individuals only—such as those that exist in both the states under review—whose preferences and interests can be validly seem to matter for the comparison.

In the context of poverty measurement, it is arguable that the poverty ranking of alternative distributions must depend solely on the interests and preferences of the *poor* constituency of the population. What is important to note is that if such a view is to be defended, it must be defended in its entirety, that is to say, one must defer to what in Sect. 5.2 has been labelled a *Comprehensive Focus Axiom*, one which respects both Income Focus *and* Population Focus. Alternatively, one may reject both the Income Focus and the Population Focus Axioms. An index that satisfies Comprehensive Focus is any standard measure of poverty which incorporates the headcount ratio, such as the Sen Index, multiplied by the total population: the headcount ratio in the expression for the Sen Index would then be replaced by the aggregate headcount (call it $A$), and the resulting measure (call it $S' \equiv A\,[I + (1 - I)G^P]$) would defer to both Income Focus and Population Focus.[3] An example of a measure which *violates* both Income Focus and Population Focus is Anand's (1977) modification of the Sen Index, given, for 'large' numbers of the poor, by the expression $S'' = H[I^* + (1 - I^*)G^P]$ where $I^*$ is a modified

[3]This, obviously, is also true for the well-known $P_{\alpha \geq 0}$ family of poverty measures due to Foster et al. (1984). A distinguished member of this family is the $P_2$ index, given, for all $\mathbf{x} \in \mathbf{X}$ and $z \in S$, as we have seen earlier (in Sect. 5.3), by: $P_2(\mathbf{x};z) = H(\mathbf{x};z)[I^2(\mathbf{x};z) + (1 - I(\mathbf{x};z))^2 C^P(\mathbf{x};z)]$. This is a measure of 'how poor' a society is. A corresponding measure of the 'quantity of poverty' in a society would be given by: $P_2'(\mathbf{x};z) = A(\mathbf{x};z)[I^2(\mathbf{x};z) + (1 - I(\mathbf{x};z))^2 C^P(\mathbf{x};z)]$: all one has to do to derive $P_2'$ from $P_2$ is to replace the headcount ratio by the aggregate headcount.

income-gap ratio which measures the shortfall of the average income of the poor from the poverty line as a proportion of the average income of the entire population rather than of the poverty line ($I^* \equiv 1 - \mu^P/\mu$, and $\mu$ is the average income of the entire population). Without entering into the substantive merits of a Constituency Principle, one may still pronounce on a matter of consistency, as such: namely, that it would be consistent to violate both Income and Population Focus, or to respect Comprehensive Focus, but inconsistent to defer to one of the Focus Axioms while violating the other. In this sense, the measure $S'$ is a consistent measure (in that it satisfies both Income and Population Focus), just as the measure $S''$ is also a consistent measure (in that it violates both Income and Population Focus), whereas, unfortunately, most extant measures of poverty are inconsistent, in that they tend to insist on the sanctity of Income Focus, while apparently seeing no case for Population Focus. It is this inconsistency which is at the heart of the impossibility results subsumed in Propositions 5.1–5.4: Replication Invariance and Maximality are properties of a poverty measure which uphold a 'how poor a society is' view of poverty, while Population Focus is a property that upholds a 'how much poverty there is in a society' view of poverty. Combining these conflicting views of poverty inevitably leads to incoherence.

An issue that is directly precipitated by the above considerations has to do with the rival claims of the headcount ratio ($H$) and the aggregate headcount ($A$) as the appropriate indicator of the prevalence of poverty. This problem has been considered in Subramanian (2005a, b), and in Chakravarty et al. (2006). Perhaps one of the earliest efforts at dealing with the problem from a conceptual perspective is to be found in related work done by Arriaga (1970) on the measurement of urbanization. As pointed out in Subramanian (2005a, b), the headcount ratio violates, and the aggregate headcount satisfies, the Constituency Principle; on the other hand, the headcount ratio satisfies, and the aggregate headcount violates, what one may call a 'Likelihood Principle', which is the principle that an assessment of the extent of poverty in a population should carry some indication of the probability of encountering a poor person in that population. Thus, arguably, each of $H$ and $A$ has something to commend it, but each also has something to detract from it. Under the circumstances, it may always be best, in empirical work dealing with the prevalence of poverty, to report on both the headcount ratio *and* the aggregate headcount. This is not a particularly common practice, but two notable exceptions are reflected in the work of Sundaram and Tendulkar (2003) and Reddy and Miniou (2007).

An alternative to providing a disaggregated picture of the headcount ratio and the aggregate headcount is to *combine* the two indices in a composite headcount indicator of poverty. Examples of this approach are available in Arriaga (1970), Chakravarty et al. (2006), and Subramanian (2005a). The last-cited work advances an axiom of '*Flexible Replication Responsiveness*' (Axiom FRR), in terms of which a $k$-fold replication of an income distribution induces a $k^{\beta}$—fold increase in the extent of measured poverty, where $\beta$ is a parameter in the interval (0, 1): the closer $\beta$ is to zero, the closer the FRR Axiom is to Replication Invariance; and the closer $\beta$ is to unity, the closer the FRR Axiom is to Replication Scaling. If we pitch $\beta$ at the mid-point (1/2) of the unit interval, then a 'compromise headcount index' which

combines the headcount ratio and the aggregate headcount in a 'mixed' measure is given—under some reasonably undemanding axiomatic restrictions—by the quantity $M \equiv A^{\frac{1}{2}}(1+H)$, a measure which has been advanced and discussed in Subramanian (2005a). A possibly useful feature of the measure $M$ is that when two income distributions are indistinguishable in terms of the headcount ratio, $M$ ranks the distributions according to the aggregate headcount; and when two distributions are indistinguishable in terms of the aggregate headcount, $M$ ranks the distributions according to the headcount ratio.

The competing appeals of $H$ and $A$ are, in the end, only a specific manifestation of the more general conceptual difficulties that preside over an appropriate interpretation of what it means to measure 'the extent of poverty' in situations—which are the rule rather than the exception—wherein poverty comparisons have to be effected across populations of variable size. This section has provided a summary of some of these difficulties relating to poverty measurement and population ethics. A similar exercise is undertaken, in the following section, on problems relating to inequality measurement and population ethics.

## 5.5 Variable Population Inequality Comparisons

When we deal with variable populations we find that the problem of 'fractions versus whole numbers' encountered in the measurement of poverty carries over also to the measurement of inequality. This is far from surprising: to recall from Sect. 5.2, properties such as Replication Invariance are concerned with population proportions, while properties such as Upper Pole Monotonicity are concerned with absolute population size. The conflict between these two ways of viewing population size is manifested in the following elementary impossibility result, stated and proved in Subramanian (2010) and Subramanian (2011a):

**Proposition 5.5** *There exists no anonymous inequality measure* $I$: $X \rightarrow R$ *which satisfies Upper Pole Monotonicity (Axiom UPM), Replication Invariance (Axiom RI*) and Weak Upper-Bound Normalization (Axiom WUBN).*

*Proof* Let $x$ be any positive scalar, and let **a,b**, **c** and **d** be four income vectors such that $\mathbf{a} = (0,0,\ldots,0,x)$, $\mathbf{b} = (0,0,\ldots,0,0,x)$, $\mathbf{c} = (0,0,\ldots,0,0,x,x)$ and $\mathbf{d} = (0,0,\ldots,0,x,x,\ldots,x)$, with $n(\mathbf{c}) = n(\mathbf{b}) + 1$, $n(\mathbf{b}) = n(\mathbf{a}) + 1$, and $n(\mathbf{d}) = n(\mathbf{a})n(\mathbf{c})$. Then, **d** is an $n(\mathbf{c})$-replication of **a** and an $n(\mathbf{a})$-replication of **c**, so that, by Axiom RI, $I(\mathbf{d}) = I(\mathbf{a})$, $I(\mathbf{d}) = I(\mathbf{c})$, and therefore $I(\mathbf{a}) = I(\mathbf{c})$; and $I(\mathbf{c}) < I(\mathbf{b})$ by Axiom UPM, whence $I(\mathbf{a}) < I(\mathbf{b})$, which, however, is contradicted by $I(\mathbf{a}) \geq I(\mathbf{b})$, as dictated by Axiom WUBN.■

The result above is reflected in the fact that each of the inequality measures $C^2$, T, G and $A_\lambda$ presented in Sect. 5.2 satisfies Axiom UPM and RI* while violating Axiom WUBN, and each of the inequality measures $C^2$*, T*, G* and $A_\lambda$* satisfies Axiom UBN and UPM while violating Axiom RI*. This suggests an inherent

tension between Replication Invariance and Upper-Bound Normalization, as is, indeed, confirmed by the following result, stated and proved in Subramanian (2011a):

**Proposition 5.6** *There exists no proper, anonymous and scale-invariant measure of inequality* $I$: $X \rightarrow R$ *which satisfies Replication Invariance (Axiom RI*) and Weak Upper-Bound Normalization (Axiom WUBN).*

*Proof* Let $x$ be any positive scalar, and $\mathbf{a}$, $\mathbf{b}$, $\mathbf{c}$, $\mathbf{d}$, $\mathbf{e}$ and $\mathbf{f}$ be six income vectors such that $\mathbf{a} = (0, x)$, $\mathbf{b} = (0, 0, x)$, $\mathbf{c} = (0, 0, 0, x)$, $\mathbf{d} = (0, 0, 0, 2x)$, $\mathbf{e} = (0, 0, x, x)$ and $\mathbf{f} = (0, 0, 0, 0\ x, x, x, x)$. By Axiom WUBN, $I(\mathbf{a}) \geq I(\mathbf{b}) \geq I(\mathbf{c})$, whence $I(\mathbf{a}) \geq I(\mathbf{c})$; noting that $\mathbf{d} = 2\mathbf{c}$, Scale Invariance (Axiom SI) requires that $I(\mathbf{d}) = I(\mathbf{c})$ and hence (since $I(\mathbf{a}) \geq I(\mathbf{c})$), $I(\mathbf{a}) \geq I(\mathbf{d})$). Further, $I(\mathbf{d}) > I(\mathbf{e})$ by Axiom T*, whence, given $I(\mathbf{a}) \geq I(\mathbf{d})$, one must also have $I(\mathbf{a}) > I(\mathbf{e})$. Since $\mathbf{f}$ is a 2-replication of $\mathbf{e}$ and a 4-replication of $\mathbf{a}$, Axiom RI* dictates that $I(\mathbf{f}) = I(\mathbf{e})$ and $I(\mathbf{f}) = I(\mathbf{a})$, whence $I(\mathbf{e}) = I(\mathbf{a})$ which, however, is contradicted by $I(\mathbf{a}) > I(\mathbf{e})$, as deduced earlier.■

From a wholly pragmatic point of view, inequality measurement without Replication Invariance is hard to conceive of: one would have to dispense with such devices of comparison as Stochastic Dominance and Lorenz Dominance, which are foundational aspects of inequality measurement as it is 'standardly' practiced, if one were to renounce Replication Invariance. Upper Bound Normalization is also a practically useful property in an inequality index: it permits one to express the extent of inequality in any general $n$-person distribution in terms of the share of the poorer of two individuals in a classic—and easily comprehended—two-person cake-sharing problem. (The equivalence between $n$-person inequality measures and two-person shares is dealt with in Subramanian (2002a) and Shorrocks (2005).) If —from these pragmatic considerations of manipulability and interpretability—one wished to retain the properties of Replication Invariance and Upper-Bound Normalization, then one would have to be prepared to sacrifice certain other properties of an inequality measure. Propositions 5.5 and 5.6 suggest that one may have to give up the variable population property of Upper Pole Monotonicity and the fixed population property of Transfer in this cause. It turns out, as it happens, that there does exist a 'threshold' inequality measure—namely one which satisfies the Weak Transfer but not the Transfer Axiom—which fulfills the requirements of Replication Invariance and Upper-Bound Normalization, while violating Upper Pole Monotonicity. This result, which is discussed in Subramanian (2011a), is reflected in the following Proposition:

**Proposition 5.7** *There exists a 'threshold' inequality measure* $I$: $\mathbf{X} \rightarrow R$ *which satisfies Replication Invariance (Axiom RI*) and Upper-Bound Normalization (Axiom UBN).*

*Proof* Consider the inequality measure $D$: $X \rightarrow R$ which, for all $\mathbf{x} \in \mathbf{X}$, is given by:

$$D(\mathbf{x}) = 1 - \left(\frac{1}{n(\mathbf{x})\mu^2(\mathbf{x})}\right)\Sigma_{i\in N(\mathbf{x})}x_i x_{n(\mathbf{x})+1-i}, \tag{5.1}$$

Where the incomes in the vector have been arranged in non-descending order.

Note first, in view of (5.1), that for any extremal distribution $\mathbf{x} \in \hat{\mathbf{X}}$, $D(\mathbf{x}) = 1$, which establishes that $D$ satisfies Axiom UBN. Next, for any ordered $n$-vector of incomes $\mathbf{x}$, let $\mathbf{y}$ be a $k$-fold replication of $\mathbf{x}$, where $k$ is any positive integer. Then, given (5.1), one can

$$\begin{aligned}\text{see that } D(\mathbf{y}) &= 1 - \left(\frac{1}{kn(\mathbf{x})\mu^2(\mathbf{y})}\right)\mathrm{k}\Sigma_{i\in N(\mathbf{x})}x_i x_{n(\mathbf{x})+1-\mathrm{i}} \\ &= 1 - \left(\frac{1}{n(\mathbf{x})\mu^2(\mathbf{x})}\right)\Sigma_{i\in N(\mathbf{x})}x_i x_{n(\mathbf{x})+1-i}\end{aligned}$$

(Since. obviously, $\mu(\mathbf{y}) = \mu(\mathbf{x})) = D(\mathbf{x})$, as required to establish Axiom RI*. That $D$ is not violative of 'equity-consciousness' is clear from the fact that $D$ resorts to a weighting structure in which the $i$th poorest person's income is weighted by the $(n + 1 - i)$th poorest person's income, which ensures a non-increasing scheme of weights and, therefore, the fulfilment by $D$ of at least Weak Transfer. More formally, let $\mathbf{x}$ and $\mathbf{y}$ be two ordered $n$ vectors of income with the same mean $\mu$, and suppose the antecedents of the Transfer and the Weak Transfer Axioms, as stated in Sect. 5.2, to be satisfied. It can be verified that $D(\mathbf{x}) - D(\mathbf{y}) = (2\delta/n\mu^2)(x_{n+1-j} - x_{n+1-k}) \geq 0$, since $x_{n+1-j} - x_{n+1-k} \geq 0$ (which follows from the fact that incomes have been arranged in non-decreasing order), which is what is required to establish Weak Transfer. (However the regular Transfer axiom may be violated: if it should turn out that $x_{n+1-j} = x_{n+1-k}$, then one would have $D(\mathbf{x}) = D(\mathbf{y})$, a case where Weak Transfer, but not Transfer, is satisfied.)■

It may be added that the index $D$, by virtue of being normalized, lends itself to interpretation in terms of the simplest and most familiar representation of inequality one can think of—the share of the poorer person in the division of a cake of fixed size between two individuals. To see what is involved—the reader is also referred, in this connection, to Shorrocks (2005) and Subramanian (2002a, 2010, 2011a)—consider the following. For any $n$-person ordered income vector $\mathbf{x}$ with mean $\mu$ and inequality value $D$, construct what may be called a *dichotomously allocated equivalent distribution* (DAED), which is the two person non-decreasingly ordered income vector $\mathbf{x}^* = (x^*_z, x^*_2$ with the feature that its mean $\mu^*$ is the mean $\mu$ of $\mathbf{x}$, and its inequality value $D^*$ is the inequality value $D$ of $\mathbf{x}$. $\mu^* = \mu$ and $D^* = D$ entail, respectively [given (5.1)], that $x^*_1 + x^*_2 = 2\mu$ and $1 - x^*_1 + x^*_2/\mu = D$. Solving for $x^*_1$ and $x^*_2$

$$x^*_1 = \mu(1 - \sqrt{D}), x^*_2 = \mu(1 + \sqrt{D}) \tag{5.2}$$

If we designate by $\sigma_D[\equiv x_1^*/x_1^* + x_2^*]$ the share of the poorer of the two individuals in the DAED $\mathbf{x}^*$, then, in view of (5.2), one obtains the following expression for $\sigma_D$ in terms of the inequality index $D$:

$$(\sigma_D = (1 - \sqrt{D})/2. \tag{5.3}$$

This relationship is of considerable value in interpreting the 'meaning' of the inequality measure. Thus, if in some actual situation involving an $n$-person distribution the extent of inequality as measured by $D$ should be of the order of 0.25, then this is 'equivalent'—in view of (5.3)—to a situation in which the poorer of two persons in a two-person distribution of a cake receives 25% of the cake. The utility of this 'interpretational advantage' must, of course, be set off against the fact that a measure such as $D$ is not a 'proper', but only a 'threshold', measure of inequality, and it does not satisfy the property of Upper Pole Monotonicity.

In a general way, Proposition 5.7 suggests the existence of a trade-off amongst competing properties of an inequality index. How the trade-off is resolved must depend on the value system of the practitioner. What Proposition 5.7 does do is to indicate that a trade-off cannot be avoided.

## 5.6 Summary and Conclusions

This paper has been a selective review of certain implications of variable population comparisons for the ethical content and logical coherence of poverty and inequality measurement. In the first instance, we have considered comparisons for aggregate populations of fixed size in which, however, the size of the poor population is allowed to vary. We find certain parallels between Parfit's quest for a satisfactory theory of beneficence and the economist's quest for a satisfactory measure of poverty such that, in particular, the categories of both 'quantity' and 'quality' (of wellbeing/poverty) can be adequately reflected in the theory/measure of one's choice. Next, we consider variable population poverty comparisons, and note the fact that most available indices of poverty insist on the fulfilment of an Income Focus Axiom, the spirit of which, however, is violated by non-observance of an analogous Population Focus Axiom. Population Focus, in conjunction with other canonical fixed and variable population axioms (in particular, Replication Invariance) is found to result in impossibility theorems. This suggests the need for a consistent stance to be displayed toward a Constituency Principle, one in which both Income and Population Focus are respected, or neither is (or, indeed, the need for a 'poverty line' separating the poor from the non-poor is altogether dispensed with, such as would happen with a wholly 'fuzzy' approach to poverty conceptualization, in which all individuals are seen to be more or less poor, rather than as either poor or non-poor). Finally, we note that inequality comparisons across variable populations are also not devoid of complication, and depending upon what particular combination of fixed and variable population axioms we may find

relatively attractive, we may be compelled to choose amongst alternative combinations of properties. In general, variable population poverty and inequality comparisons have tended to be somewhat facilely performed through the postulation of a Replication Invariance Axiom. A part of the present paper has been concerned to argue that the practical advantages of invoking Replication Invariance have perhaps occluded recognition of the fact that the logical and ethical implications of this standard scheme of resolution may be open to question.

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## References

Anand, S. (1977). Aspects of poverty in Malaysia. *Review of Income and Wealth, 23*, 1–16.

Arriaga, E. E. (1970). A new approach to the measurement of urbanization. *Economic Development and Cultural Change, 18*, 206–218.

Bossert, W. (1990). Population replications and ethical poverty measurement. *Mathematical Social Sciences, 20*, 227–238.

Broome, J. (1996). The welfare economics of population. *Oxford Economic Papers, 48*, 177–193.

Chakravarty, S., Kanbur, S. R., & Mukherjee, D. (2006). Population growth and poverty measurement. *Social Choice and Welfare, 26*, 471–483.

Chateauneuf, A., & Moyes, P. (2006). A non-welfarist approach to inequality measurement, poverty and well-being. In M. McGillivray (Ed.), *Inequality*. Houndsmill (Basingstoke, Hampshire) and New York: Palgrave Macmillan.

Donaldson, D., & Weymark, J. A. (1986). Properties of fixed population poverty indices. *International Economic Review, 27*, 667–688.

Foster, J., Greer, J., & Thorbecke, E. (1984). A class of decomposable poverty measures. *Econometrica, 52*, 761–766.

Hassoun, N. (2010). *Another mere addition paradox? A problem for some common poverty indexes in variable populations*. WIDER Working Paper 2010/120. UNUI_WIDER, Helsinki. Available online: http://www.wider.unu.edu/publications/working-papers/2010/en_GB/wp2010-120/

Hassoun, N., & Subramanian, S. (2011). An aspect of variable population poverty comparisons, in press, corrected proof: *Journal of Development Economics*. Available online August 2011, http://dx.doi.org/10.1016/j.jdeveco.2011.07.004

Kanbur, S. R., & Mukherjee, D. (2007). Premature mortality and poverty measurement. *Bulletin of Economic Research, 19*, 339–359.

Kundu, A., & Smith, T. E. (1983). An impossibility theorem on poverty indices. *International Economic Review, 24*, 423–434.

Parfit, D. (1984). *Reasons and persons*. Oxford: Clarendon Press.

Pattanaik, P. K., & Sengupta, M. (1995). An alternative axiomatization of Sen's poverty measure. *Review of Income and Wealth, 41*, 73–80.

Paxton, J. (2003). A poverty outreach index and its application to microfinance. *Economics Bulletin, 9*, 1–10.

Reddy, S. G., & Miniou, C. (2007). Has world poverty really fallen? *Review of Income and Wealth, 53*, 484–502.

Sen, A. K. (1976). Poverty: An ordinal approach to measurement. *Econometrica, 33*, 219–231.

Shorrocks, A. F. (2005). *Inequality values and unequal shares*. Helsinki: UNU-WIDER. Available online at: http://www.wider.unu.edu/conference/conference-2005-5/conference-2005.5.htm

Subramanian, S. (2000). *Poverty measurement and the repugnant conclusion*. S. Guhan memorial series discussion paper 3. Madras Institute of Development Studies, Chennai.

Subramanian, S. (2002a). An elementary interpretation of the Gini inequality index. *Theory and Decision, 52*, 375–379.

Subramanian, S. (2002b). Counting the poor: An elementary difficulty in the measurement of poverty. *Economics and Philosophy, 18*, 277–285.

Subramanian, S. (2005a). Fractions *versus* whole numbers: On headcount comparisons of poverty across variable populations. *Economic and Political Weekly, 40*, 4625–4628.

Subramanian, S. (2005b). Headcount Poverty Comparisons, International Poverty Centre One Pager No. 18, United Nations Development Programme: Brasilia, Brazil.

Subramanian, S. (2006). Poverty measurement and theories of beneficience. In: *Rights deprivation, and disparity: Essays in concepts and measurement.* Delhi: Oxford University Press.

Subramanian, S. (2010). Variable populations and inequality-sensitive ethical judgments. In B. Basu, B. K. Chakrabarti, S. R. Chakravarti, & K. Gangopadhyay (Eds.), *Economics of games, social choices and quantitative techniques*. Milan: Springer.

Subramanian, S. (2011a). On a Normalized and replication-invariant "threshold" inequality measure. *Journal of Economic Theory and Social Development*, *1*.

Subramanian, S. (2011b). The focus axiom and poverty: On the co-existence of precise language and ambiguous meaning in economic measurement. *Economics: The Open-Access, Open Assessment E-Journal*, *6*, 2012-8. Available online at: http://dx.doi.org/10.5018/economicsejournal.ja.2012-8

Sundaram, K., & Tendulkar, S. D. (2003). Poverty among social and economic groups in India in the 1990s. *Economic and Political Weekly, 38*, 5263–5276.

# Chapter 6
# Some Recent Trends in Population, Employment and Poverty in India: An Analysis

**K. Sundaram**

**Abstract** Bringing together the results of the NSS 66th Round Employment-Unemployment Survey and the Provisional Population Totals of the 2011 Population Census, we examine the inter-play of demographic change, decisions on schooling and participation in the labour force, and the changes in the economy in shaping the size and structure of employment and the resultant impacts on labour productivity, real wages and poverty among those inside and outside the labour force in India over the period 2005–2010. We also offer a brief discussion on some issues in the measurement of poverty in India. A sluggish growth in the total number of workers on UPSS alongside an absolute reduction in the size of female workforce, and in the number of workers in agriculture and unorganized manufacturing are among the key results of our analysis. On the positive side we find a strong growth in employment in the organised manufacturing sector and in the number and share of regular wage salary workers; and, a strong growth in labour productivity and in real wages. We also find an across the board reduction in the proportion and count of the working poor between 2005 and 2010. These improvements in quality of employment must temper our disappointment with the small growth in the size of the workforce.

**Keywords** Population growth · Worker-population ratios · Size and structure of workforce · Measurement of poverty · Working poor

**JEL Codes** I32 · J11 · J23 · J31

## 6.1 Introduction

In this paper, we examine the interplay of demographic change, schooling and labour force participation decisions and the changes in the economy shaping the size and structure of employment and the resultant impacts on labour productivity,

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real wages and poverty among those inside and outside the labour force in India over the 2005–10 period. We also offer a brief discussion on some issues in the measurement of poverty in India.

An accelerated pace of slow-down in India's population growth over the 2001–2011 decade is one of the key results of the 2011 Population Census (Sect. 6.2). This slowdown, and, the underlying fertility decline is expected to shift the age-distribution away from children (0–14 age-group) towards adults—with the adults having significantly higher labour force participation rates (LFPRs). This shift in the age-distribution, with unchanged age-sex-specific LFPRs is, in turn, expected to lead to a surge in labour force. If these additions to labour force are productively absorbed, there would be a reduction in the dependency burden—defined as the proportion of children and the old (in the age-group 65 and above) to the adult working population. This is expected to lead to a virtuous cycle of higher savings and faster GDP growth. This is the so-called "demographic dividend" flowing from the slow-down in population growth that had attained salience in the context of analyses of the growth experience of several economies in East and South-East Asia—the so-called "East Asian Miracle". We analyse this issue in Sect. 6.3.

In analysing this issue of demographic dividend we need to ascertain whether the predicted consequence of the shift in age-distribution of the population in terms of large additions to labour force did indeed occur. This, in turn, requires one to examine the concurrent changes in the age-sex-specific LFPRS. Here, potentially, two types of factors could be at play.

First, parents could choose to keep their children in the education system longer to better endow them with skills and thereby raise the probability of and/or the returns from employment. And, this could even have been a factor in their prior decision to have fewer children in the first place leading to the realised fertility decline. Irrespective of the motivation, such a decision by parents to keep their children in the education system for a longer period would translate to higher school-participation rates and correspondingly lower LFPRs among older children and young adults.

Secondly, in respect of women, there is an additional factor. As Suresh and I had argued in our 2004 EPW paper (Sundaram and Tendulkar 2004), in part at least, participation of women in the labour force (typically in addition to carrying the full burden of bearing and rearing children) in poor households is driven by a compelling need to augment household income. So that, if wages and levels of living rise, one possible manifestation of the reduced pressure of poverty would be a significant reduction in female LFPRs extending well-beyond the "young-adult" age-groups relevant for decisions regarding continuance in the educational system. We show (Sect. 6.4) that, possibly, both factors have been in operation in the period 2004–05 to 2009–10 to significantly reduce the LFPRs—especially of women. Consequently, in spite of the realisation of the expected shifts in the age-distribution of the population we have only a very modest growth in labour force in the aggregate and an absolute reduction in female workforce. In interpreting this result,

especially the absolute reduction in female workforce, the nature of the activity status category (self-employment, regular wage/salary work, casual labour) where this reduction takes place is critical. For, in the case of the self-employed, both supply and demand for their labour is simultaneous. In their case a withdrawal of supply is not to be equated with job-losses for the regular wage/salary workers or the casual labourers: for the latter group it would reflect inadequate demand for labour, for the self-employed, however, the same cannot be inferred unless their withdrawal from labour force can be shown to be involuntary As we shall show subsequently what we have is a situation of a reduction in unemployment and a significant rise in real wage rates. This militates against the notion of an involuntary withdrawal of (formerly) self-employed women from labour force.

In analysing changes in the industrial distribution of workforce one key issue is the size of the work force in low-productivity sectors in general and in Agriculture in particular. In fact in early development models, notably that associated with (Lewis 1954), transfer of labour from agriculture towards higher productivity sectors defines the very process of development. Our analysis of the changes in the industrial distribution of the workforce highlights the sharp absolute decline in the number of workers in the agricultural sector and sizeable reduction in the share of this sector in total work force. It also brings out the contrasting outcomes on the quantity and quality dimensions of employment—including but not limited to rising labour productivity and real wages.

This is followed by a brief discussion of some issues in the measurement of poverty in India in Sect. 6.5 and an analysis of the working poor and of the population in other activity-status categories located in households below the poverty line (Sect. 6.6). Section 6.7 concludes the paper.

## 6.2 2011 Population Census: Some Key Results

The 2011 Population Census (Provisional Population Totals) places the all-India population as on 1st March 2011 at 1210.19 million up from 1028.74 million ten years earlier, (Paper 1 of 2011, Census of India, GOI 2011a). The implicit compound annual growth rate (CAGR) of 1.64% per annum (pcpa) over the 2001–2011 decade marks a significant slow-down from a CAGR of 1.97 pcpa over the 1991–2001 decade. In fact, over the period 1981–2011, the pace of decline in CAGR of all-India population has steadily risen: from 0.06% points in the 1981–1991 decade to 0.19% points in the 1991–2001 decade, and, now, in the 2001–2011 decade to 0.33% points.

The provisional population totals also indicate a small but welcome rise in the overall sex ratio (females per 1000 males) from 933 to 940 over the 2001–2011 decade. This shows up as a faster growth of the total female population at 1.68 pcpa relative to the 1.64 pcpa growth of the total population.

**Table 6.1** Census count of all-India population by gender and location: 2001–2011

| | | 2001 ('000s) | 2011 ('000s) | CAGR (percent per annum) |
|---|---|---|---|---|
| Rural | Males | 381,603 | 427,917 | 1.15 |
| | Females | 360,888 | 405,171 | 1.16 |
| | Persons | 742,491 | 833,088 | 1.16 |
| Urban | Males | 150,554 | 195,807 | 2.66 |
| | Females | 135,566 | 181,299 | 2.95 |
| | Persons | 286,120 | 377,106 | 2.80 |
| Total | Males | 532,223 | 623,724 | 1.60 |
| | Females | 496,514 | 586,469 | 1.68 |
| | Persons | 1028,737 | 1210,193 | 1.64 |

*Source* Census of India 2011, Provisional Population Totals, Paper 1 of 2011 and Paper 2 of 2011 (GOI, ORGI 2011b)

The 2011 Census results also show a sharp rise in the share of urban areas in total population from 27.8% in 2001 to 31.8% (Paper 2 of 2011 Census of India, GOI 2011b). To see this in perspective, it may be noted that in the official population projections for India and States 2001–2026 (2006) the Urban share in total all-India (projected) population, **in 2016** is lower at 31.1%.

Reflecting this sharp rise in the share of urban areas in total all-India population, we have the total (male plus female) Urban population growing at 2.8 pcpa over the 2001–2011 decade, compared to a mere 1.16 pcpa growth in total rural population. The improvement in the overall sex ratio in urban areas, from 900 and 926 (per 1000 males) is even more marked than that for the country as a whole. This is reflected in the urban female population growing at close to 3% per annum over the 2001–2011 decade, compared to 2.66 pcpa for urban males (see Table 6.1).

Even as the overall sex ratio has improved over the 2001–2011 decade, the sex ratio for children in the 0–6 age group has worsened from 934 to 919 in rural India; from 906 and 902 in urban India; and, from 927 to 914 in the country as a whole (Table 6.2). This has occurred **despite** the fact that the gains in probability of survival from birth to age 5 over the period 1996–2000 to 2006–2010 have been higher for girls—especially in rural India (Table 6.3). Given this, the reduction in the child sex ratio would appear to be largely reflective of a likely worsening of the ratio of girls to boys at birth—possibly reflecting a more wide-spread use of sex-selective abortions.

The improvement in the overall sex ratio despite a worsening of the child sex ratio reflects greater gains in life expectancy at age 5 for girls relative to boys over the period 1996–2000 to 2006–2010. Thus, in the country as a whole, SRS-based Abridged Life Tables (GOI, RGI 2012) show that the female life expectancy at age 5 rose from 64.9 to 67.8 years (i.e. a gain of 2.9 years) over the decade. For males, the life expectancy at age 5 rose more modestly from 62.3 to 63.9 years or by 1.6 years. In rural India, the gain in life expectancy at age 5 over this period was

**Table 6.2** Sex ratios (females per 1000 males) for the total and child (0–6 years) population by rural urban location: all India, 2001 and 2011. Sex-ratios (females per 1000 males)

| Population | Population of all ages | | Children in 0–6 years | |
|---|---|---|---|---|
| Segment | 2001 | 2011 | 2001 | 2011 |
| Rural | 946 | 947 | 934 | 919 |
| Urban | 900 | 926 | 906 | 902 |
| Total | 933 | 940 | 927 | 914 |

*Source* As in Table 6.1

**Table 6.3** Probability of survival from birth to completed age 5 by gender and rural urban location: all India, 1996–2000 and 2006–2010 (survival probabilities from birth of age 5 years)

| Segment | 1996–2000 | | 2006–10 | | Percentage Change | |
|---|---|---|---|---|---|---|
| | Boys | Girls | Boys | Girls | Boys | Girls |
| Rural | 0.89932 | 0.88624 | 0.92907 | 0.92121 | 3.31 | 3.95 |
| Urban | 0.94160 | 0.93860 | 0.95965 | 0.95566 | 1.92 | 1.82 |
| Total | 0.90756 | 0.89639 | 0.93595 | 0.92892 | 3.13 | 3.63 |

*Source* Office of the Registrar General of India SRS-based Abridged Life Table 1996–2000 and 2006–2010 (GOI, RGI 2012)

3.0 years for females and 1.6 years for males. For urban India, the gains in female life expectancy at age 5 was more modest at 2.00 years, but was still higher than that for urban males (1.5 years.)

## 6.3 Changes in Age-Distribution and the Issue of Demographic Dividend

In the previous section, we noted the significant slowdown in the (compound annual) growth rate of all India population from 1.97% in the 1991–2001 decade to 1.64% over the 2001–2011 decade. Underlying this deceleration in population growth is a significant reduction in the total fertility rate (TFR, for short) over the period 1998–2000 to 2008–10 (the latest 3-year period for which SRS based estimates of TFR are available). The TFRs declined from 3.5 to 2.8 in rural India, from 2.4 to 1.9 in Urban India, and from 3.2 to 2.6 for the country as a whole.

This reduction in fertility rates and the consequent reduction in the rate of growth of population is expected to shift the age-distribution away from children in the 0–14 age group towards the prime working age group (15–59) with some increase also occurring in the share of the population aged 60 and above. Given the higher labour force/work force participation rates among the non-children, in the absence of any concurrent changes in the age, sex, and gender specific participation rates, this change in the age-distribution of population will, **ceteris paribus**, raise the overall

labour force participation rates and thereby raise the rate of growth of labour force above that of the population as a whole. As noted previously, if households reduce the number of children they wish to have in part to afford better health and education for their children (who might otherwise have participated in the labour force), the extent of the ceteris paribus rise in the overall LFPR would be moderated.

Productive absorption of this faster growing labour force, in turn, is expected to raise the rate of growth of overall GDP with a virtuous cycle of higher saving and higher growth ensuing thereon. If this materializes, it will have a beneficial impact on poverty outcomes both from a higher GDP and a smaller population total.

In examining whether or not such a demographic dividend has occurred consequent on the clear slow-down in population growth in the 2001–2011 decade, we would need to examine the changes in the age distribution of the population as well as the changes in the age-specific labour force/work force participation rates.

At this point in time, age-distribution comparisons are possible only by reference to the quinquennial NSS employment-Unemployment Surveys. However, given that we have the 2011 (provisional) Census count of children in the 0–6 age-group (as on 1st March 2011), it is useful to compare the proportion of children in this age group as between the 2011 Population Census and the NSS 66th Round Employment Survey (with 1st January 2010 as the mid-point of the survey) to serve as a broad check on the observed age-distribution in the survey. This comparison shows that, at least in respect of the proportion of children in the 0–6 age-group in the four population segments (rural males, rural females, urban males and urban females) at the all-India level, the estimates from the two data sources are broadly in line with one another (Table 6.4).

Turning to a comparison of the age distribution of the population as per the NSS 61st round (2004–05) and the NSS 66th round (2009–10) Employment-Unemployment Surveys (See Table 6.5), in all the four population segments we see a clear decline in the share of the 0–14 age-group. In the case of urban males, this decline extends also to the 15–29 age group. This is offset by a rise in the share of the higher age-groups including the 60 and above age-group.

**Table 6.4** Proportion of children in the 0–6 age group by gender and rural-urban location: a comparison of NSS 66th rd. Employment-unemployment survey and 2011 population census provisional totals: all India (percentage of children in the 0–6 age group: all India)

| Gender | NSS 66th Rd. survey (2009–10) | | 2011 population census | |
|---|---|---|---|---|
| | Rural | Urban | Rural | Urban |
| Males | 14.05 | 11.57 | 14.32 | 11.07 |
| Females | 13.55 | 11.34 | 13.90 | 10.78 |

*Sources*

1. Census of India 2011, Provisional Population Totals, Paper 2 of 2011 (GOI, ORGI 2011b)
2. Computed from Unit Record Data of the NSS 66th Round Employment Unemployment Survey

**Table 6.5** Broad age distribution of population by gender and rural-urban location: all-India 2004–05 and 2009–10 (per 1000 distribution by broad age-groups)

| Age group | NSS 61st Ref. (2004–05) | | | | NSS 66th Ref. (2009–10) | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural | | Urban | | Rural | | Urban | |
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 0–14 | 365 | 343 | 287 | 287 | 333 | 311 | 271 | 255 |
| 15–29 | 253 | 258 | 300 | 283 | 261 | 263 | 294 | 289 |
| 30–44 | 191 | 208 | 219 | 227 | 199 | 217 | 224 | 234 |
| 45–59 | 120 | 116 | 130 | 127 | 130 | 128 | 138 | 136 |
| 60+ | 71 | 75 | 64 | 76 | 77 | 81 | 73 | 86 |
| All ages | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |

*Sources* NSS Report Numbers 515 and 537

The shifts in the age-distribution of the all-India population as between 2004–05 and 2009–10 in the four population segments broadly conforms to our prior expectations arising from the slow-down in the rate or growth of population in the 2001–2011 decade and the underlying decline in Total Fertility Rates over the same period.

Now, if the age, sex and location specific worker-population ratios (WPRs) had remained unchanged from the levels in 2004–05, then, the overall WPR for the country as a whole would have been higher in 2009–10 (436 per 1000) relative to 418 per 1000 in 2004–05. This would have occurred despite a significant rise in the share of urban population from 29.03 to 30.74%, and, a smaller rise from 48.34 to 48.44% in female share. Note in this context, that, for a given age-group and gender, rural WPRs are higher, and those for females (for given age-group and location) are lower (see Table 6.6).

However, as can be readily seen from Table 6.6, in the three age-groups 5–9, 10–14 and 15–29, the age-specific WPRs have fallen in all the four population segments over the period 2004–05 and 2009–10. The fall in WPRs, in the case of rural females is not only sharper but also extends to the higher age-groups.

In the absence of the observed shifts in age distribution, the overall WPRs would have declined from 546 (per 1000) to 525 for rural males; from 327 to 248 for rural females; from 549 to 530 for Urban males; and from 166 to 132 for Urban females. The shift in age-distribution marginally **raises** the overall WPR for rural males while moderating the decline in the overall WPRs in the other three population segments. To put it differently, in the absence of the observed shifts in the age-distribution over the 2005–2010 period, the overall WPR (for the country as a whole) would have fallen from 418 per 1000 to just 375 per thousand. Thanks to the age structure shifts that did occur over this period, the overall WPR in 2009–10 is 390 per thousand. Seen from this perspective, the age structure shift, has, as it were, ‘saved’ about 18 million jobs/work opportunities over the period 2004–05 to 2009–10. This in a sense represents the ‘demographic dividend’.

**Table 6.6** Per 1000 age-specific worker population ratios (WPRS) on UPSS by gender and rural-urban location: all India (WPRS (per 1000) on UPSS)

| Age-group | 2004–05 | | | | 2009–10 | | | |
|---|---|---|---|---|---|---|---|---|
| | RM | RF | UM | UF | RM | RF | UM | UF |
| 5–9 | 3 | 3 | 2 | 3 | 4 | 4 | 1 | 1 |
| 10–14 | 68 | 74 | 48 | 33 | 44 | 35 | 28 | 12 |
| 15–29 | 742 | 410 | 623 | 184 | 648 | 288 | 564 | 144 |
| 30–45 | 984 | 614 | 975 | 310 | 991 | 473 | 980 | 252 |
| 45–60 | 962 | 569 | 923 | 252 | 965 | 468 | 937 | 219 |
| 60+ | 644 | 263 | 366 | 100 | 646 | 226 | 341 | 70 |
| All ages (1) | 546 | 327 | 549 | 166 | 547 | 261 | 543 | 138 |
| All age(2) | (576) | (344) | (562) | (173) | (525) | (248) | (530) | (132) |

*Notes*
1. The all-ages WPR are based on the observed age distribution for the survey year
2. This row gives, for 2004–05, the all ages WPRs (in brackets) when age specific WPRs are reweighted with the age distribution observed in 2009–10. **Conversely**, for 2009–10, the figures in brackets represent weighted average of age specific WPRs weighted by the age-shares in population observed for the survey year 2004–05
3. RM, RF, UM, UF, refer to respectively, Rural Males, Rural Females, Urban Males and Urban Females
*Sources* NSS Report Numbers 515 and 537

## 6.4 Dimensions of Size and Quality of Employment 2004–05 to 2009–10

### *6.4.1 Dealing with Divergences in Population Estimates from the Population Census and the NSS Surveys*

In moving from the labour force/workforce population ratios to the size and structure of the workforce we start with the well-recognised fact that, for a variety of reasons, the survey-based estimates of aggregate population are significantly below those based on interpolations of the Census count of populations over two successive Population Censuses or, estimates based on official Population projections starting from the nearest Population Census. At the all-India level, the census-based estimate(s) of the total (rural plus urban and males plus females) population for the mid-point of the survey year(s) are higher than the survey-based estimate by 122.7 million on 1st January 2005 (the mid-point of the Survey year 2004–05) and by close to 167 million on 1st January 2010 (Table 6.7).

The problems are not fully solved by multiplying the total all-India WPR by the Census-based estimate of total all-India population. Problem arises from the fact that **the extent** of divergence between the Census-based and the Survey-based estimates of total population varies significantly as between the rural and the

**Table 6.7** All-India population by gender and rural-urban locations as on 1st January 2005 and 2010: NSS estimates and census-based estimates. All-Indian population (in '000s)

| Population segment | 1st January 2005 | | | 1st January 2010 | | |
|---|---|---|---|---|---|---|
| | NSS 61 estimates | Census based estimates | Percentage difference | NSS 66th | Census based estimates | Percentage difference |
| Rural males | 369,196 | 399,146 | 8.11 | 381,035 | 422,429 | 10.86 |
| Rural females | 355,154 | 377,701 | 6.35 | 360,703 | 399,944 | 10.88 |
| Rural persons | 724,350 | 776,847 | 7.25 | 741,739 | 822,373 | 10.88 |
| Urban males | 128,970 | 166,375 | 29.00 | 146,010 | 189,822 | 30.01 |
| Urban females | 118,602 | 151,407 | 27.66 | 132,772 | 175,178 | 31.94 |
| Urban persons | 247,572 | 317,782 | 28.36 | 278,782 | 365,000 | 30.93 |
| Total male | 498,166 | 565,521 | 13.52 | 527,045 | 612,251 | 16.17 |
| Total female | 473,756 | 529,108 | 11.68 | 493,475 | 575,122 | 16.55 |
| Total persons | 971,922 | 1094,629 | 12.63 | 1020,520 | 1187,373 | 16.35 |

*Notes* Census based estimates are based on interpolation from the 2001 and 2011 Population Census counts by Gender and rural urban location
NSS Estimates have been computed from Unit Record Data of the NSS 61st and 66th Round Employment Unemployment Surveys

urban-areas, and also as between males and females in both segments for 2005 and at least in urban areas for 2009–10.

In view of the foregoing, a widely used procedure for estimating the size and structure of workforce at the all-India level is to derive the estimates of workforce for the four population segments separately and aggregate them as necessary for estimates by gender and rural-urban location. For each of the four population segments, the estimates of labour force/workforce are derived by multiplying the Census-based estimates of population for the mid-point of the Survey-year by the corresponding (all-ages) LFPR/WFPR.[1] This is the procedure used by the Planning Commission. Suresh and I, in our papers on employment in India have also followed this route.[2]

To follow up on a comment by Professor T.N. Srinivasan[3] at my presentation of an earlier version of this paper (which had followed the procedure just outlined) at this Conference, it was decided to explore, as a first step, the extent of divergence between the Census-based and the survey-based estimates of population, separately

[1]The use of LFPR/WFPR for all-ages would be appropriate provided the age-distributions from the NSS Employment-Unemployment Surveys are at least broadly in line with those from the Census or Census-based population projections (see Sundaram 2007b).

[2]See, Sundaram and Tendulkar (2002), and Sundaram (2007a, b).

[3]The central burden of Professor Srinivasan's comment was that there was no automatic presumption that the "excess" (of Census—count over the Survey-based estimate of) population had the same labour force characteristics as those captured by the survey.

for the four population segments, at the level of individual States and Union Territories for which survey-based estimates are available.

Not surprisingly (see Appendix Tables A.6.1 and A.6.2 for the two Survey-years), the extent of divergence between the Census-based and the Survey-based estimates of Population varies sharply across states, by gender, and rural-urban locations as well as between the two years. Thus, for the survey-year 2004–05 (NSS 61st Round), for rural areas of Kerala the Census-based estimate of male (female) population was only 95 (92) percent of the Survey-based estimate. In contrast, for rural Bihar, the Census-based estimates are **higher** by 25% for males and by 26% in respect of females. For the smaller states, the variation **across** states is much sharper. The ratio of Census-based estimates to the survey estimates varied from 3.0 (Nagaland) to 0.73 (**Chandigarh**).

In the case of urban areas, among **the larger states**, the excess of Census-based estimate over the corresponding survey estimate varies from just 7% (Himachal Pradesh) to 68% (Jharkhand) for males and from 16% (Himachal Pradesh) to 64% (Jharkhand) for females. A similar picture is seen for 2009–10.

Following the logic underlying the procedure used by us (as well as by the Planning Commission), it was decided to build-up the all-India estimates of workforce, unemployed, students and others outside the labour force by **multiplying** the state/segment/gender specific Census-based population estimates by the respective survey-based estimates of the proportion of workers, the unemployed, the students and non-student population outside the labour force to the (survey estimate) of population. The all-India estimates are then derived separately for the four population segments, by aggregating the estimates derived as above across States and Union Territories. The corresponding all-India estimates of ratios—such as WPR, LFPR etc.—are then derived by dividing the level estimates so-derived, by the Census-based population totals. These ratios will in effect be a **weighted** a**verage** of the state specific LFPR/WFPR etc., **weighted** by the share of the State in the respective all-India (Census-based) estimate of population. By the same token, the survey based estimates of all-India LFPR/WFPR etc. represent a weighted average of state specific ratios weighted, this time, by the ratio of the survey-based estimate of the population of the state under reference to the survey-based estimate of the all-India population.

If we compare the all-India per 1000 distribution of population by broad activity status categories on UPSS that is derived by aggregation from state-level estimates (with Census-based population estimates for the individual States) against the direct survey based estimates for all-India (which are based on the survey-based estimates of population for the individual states) we get a pleasant surprise: **the two-sets of activity-status ratios are very close to one another**, **with differences**, **where present**, **occurring at the third decimal place**. (See Table 6.8).

The reason for the closeness of the two sets of ratios turns out be, unsurprisingly, a very close correspondence of the population shares of the individual states in the

**Table 6.8** Per 1000 distribution of population by activity status on UPSS obtained by aggregation from state level estimate with survey-based and census based population weights: all india, 2004–05 and 2009–10

| Per 1000 Distribution by Activity Status | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2004–05 | | | | 2004–05 | | | |
| | Survey-based weights | | | | Census-based weights | | | |
| | WPR | PUE | SPR | Other OLF | WPR | PUE | SPR | Other OLF |
| Rural males | 546 | 9 | 262 | 183 | 544 | 9 | 263 | 183 |
| Rural females | 327 | 6 | 211 | 456 | 325 | 6 | 210 | 459 |
| Urban males | 549 | 22 | 268 | 161 | 548 | 22 | 269 | 161 |
| Urban females | 166 | 12 | 249 | 573 | 166 | 13 | 249 | 572 |
| | 2009–10 | | | | 2009–10 | | | |
| | Survey-based weights | | | | Census-based weights | | | |
| | WPR | PUE | SPR | Other OLF | WPR | PUE | SPR | Other OLF |
| Rural males | 547 | 9 | 290 | 154 | 546 | 9 | 291 | 154 |
| Rural females | 261 | 4 | 235 | 500 | 257 | 4 | 235 | 504 |
| Urban males | 543 | 16 | 288 | 153 | 543 | 16 | 288 | 153 |
| Urban females | 138 | 8 | 255 | 599 | 137 | 9 | 255 | 599 |

*WPR* Worker-population ratio
*PUE* Proportion unemployed
*SPR* Student-population rates
*Other OLF* Non-students outside the labour force
*Source* Computed from Unit Record Data for NSS 61st and 66th Round Employment Unemployment Surveys and Interpolation of the population Counts from the 2011 and 2011 Population Censuses

all-India population as between the census-based and the survey-based estimates of population. (See Appendix Tables A.6.3.R and A.6.3.U for 2004–05 and A.6.4.R and A.6.4.U for 2009–10).

This result provides a partial support[4] to the procedure used by us (earlier) and by others for deriving the all-India estimates of the size and structure of the workforce, the unemployed, the student population, and of non-students outside the labour force.

[4]The support is only partial because the state-specific level and ratio estimates are still based on the survey design and multipliers that are based on population estimates of (typically) an earlier (rather than the current) Population Census—in the case of rural areas—and on the latest Urban Frame Survey (UFS) for the urban areas. These have not been altered to reflect the results of the 2011 Population Census. Also, if part of the explanation for the divergence between the Census & NSS Survey estimates of population arise from possible inadequate capture in the Survey of large households (say, with 7 or more members), or due to any other reason, we cannot adjust for the same.

### 6.4.2 Activity-Status Ratios: 2005–2010

Examining the activity-status ratios on UPSS that are derived by aggregating the level estimates over the States (with population estimates based on interpolations between 2001 and 2011 Census counts) and expressing the resulting sum as a ratio of the all India population (again based on interpolation between 2001 and 2011 Censuses) we have the following key results.

**For males** the overall WPRs have remained more or less unchanged as between 2004–05 and 2009–10, though, as discussed earlier, this has been made possible by the shifts in the age-structure-away from children and towards the prime working age-groups over the same period.

Staying with the males, over the period 2005–2010, there has been a sizeable reduction in the proportion of non-student population outside the labour force (**NSOLF**, for short) in both segments. This reflects, almost entirely, a **rise** in the proportion of student population. In the case Urban India the reduction in the proportion of NSOLF-population is partially offset by a decline in the proportion of population that is unemployed on UPSS. This reduction in proportion unemployed, added to the small reduction in WPR, yields a reduction in overall LFPR by 11 points per 1000.

In the case of **females**, in both, rural and urban India, there has been a fairly steep fall in the worker population ratios between 2005 and 2010 **despite t**he age-structure shifts over the same period. This decline in WPR has been particularly steep in the case of rural females-close to 7% points—with a **decline** in LFPR of the same order.

The bright **spot** in this picture is the sizeable rise in the **student-population ratios (SPRs)** over the same period, especially in rural areas. For males in both segments this rise in the student population ratios is sufficient to reduce significantly the proportion of NSOLF in the population.

Let us examine further this rise in the SPRs by considering the changes in the age specific SPRs by gender and rural-urban location over the period 2005–2010. It is seen (Table 6.9) that there has been an increase in the age-group-specific SPRs in each of the 5-year age-group in the age interval 5–29.[5] As is to be expected, given the initial levels of SPR, the gains have been larger in rural areas and for the females. So that, in almost all the (component) age-groups, the gender-gap has been reduced, and, generally speaking, the rural-urban gap has also been reduced. In fact, reflecting the differences in the age-composition of the rural males and urban males, the overall (all-ages) student population ratio for the rural males is fractionally higher than that for their urban counterparts.

Another impact of the changes in the age-distribution of population over the 2005–2010 period is that the observed rise in overall SPR is under-stated. A proper

[5]These are the direct survey-based estimates of all-India age-specific SPRs rather than those based on an aggregation of state-level estimates (with census-based population shares as weights).

**Table 6.9** School-participation rates (on UPSS) by gender, age and rural-urban location: all-India: 2004–05 and 2009–10. Proportion of population attending educational institutions on UPSS (per 1000)

| Age group | (2004–05) | | | | (2009–10) | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural | | Urban | | Rural | | Urban | |
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 5–9 | 802 | 768 | 887 | 874 | 859 | 841 | 924 | 913 |
| 10–14 | 858 | 761 | 898 | 878 | 910 | 869 | 936 | 936 |
| 15–19 | 436 | 315 | 587 | 567 | 573 | 741 | 701 | 682 |
| 20–24 | 91 | 39 | 215 | 149 | 166 | 75 | 297 | 234 |
| 25–29 | 9 | 3 | 31 | 9 | 12 | 5 | 39 | 25 |
| All ages | 262 | 211 | 268 | 249 | 290 | 235 | 288 | 255 |
| All-ages (with 2010 age structure) | 255 | 198 | 260 | 226 | | | | |

*Source* NSS Reports 515 and 537

comparison would involve a re-working of the all-age SPR of 2004–05 using the 2009–10 age structure. Such a comparison yields larger gains in overall SPR.

Two further points may be noted:

First, we observe a small, but a still welcome, trend of rise of SPRs in the older (20–29) age-groups. This portends well for the human-capital content of the additions to labour force over the next decade and more.

Secondly, we still have substantial gaps in SPRs between rural and urban areas and as between males and females. This, taken together with first point just noted, leads me to believe that the downward drift of the overall female WPRs will continue for some more time—possibly for the next 5–10 years. This tendency will be reinforced if, as one expects, living standards continue to improve with a withdrawal of woman from work on the subsidiary status as a possible consequence. Recently released results for the NSS 68th Round Employment-Unemployment Survey (2011–12) appears to confirm this—at least in the case of rural women.

### *6.4.3 The Employed, the Unemployed and the Students*

In the country as a whole and taking all the four population segments together, the number of workers on the usual (principal plus subsidiary) status increased by a meagre 3.9 million over the period 2005–2010. In other words, the average annual addition to work force was less than 0.8 million. There was also a decline in the number of the unemployed by **1.24 million** over the same period. This, of course, implied that the growth in aggregate labour force was even smaller at 2.65 million, that is, by barely half-a-million per annum (See Table 6.10).

**Table 6.10** Number of workers, unemployed, students and others outside the labour force (OLF) on UPSS: all-India, 2004–05 to 2009–10, by gender and rural-urban location*. Number of persons ('000s)

| 2004–05 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | RM | RF | RP | UM | UF | UP | M | F | P |
| Employed | 217,387 | 122,636 | 340,023 | 91,238 | 25,175 | 116,413 | 308,625 | 147,811 | 456,436 |
| Un-employed | 3494 | 2098 | 5592 | 3651 | 1940 | 5591 | 7145 | 4038 | 11,183 |
| Students | 104,923 | 79,368 | 184,291 | 44,702 | 37,642 | 82,344 | 149,625 | 117,010 | 266,635 |
| Other OLF | 73,343 | 173,599 | 246,942 | 26,784 | 86,650 | 113,434 | 100,127 | 260,249 | 360,376 |
| Total population | 399,147 | 377,701 | 776,848 | 166,375 | 151,407 | 317,782 | 565,522 | 529,108 | 1,094,630 |
| 2009–10 | | | | | | | | | |
| | RM | RF | RP | UM | UF | UP | M | F | P |
| Employed | 230,486 | 102,727 | 333,213 | 103,013 | 24,107 | 127,120 | 333,499 | 126,834 | 460,333 |
| Unemployed | 3805 | 1520 | 5325 | 3066 | 1549 | 4615 | 6871 | 3069 | 9940 |
| Students | 122,918 | 94,239 | 217,157 | 54,655 | 44,639 | 99,294 | 177,573 | 138,878 | 316,451 |
| Other OLF | 65,220 | 201,458 | 266,678 | 29,088 | 104,883 | 133,971 | 94,308 | 306,341 | 400,649 |
| Total population | 422,429 | 399,944 | 822,373 | 189,822 | 175,178 | 36,500 | 612,251 | 575,122 | 1,187,373 |

*Notes* *For details related to data see GoI (2006).
*RM* Rural Males; *RF* Rural Females; *RP* Rural Persons
*UM* Urban Males; *UF* Urban Females; *UP* Urban Persons
*M* Total Males; *F* Total Females; *P* Total Persons
*Source* Computed from Unit Record Data of the NSS 61st and 66th Round Employment Unemployment Surveys, with estimates for all India built up by aggregating estimates at the State- level with State-level estimates of Population for the mid-point of the two survey years obtained by interpolation of population counts from the 2011 and 2011 Population Censuses

Against this relatively small growth in the workforce and the labour force, there has been a major expansion in the student population. Over the period 2005–2010, the number of persons currently attending an educational institution increased from 266.6 million in 2005 to 316.5 million in 2010, i.e. an increase of close to 50 million in the student population at an annual average rate of 10 million over this period. When this sizeable student population enters the labour market over the next decade and more they will have a greater measure of human-capital embedded in them and would be more employable and productive. The central point is that the demographic dividend from the slow-down in population growth realised over the 2001–2011 decade, while not translating into a big jump in the work force in the period under review (2005–2010), can indeed materialise in the medium-term with sizable additions of a more educated and employable work force. In this case we will have a deferment but not a negation of the demographic dividend.

Underlying the meagre increase in the total workforce between 2005 and 2010 is a massive (close to 21 million) decline in female workforce. Nearly all of this decline (19.9 million) occurs in rural India. In order to understand this further, let us examine the activity-status composition of the workforce (see Table 6.11). Taking both rural and urban female workforce together, we observe that the number of **self-employed** (female) workers declines from 90.2 to 67.6 million, that is, by 22.7 million. This is larger than the total decline in female workforce. As in the case of the aggregate female workforce, the decline in the number of female self-employed workers is predominantly in the rural areas. Thus the number of such workers in rural India declines from 78.3 million in 2004–05 to 57.7 million i.e.by 20.6 million.

A break-up of the self-employed women workers in terms of own-workers, employers, and helpers in family-enterprises (see Table 6.12) shows that over 86% of the decline among rural female self-employed workers is accounted for by a 17.7 million decline in the number of (typically) unpaid helpers. In the case of urban India, the decline in the number of female unpaid helpers (1.87 million) accounts for over 92% of the total decline in the number of female self-employed workers (2.03 million between 2005 and 2010).

A further break up of self employed women working as helpers in family enterprises in terms of those who are in the work force on the Usual principal status and those in the workforce only on the subsidiary status (see Table 6.13) shows that nearly half (46%) of the decline in the number of such workers (on UPSS) between 2005 and 2010 is accounted for by the withdrawal from the workforce among those who were so engaged only on the subsidiary status.

From the above, it is clear that, overwhelmingly, the sharp decline in female workforce reflects a withdrawal of unpaid helpers and that among such workers also, nearly half of the decline relates to those who were in the workforce only on the subsidiary status. This fact needs to be borne in mind while assessing the implications of the meagre growth in aggregate workforce between 2005 and 2010 and before bemoaning a so-called "jobless growth".

From the perspective of incomes in rural household, another facet of the changing activity composition of the rural workforce needs to be noted. We refer

**Table 6.11** Broad activity-status distribution of usual principal plus subsidiary status (UPSS) workforce by gender and rural-urban location, all-India, 2004–05 to 2009–10

| Number of Workers ('000 s) 2004–05 | | | | | |
|---|---|---|---|---|---|
| | Self employed | Regular wage/salary worker | Casual labour in pub. works | Other casual labour | Total |
| Rural males | 127,165 | 19,344 | 354 | 70,524 | 217,387 |
| Rural females | 78,328 | 4460 | 210 | 39,638 | 122,636 |
| Rural persons | 205,493 | 23,804 | 564 | 110,162 | 340,023 |
| Urban males | 40,726 | 37,102 | 99 | 13,311 | 91,238 |
| Urban females | 11,883 | 9033 | 19 | 4240 | 25,175 |
| Urban persons | 52,609 | 46,135 | 118 | 17,551 | 116,413 |
| Male (R + U) | 167,891 | 56,446 | 453 | 83,385 | 308,625 |
| Female (R + U) | 90,211 | 13,493 | 229 | 43,878 | 147,811 |
| Persons (R + U) | 258,102 | 69,939 | 682 | 127,713 | 456,436 |
| 2009–10 | | | | | |
| | Self employed | Regular wage/salary worker | Casual labour in pub. works | Other casual labour | Total |
| Rural males | 123,895 | 19,280 | 1858 | 85,453 | 230,486 |
| Rural females | 57,696 | 4349 | 2431 | 38,251 | 102,727 |
| Rural persons | 181,591 | 23,629 | 4289 | 123,704 | 333,213 |
| Urban males | 42,384 | 42,9499 | 446 | 17,234 | 103,013 |
| Urban females | 9857 | 9563 | 100 | 4587 | 24,107 |
| Urban persons | 52,241 | 52,512 | 546 | 21,821 | 127,120 |
| Male (R + U) | 166,279 | 62,229 | 2304 | 102,687 | 333,499 |
| Female (R + U) | 67,553 | 13,912 | 2531 | 42,838 | 126,834 |
| Persons (R + U) | 233,832 | 76,141 | 4835 | 145,525 | 460,333 |

*Source* See Table 6.10

**Table 6.12** Composition of female self-employed workers: all-India 2004–05 and 2009–10. Number of female self-employed workers ('000s)

| 2004–05 | | | | Total | 2009–10 | | | Total |
|---|---|---|---|---|---|---|---|---|
| | Own-workers | Employer | Helper | | Own-workers | Employer | Helper | |
| Rural | 18,822 | 628 | 58,878 | 78,328 | 16,068 | 516 | 41,112 | 57,696 |
| Urban | 5900 | 197 | 5786 | 11,883 | 5782 | 155 | 3920 | 9857 |
| Total | 24,722 | 825 | 64,664 | 90,211 | 21,850 | 671 | 45,032 | 67,553 |
| (Per 1000) | (274) | (9) | (717) | (1000) | (323) | (10) | (667) | (1000) |

*Source* See Table 6.10

**Table 6.13** Helpers among self-employed women on usual principal and subsidiary status: all-India, 2004–05 to 2009–10 ('000s)

| Number of women working as Helpers ('000s) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2004–05 | | | 2009–10 | | | Change over the period | | |
| | On UPS | On SS | On UPSS | On UPS | On SS | On UPSS | On UPS | On SS | On UPSS |
| Rural | 38,156 | 20,722 | 58,878 | 28,773 | 12,339 | 41,112 | (−) 9383 | (−) 8383 | (−) 17,766 |
| Urban | 4099 | 1687 | 5786 | 2890 | 1030 | 3920 | (−) 1209 | (−) 657 | (−) 1866 |
| Total | 42,255 | 22,409 | 64,664 | 31,663 | 13,369 | 45,032 | (−) 10,592 | (−) 9040 | (−) 19,632 |
| | | | | | | | (540) | (460) | (1000) |

*Source* See Table 6.10

here to the sharp rise in the number of both male and female casual labourers working in public works projects. Among rural females, the increase in the number of such workers by a little over 2.2 million more than offsets the decline in women causal labourers in activities other than public works. Given that, for rural females the average daily earnings of causal labourers in public works are **higher** than those for casual labourers in other activities[6] this significant rise in the share of those engaged in public works among rural female casual labourers would have, **ceteris paribus**, a positive impact on rural household incomes.

More positively, in the county as a whole, the period 2005–2010 witnessed a sizeable growth in the number of regular wage/salaried workers. Against an increase of less than 4 million in aggregate workforce, the number of regular wage/salaried workers increased by 6.2 million. As we have argued elsewhere (see Sundaram in A. Vaidyanathan and K.L. Krishna 2007a), this relatively strong growth in the number of regular wage/salaried workers constitutes a good measure of growth of jobs and of better quality employment.

### *6.4.4 Industrial Distribution, Productivity Growth and Real Wages*

In Table 6.14 we present the distribution by broad industry groups of the aggregate work force on Usual (principal plus subsidiary) status, the gross value-added (GVA), and labour productivity measured by GVA per worker, for 2004–05 and 2009–10.

The most noticeable feature of the changes in the industrial distribution of the workforce is a reduction by over 21 million in the number of workers in the

[6]For the Agricultural Year 2009–10, the average daily earnings of adult rural women working as casual labour in MGNREGA public works was Rs 87.20, and, for casual labour in other (non-MGNREGA) public works was Rs 86.11. In contrast, the average daily earnings for rural female casual labourers in all other activities was only Rs 68.94 or, about 20% lower than the average daily earnings in public works. See NSS Report No: 537 (GOI 2011).

**Table 6.14** Workforce (WF), gross value-added (GVA), labour productivity (GVA/WF) by broad industry groups: 2004–05 and 2009–10*

| | (2004–05) | | | (2009–10) | | | CAGR of GVA/WF (PCPA) |
|---|---|---|---|---|---|---|---|
| Industry group | Workforce (millions) | GVA (Rs Crores) | GVA/WF (Rs) | Workforce (millions) | GVA (Rs Crores) | GVA/WF (Rs) | |
| 1. AFF | 257.559 | 565,426 | 21,953 | 236.436 | 656,975 | 27,787 | 4.8 |
| 2. M + Q | 2.646 | 85,028 | 321,345 | 2.922 | 103,999 | 355,917 | 2.1 |
| 3. Manufacturing | 55.676 | 453,225 | 81,404 | 52.703 | 713,428 | 135,368 | 10.7 |
| 4. EGW | 1.312 | 62,675 | 477,706 | 1.329 | 88,654 | 667,073 | 6.9 |
| 5. Construction | 25.960 | 228,855 | 88,157 | 44.228 | 355,918 | 80,473 | (-) 0.2 |
| 6. THR | 49.569 | 477,303 | 96,291 | 52.305 | 736,628 | 140,833 | 7.9 |
| 7. TCS | 18.440 | 250,417 | 135,801 | 20.775 | 456,654 | 219,809 | 10.1 |
| 8. FIREBS | | | | | | | |
| Total | 7.769 | 437,174 | | 10.365 | 771,763 | | |
| Less dwellings | Nil | (166,511) | | Nil | (200,664) | | |
| FIREBS (Net) | 7.769 | 270,663 | 348,388 | 10.365 | 571,099 | 550,988 | 9.6 |
| 9. SCP | 37.505 | 411,361 | 109,682 | 39,270 | 609,724 | 155,265 | 7.2 |
| 10. Total | 456.436 | 2,804,953 | 61,453 | 460.333 | 4,293,079 | 93,260 | 8.7 |

*Note* * For details related to data refer GOI (2004-05, 2009-10)
*Source* See Table 6.10

agriculture, forestry and fishing (AFF) sector and a consequent reduction by 5% points (from 56.4 to 51.4%) in the share of this sector in the workforce.

As Professor Tendulkar and I have argued elsewhere (Sundaram and Tendulkar 2002), given the fact that labour productivity (as measured by GVA/WF) is the lowest in this sector (under Rs 22,000 per annum in 2004–05) an absolute reduction in the size of the workforce in this sector and the consequent reduction in its share in the total workforce is to be welcomed as it will raise the overall labour productivity[7]. Not surprisingly, alongside a 16% increase in the real value added in this sector over the period 2004–05 to 2009–10, labour productivity in the Agriculture, Forestry and Fishing sector rose by close to 27% at a compound annual growth rate (CAGR) of 4.8% over this period.

Another key sector that has suffered an absolute reduction in the size of its workforce is the manufacturing sector—from 55.7 to 52.7 million. Consequently, the share of this sector in the total workforce declines from 12.2 to 11.4% over this period. A break up of manufacturing employment (on UPSS) in terms of Usual principal and subsidiary statuses (Table 6.15) shows that, close to 50% of this decline in manufacturing sector employment is due to a reduction in the number of workers in this sector who are in the workforce only on the subsidiary status.

A more positive aspect of the changes in manufacturing sector employment between 2004–05 and 2009–10 brought out in Table 6.15 is the sizeable (38%) increase in employment in the organised segment of the manufacturing sector. As per the results of the Annual Survey of Industries (ASI) for 2004–05 and 2009–10, the total number of "persons engaged" covering both workers and employees other than workers (including supervisory and managerial staff) rose from 8.18 to 11.28 million. With this, the employment share of the organised segment, with its higher productivity, wages and generally better working conditions, rose from 14.7% in 2004–05 to a little over 21% in 2009–10.

A corollary of this concurrent decline in aggregate manufacturing employment **and** a rise in the organised sector manufacturing employment is a decline over the 2005–2010 period in manufacturing employment in the un-organised sector. A further analysis of employment in unorganised manufacturing (not reported here)

[7]In our joint paper on the Working Poor, Professor Tendulkar and I argued as below:

Raising the productivity of labour, defined by gross value-added per worker in real terms in any given activity or sector, requires that the increments to the number of workers employed in that activity or sector are less than proportional to the increments in gross value-added. In the economist's jargon the widely used gross elasticity of employment with respect to growth (in GVA) will be less than 1. Now, given the distance yet to be travelled in terms of reaching satisfactory levels of labour productivity and returns to labour tied to productivity in major sectors of the economy, the policy makers would need to plan not only for elasticity of employment with respect to GVA that is less than 1 *but also for scenarios with declining employment elasticity in individual sectors*. There are also several sectors where the number of workers should decrease: the over-sized bureaucracy and over-manned public sector units across a wide-swathe of industries and the, over-crowded low productivity sectors with considerable underemployment like agriculture and lower-end personal services are the obvious examples (Sundaram and Tendulkar 2002, emphasis added).

**Table 6.15** A principal/subsidiary status and organised-unorganised sector break-up of total manufacturing employment (on UPSS): all-India, 2004–05 to 2009–10

| Workforce in the Manufacturing Sector (in millions) | | | |
|---|---|---|---|
| | 2004–05 | 2009–10 | Change over the period |
| *Total employment* | | | |
| On UPS | 50.98 | 49.41 | (−)1.57 |
| On SS | 4.69 | 3.29 | (−)1.40 |
| On UPSS | 55.67 | 52.70 | (−)2.97 |
| Organised sector employment (ASI) | | | |
| (All on UPS) | 8.18 | 11.28 | 3.10 |
| Unorganised sector employment | | | |
| On UPS | 42.80 | 38.13 | (−)4.67 |
| On SS | 4.69 | 3.29 | (−)1.40 |
| Total unorganised sector employment | 47.49 | 41.42 | (−)6.07 |

*Notes*

1. The numbers for organised sector Employment in Manufacturing covers "Total Persons Engaged" in NIC 2 digit codes 15–37 (NIC 2004) as reported in the Annual Survey of Industries 2004–05 and 2009–10, with some adjustment for prima facie over/mis-statement of number of Managerial and supervisory personnel in Industry group 265 (NIC 2008) part of Industry Division 33 as per NIC 2004) for Karnataka. All workers in the organised sector are assumed to be workers on the usual Principal Status
2. Estimates of aggregate Manufacturing Employment are drawn from Table 6.14

shows that this decline occurs in all but five of the twenty-four 2-digit industry groups. These five industry groups are: publishing, printing and reproduction of recorded media (Industry group 22, as per NIC 2004); coke, refined petroleum products, and nuclear fuel (NIC Code 23); basic metals (NIC code 27), machinery and equipment n.e.c. (NIC code 29); and electrical machinery and apparatus n.e.c (NIC Code 32). On the losing side, the biggest decline in unorganised sector employment has been textiles (NIC Code 17) with a reduction of a little under 3 million (2.89 million).

As in the case of the agricultural sector, a sizeable reduction in the total manufacturing sector employment along with an over 57% rise in manufacturing sector GVA over the same period results in a compound growth rate of GVA/WF in the manufacturing Sector of close to 11% per annum between 2005 and 2010. As Suresh and I have repeatedly argued in our earlier work on employment, a lower elasticity of employment with respect to growth in value added and a faster growth in labour productivity are but two sides of the same coin (see footnote 7).

A telling illustration of this last point is provided by the construction sector. Employment in this sector grew from a little under 26 million in 2004–05 to 44.3 million (i.e. by a little over 70%) in 2009–10. However, with the gross value added in this sector growing by a little under 56%, the GVA per worker in this sector declined from Rs 88, 157 to Rs 80, 473. It is elementary arithmetic. It is important that we are careful about what we wish for in terms of elasticity of employment with respect to value added growth for individual industry/sector. This

is particularly so in sectors where labour productivity levels are still low. In fact, in the case of the construction sector we have a situation where, starting from a position where labour productivity is higher (by over 43%) than the average for the economy as a whole, we get to a point where it is lower than that for the economy as a whole by close to 14%.

The central point of this focus on labour productivity growth with low elasticity of employment with respect to gross value added is that in a market economy rising real wages are predicated on a rising labour productivity in real terms. In our joint paper on the working poor (Sundaram and Tendulkar 2002), Suresh and I had argued that such a rise in labour productivity which makes possible rising real wages in a market economy was necessary for removing poverty among the working poor and those dependent on them.

This argument needs to be reiterated and so I reproduce below the relevant passage:

> Currently, a large proportion of the workforce in general, and of the working poor in particular, is located in low productivity activities/sectors with low returns to labour as an inescapable concomitant reality. Removing poverty, especially among the working poor and those dependent on them requires a steady and sustained rise in real returns to labour. And given that casual labourers are a major if not the dominant component of the working poor, rising real wage rates, along with expanded labour absorption in quantitative terms, is a necessity. In a market economy, rising real wages are predicated on rising labour productivity in real terms (Sundaram and Tendulkar 2002, p. 70).

We also argued further that "given the imperative (of) low or declining gross employment elasticity with respect to value added in real terms (see footnote 7 above), faster volume growth of real output is clearly needed to absorb the projected annual additions to labour force…" and, that the "focus of employment policy that combines quantity and quality dimensions must, therefore, shift to a more rapid rate of overall economic growth…" (Sundaram and Tendulkar 2002, p. 71).

Considering the economy as a whole the meagre growth in aggregate workforce between 2005 and 2010 also meant that labour productivity in the economy as a whole grew at a compound rate of close to 9% per annum (see Table 6.14). It is no surprise therefore that real wage rates of both men and women, for casual labourers as well as regular wage/salaried workers, and in both rural urban areas grew significantly over this period.

For casual labourers, real wages grew at a compound annual rate of close to or above 4% between 2005 and 2010 (see Table 6.16). For regular wage/salaried workers, the lowest compound annual rate of growth was 3% for rural males while it was over 5% for urban males. What is more heartening is the fact that generally, with one exception, real wage rates for female workers have grown significantly faster than that for their male counterparts. The sole exception is the case of casual labourers in urban India where both for males and females the real wage rates grew at roughly the same rate. To put it differently, again with the exception of casual labourers in urban India, the gender gap in real wages has declined over the period 2004–05 and 2009–10. To illustrate, for casual labourers in rural India, female wage rates as a proportion of male wage rates rose from 63.5% in 2004–05 to

**Table 6.16** Average daily wage earnings of adult (15–59) regular wage/salary workers and casual labourers by gender and rural-urban location: all India, 2004–05 to 2009–10

| Average Daily Wage Earnings | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Segment/type | 2004–05 | | 2009–10 at current prices | | Inflation Factor | 2009–10 at 04–05 current prices | | CAGR of real wage rate | |
| | Males | Females | Males | Females | | Males | Females | Males | Females |
| **Rural** | | | | | 1.485[a] | | | | |
| RWS | 144.93 | 85.53 | 249.15 | 155.87 | | 167.78 | 104.96 | 3.0 | 4.2 |
| Casual labourers | 55.03 | 34.94 | 101.53 | 68.96 | | 68.37 | 46.44 | 4.4 | 5.9 |
| **Urban** | | | | | 1.441[b] | | | | |
| RWS workers | 203.28 | 153.19 | 377.16 | 308.79 | | 261.73 | 214.29 | 5.2 | 6.9 |
| Casual Labourers | 75.10 | 43.88 | 131.92 | 76.73 | | 91.55 | 53.25 | 4.0 | 3.9 |

*Notes*

[a]For rural areas, a re-weighted CPIAL—to reflect the share of food in the total expenditure of Agricultural Labourers in 2004 to 05—is used to derive the inflation adjustment for the 2004–05 to 2009–10 period

[b]For urban areas, the CPIIW for July–June 2004–05 and (1982 = 100) indices for six major item—groups comprising the General index are re-weighted with the weighting diagram of CPIIW: 2001 = 100. Using the linking factor, we derive the CPIIW for 2004–05 with 2001 = 100. These are compared to the index for 2009–10 (with 2001 = 100) for deriving the inflation factor

67.9% in 2009–10. Again, in the case of regular wage/salary workers in urban India, this ratio went up from 75.4% in 2004–05 to 81.9% in 2009–10.

In the penultimate section we shall examine the impact of the changes in the size and structure of the workforce, labour productivity and real wages between 2004–05 and 2009–10 on the size and structure of the working poor over the same period. But before we do so, a few comments are offered in the next section on the issue of measurement of poverty in India.

## 6.5 Some Issues in the Measurement of Poverty in India

Professor Tendulkar has been a major contributor to the sizeable literature on poverty in India. And, beginning with our 1983 EPW paper on "Poverty Reduction in Sixth Plan: Population Factor and Rural-Urban Equity," it has been my privilege to have co-authored with Suresh numerous articles, papers and reports on this subject over a period of a quarter-of-a century and more. Unsurprisingly, I will be drawing on some of our joint papers in the paragraphs that follow. More specifically, I will be drawing on the 1993 Sundaram-Tendulkar paper on "Poverty in Asia Pacific: Conceptual Issues and National Approaches to Measurement" (Economic Bulletin for Asia and the Pacific, UN ESCAP)—hereafter referred to simply as the ESCAP-paper. I will also be drawing on my unpublished paper offering an appreciation of Suresh's work on Poverty, Employment and Public Policy presented at the 48th TIES Conference (Sundaram 2012).

Recently there has been a lot of debate and criticism—not always fair—of the poverty lines for 2004–05 suggested by the Tendulkar Committee.[8] Much of the controversy has centred around the inadequacy (from the perspective of meeting the basic needs) of Rs 32/per-capita per-day as the price-adjusted value of the 2004–05 poverty line proposed by the Tendulkar Committee.

A few points on this critique are in order:

Let us begin by noting that when the Report came out in November 2009, there was very little concern expressed about the 2004–05 urban poverty-line—at a little over Rs 19 per-capita per-day—about that amount being too low. This fact, incidentally, also vindicates the Committee's position of this figure being a reasonable starting point for deriving the poverty lines for the urban areas of individual States and for the corresponding rural areas, and, from that for all-India rural by appropriate price indices. More importantly from the point of the criticism of Rs 32/per-capita per-day, the change in the public perception about it would appear to be about the procedures adopted and the data-base used to adjust for inflation since

[8]The Expert Group to Review the Methodology for Estimation of Poverty set up by the Planning Commission had Professor Tendulkar as the Chairman and Professor R. Radhakrishna & Dr. Suranjan Sengupta as members who had signed the report. Regrettably, one has seen little in the form of a response to the criticisms of the report from the members of the committee—especially since Suresh was no more there to defend the position of the committee.

2004–05 rather than about the poverty-line for 2004–05 as proposed by the Committee.

It is of course entirely possible to re-draw the absolute poverty line to reflect current social sensibilities on this issue. Indeed, the new Expert Group under the Chairmanship of Dr. C. Rangarajan has been set-up by the Planning Commission (GOI 2012) with precisely such an end in view.[9]

Two further comments:

First, for assessing the change in poverty between two points of time—say 2004–05 and 2009–10—there is no alternative but to adjust the base year poverty line for the rise in prices over this period of the goods and services comprising the base year poverty line basket (PLB).

The second point to be made in the context of deriving anew a fresh set of poverty lines is something that Suresh and I stated nearly two decades ago in our ESCAP paper. I quote:

> The absolute poverty line is not the aggregation of expenditure needed for purchasing the commodities and services required for fulfilling all the basic needs. This follows from the problems of objective norm specification as well as those of aggregation across interdependent needs (discussed earlier in the paper) and from the fact that households are not uniform in their composition, tastes and location across climatic conditions. There is therefore an inherent and irreducible element of arbitrariness in the specification of the absolute poverty line and (there is) no alternative but to treat it as broadly representing a "low enough yet reasonable minimum living standard" (Sundaram and Tendulkar 1993, p. 45).

I would like to underline the idea of "low enough" in specifying, de novo, the absolute poverty line. For, it is always possible to specify a poverty line such that three-fourths or more of the all-India population would be below it. Such a construct would, in my view, rob the concept of poverty of any operational cutting edge in policy formulation and implementation. For starters, such an all-India poverty line would imply that in the relatively-poorer states/regions, almost the entire population is below the poverty line!

Admittedly, making this judgement about what constitutes "a low-enough yet reasonable minimum living standard" is easier said than done. This task is not made any easier by the analytical arguments—going back to Sukhatme (1982), Srinivasan (1992) and Sundaram and Tendulkar (1993)—and the empirical evidence (see Deaton and Dreze 2009) against anchoring the poverty line to calorie norms—*even if* the latter were to be reworked by reference to the current structure of the population.

Having rejected the anchoring of the poverty line to calorie-norms, it is indeed a mystery why the Tendulkar committee goes into what it calls "external validity checks… with regard to nutritional, educational and health outcomes" (GOI 2009, p. 8).

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[9]This Expert Group, with Dr. C. Rangarajan as chairman, has as its members Dr. S. Mahendra Dev, Director IGIGDR, Dr. Mahesh Vyas, MD & CEO of CMIE, Dr. K.L. Dutta, formerly adviser, Perspective Planning Division, Planning Commission, and, myself. Needless to say, the views presented here are those made in my personal capacity and should in no way be seen as reflecting the views of other Members of the Expert Group.

As regards nutrition outcomes, except in the case of "weight-for-height" measure, other anthropometric measures of undernourishment reflect an "outcome of a situation where, over a *sustained* period, the nutritional intake of the individual under reference has remained inadequate. As against this, the focus of measurement by reference to the absolute poverty line is on purchasing power and its disposition in the *current* period … (and) one can at best capture the deficiency in intake of nutrients in the current period. There is however, no necessary presumption that those who are identified (on the stated assumptions) as having been in that state over a sustained period in the past as well." (Sundaram and Tendulkar 1993, p. 47, emphasis added). See also Suryanarayana (2011).

As regards educational outcomes, in our 1993 ESCAP-paper referred to earlier, Suresh and I had noted that: "the observed outcomes, in terms of say the proportion of illiterates in the adult population, would primarily reflect the cumulative impact of past provisioning of public services and private decisions to avail of these services and to utilize a part of private purchasing power for the same and for buying essential complementary goods and services. The role of resources (public and private) *currently committed* to this end would be important primarily in shaping *future outcomes*" (Ibid., p. 47, emphasis added).

In respect of health outcomes, the problems of using indicators of these outcomes—mortality/morbidity—are more basic. Mortality indicators are not even defined at the level of an individual person/household. As for morbidity indicators, which also are defined for population groups, they could be seriously misleading and out of alignment with mortality indicators for the same population. This can be readily seen from a comparison of NSS Survey-based morbidity indicators for, say, Kerala and Jharkhand.

This feature of the mortality/morbidity indicators that they are appropriately defined only for population groups would also automatically rule them out as a component of any measure of poverty relevant for the design and implementation of polices targeted at individuals or individual households.

If health status outcomes cannot be a meaningful part of a measure of poverty focused on individual persons/households can we at least define a normative level of private expenditure on health in defining the poverty line? In answering this question a few features of the household expenditure on healthcare need to be kept in view.

First and foremost, household expenditures on healthcare—focusing here on curative healthcare-are in the nature of contingent liabilities in the sense that they arise if and only if and when someone in the household falls ill or suffers an injury. But, when such a contingency does arise, the expenditures can be quite substantial and estimates of average expenditure on health carry little meaning to the affected household.[10]

[10]The case of private expenditure on health insurance is, strictly speaking, a part of financing strategy of the household to meet such contingent liabilities as and when they arise.

Secondly, the prevalence and incidence of several diseases –which underlie the probability of a member of a household falling ill—are crucially dependent on the public provision of a range of goods and services—drinking water, sewage and sanitation facilities, Vaccination services, to name just a few—and the access of the households to them.[11] This factor, in turn, raises questions about the very idea of a *normative* level of private expenditure on health.

Finally, inferring the "required" health expenditures from household consumer expenditure surveys runs into a different sort of a problem. What gets recorded—in fact what can get recorded—are the "out-of-pocket" expenses incurred by the households. Specifically, it excludes a sizeable component of "costs" of healthcare that are met by publicly provided services at heavily subsidized "user charges"—if not provided free.

From another perspective, deprivation of households in respect of access to a range of public goods and services such as drinking water, sewage and sanitation facilities, vaccination services is indeed measurable. Some of these deprivations are sometimes listed as components of what is referred to as multi-dimensional measure of poverty. Some comments/reservations on this are in order.

First, these and other similar goods and services are public goods and, therefore, their provision to the population must be on a universal basis. Specifically, this public provisioning must not be tied to the "poverty-status" of the household or individual.

A second set of problems would arise if deprivation in respect of services that are in the nature of inputs shaping outcomes such as incidence of malnutrition are aggregated with such outcome indicators.

There is, firstly, the problem of these indicators being not independent of one another. Further, even if the indicators that are sought to be combined are indeed independent of one another and hence aggregable in principle, there is the problem of analytically appropriate rules of aggregation. Also, as I had argued over a decade ago (Sundaram 2003) such an aggregation results in loss of information from the perspective of design and implementation of policies targeting individual components.

Finally, given the public goods character of these services, an efficient design of policy would focus on locations of inadequate supply rather than on the number and identity of "poor" households with poverty being defined by reference to another metric.

[11]The improvements in mortality/morbidity indicators that have been realized over the past two decades or so cannot be fully understood without factoring-in the increase in public expenditure in this sector. Also important has been the growth in the expenditures in the provision of a range of healthcare services by non-profit institutions serving households—NPISH in National Accounts terminology. At least a part of the explanation for the growing divergence between the National Accounts estimate of Private Final Consumption Expenditure and the NSS estimates of household consumer expenditure over the same period is tied to this last-mentioned factor.

Such problems referred to above-especially in respect of aggregation of indicators irrespective of whether or not they are independent of one another-also apply to other indicators such as access to land.

To cut a long story short, there are no clear and easy answers to the issue of defining a poverty cut-off in terms of generalised purchasing power by reference to which one could track changes (variations) in levels of living of the poor over time (across space).

As professor Tendulkar and I had recognised nearly two decades age, this cut-off is essentially, and inherently, arbitrary, with "low-enough yet reasonable minimum living standards" as the only guide. There are however some policy initiatives that in my view can significantly mitigate the consequences of any misjudgements one may make in drawing this arbitrary cut-off to demarcate the poor in the society. These would include a public policy on universal provisioning of public goods and services; support for a universal health insurance to cover the contingent liability of large costs of health care; and, last but not the least, a policy of ensuring access to essential food at reasonable prices to at least the vulnerable sections of the society if not to all. This last is a key component of Scitovsky's notion of equity: a concept that deeply influenced Suresh's writings on inequality and poverty in India.

## 6.6 On the Working Poor and the Other Poor in BPL-Households

The Sundaram and Tendulkar (2002) ILO working paper on the working poor in India was, to the best of our knowledge, the first effort to operationalise, for India, the concept of the working poor i.e. workers located in households below the poverty line. We followed this up, in 2004, with a paper on The Poor in the Indian Labour force Scenario for the 1990s (Sundaram and Tendulkar 2004). My 2007 paper on employment and poverty in India (Sundaram 2007a, b), carried forward this analysis to cover the 2000–2005 period. In this section, using the same methodology and using the Population Census-based population estimates for the mid-point of the NSS survey years 2004–05 and 2009–10, we provide comparable estimates of those inside and outside the labour force who are located in households below the poverty line. For this exercise we use the poverty lines for 2004–05 suggested by the Tendulkar Committee and the update of the same by the Planning Commission using the methodology recommended by the Tendulkar Committee for 2009–10.

Any analysis of the activity-composition of the population for India necessarily involves the use of the NSS Employment-Unemployment Surveys (EUS, for short). As is well known, in the EUS only a short one-page worksheet is canvassed to record the monthly consumption expenditure of the surveyed households. It is also well recognized that the canvassing of such an abridged worksheet results in a general understatement of consumption expenditure of the households. This, in turn, implies that one cannot directly apply the selected poverty-lines to the

distribution of households ranked by per-capita consumer expenditure based on EUS to demarcate the poor households—a necessary first step for any analysis of the activity-composition of the members of the households so demarcated. Instead, as we had spelt out in our 2004 EPW paper referred to above, we follow a two-step procedure.

In the first step, we derive the proportion of households below the specified poverty line (s) from the NSS Consumer Expenditure Survey (CES, for short). In the next step, after ranking the EUS households from the lowest to the highest monthly per-capita expenditure(MPCE), we find that level of MPCE at which the cumulated proportion of households is just equal to the proportion of BPL households as derived in step 1 (using CES). That cut-off level of MPCE from EUS is taken to be the appropriate poverty line for use with the EUS data to identify and characterize the poor households in the Employment-Unemployment Survey. This is set out in Table 6.17.

As we did in the case of estimates of workers, the unemployed etc. in Sect. 6.4, we derive the estimates of the working poor etc. separately for rural males, rural females, urban males, and, urban females, but with the difference that instead of building-up the ratio estimates from the level of States up to the all-India level, they are derived directly at the all-India level.

Even without getting into the activity-status characterization of the BPL–population in EUS, we have an interesting result in Table 6.17.

The head count ratios (HCR's) in terms of persons is higher than that derived from CES despite the proportion of households below the (EUS-appropriate) poverty line being the same (by construction) as those derived from CES. In terms of absolute number of the poor, at the all-India level, we have about 8.7 million more poor.

**Table 6.17** Derivation of poverty lines for EUS for estimating the size and structure of the working poor: all-India, 2004–05 to 2009–10

| Item | 2004–05 | | 2009–10 | |
|---|---|---|---|---|
| | Rural | Urban | Rural | Urban |
| CES poverty lines: Tendulkar CTC/Tendulkar methodology: (Rs 0.00) head count ratios (CES) (%) | 446.48 | 578.80 | 672.80 | 859.60 |
| Persons | 41.8 | 25.7 | 33.8 | 20.9 |
| Households (estimates) | 36.8 | 20.1 | 28.7 | 15.6 |
| EUS poverty lines (Rs 0.00) | 435.66 | 550.17 | 645.8 | 805.25 |
| EUS HCRs with EUS poverty lines | | | | |
| Households (%) | 36.8 | 20.1 | 28.7 | 15.6 |
| Persons (%) | | | | |
| With NSS population | 42.8 | 26.2 | 34.6 | 21.4 |
| With census population | 42.9 | 26.3 | 34.6 | 21.4 |

*Source* Computed from Unit Record Data for the NSS 61st and 66th Round Employment Unemployment Surveys

**Table 6.18** Broad activity-status composition of the poor by gender and rural-urban location: all-India, 2004–05 to 2009–10

| Population segment/activity status | Employed | Unemployed | Students | Other OLF | Total |
|---|---|---|---|---|---|
| 2004–05 number of poor (in '000s) | | | | | |
| Rural | 134,118 | 1659 | 78,798 | 118,367 | 332,942 |
| Urban | 29,128 | 1191 | 20,888 | 32,324 | 85,531 |
| Males | 104,222 | 2025 | 54,623 | 48,786 | 209,646 |
| Females | 59,024 | 825 | 45,063 | 101,905 | 206,817 |
| Total | 163,246 | 2850 | 99,686 | 150,691 | 416,463 |
| 2009–10 number of poor (in '000s) | | | | | |
| Rural | 103,625 | 1582 | 78,573 | 100,927 | 284,707 |
| Urban | 25,355 | 853 | 21,440 | 30,620 | 78,268 |
| Males | 91,125 | 1838 | 53,621 | 36,329 | 182,913 |
| Females | 37,855 | 597 | 46,392 | 95,218 | 180,062 |
| Total | 128,980 | 2435 | 100,013 | 131,547 | 362,975 |

*Source* See Table 6.17

In Table 6.18, we present a break-up of the all-India poor population by four broad activity-status categories: workers, the unemployed, students, and non-students outside the labour force. These estimates are presented separately for rural and urban India (in each case for both sexes taken together), and, for males, females and persons—taking both rural and urban estimates together.

In 2004–05, there were 163.25 million workers on UPSS who were in BPL-households. This is the estimate of the working poor for 2004–05. Adding the 2.85 million unemployed in such households, the size of the labour force in poverty in India in 2004–05 was a little over 166 million representing roughly 40% of the total poor population.

Also, close to 100 million persons—roughly 25% of the poor—were students, with the non-students outside the labour force accounting for the balance 35%.

Over the period 2004–05 to 2009–10, the number of the working poor in the country as a whole declined by over 34 million, with the bulk of this decline of 34 million occurring in rural India (30.5 million).

In terms of gender, women contributed close to 62% of the total decline in the number of the working poor. While the sizeable decline in the number of women workers was an important contributory factor, women in the workforce also experienced a full 10% point decline in their HCRs—from 39.93% in 2004–05 to 29.85% in 2009–10.

A concomitant decline in the number of the unemployed on UPSS over this period meant that, in the country as a whole, the number persons in labour force located in households below the poverty line declined by 34.7 million.

Another interesting result is that, despite an increase of close to 50 million in the total student population in the country between 2004–05 and 2009–10, the number

**Table 6.19** Head count ratios and number of poor among workers on UPSS by gender and rural-urban location: all-India, 2004–05 to 2009–10

| Head count ratios (%) and number of poor workers ('000s) | | | | |
|---|---|---|---|---|
| Population segment | 2004–05 | | 2009–10 | |
| | HCR | Number of poor | HCR | Number of poor |
| Rural | 39.4 | 134,118 | 31.1 | 103,625 |
| Urban | 25.0 | 29,128 | 20.0 | 25,355 |
| Males | 33.8 | 104,212 | 27.0 | 91,125 |
| Females | 39.9 | 59,204 | 29.9 | 37,855 |
| Persons | 35.8 | 163,246 | 28.0 | 128,980 |

*Source* See Table 6.17

**Table 6.20** Head count ratios and number of poor by broad activity status of workers on UPSS: all-India, 2004–05 to 2009–10

| Head count ratios (%) and number of poor workers ('000s) | | | | |
|---|---|---|---|---|
| Activity-status categories | 2004–05 | | 2009–10 | |
| | HCR | Number of poor | HCR | Number of poor |
| Self employed | 32.3 | 83,261 | 24.1 | 56,514 |
| RWS-workers | 16.0 | 11,209 | 11.4 | 8697 |
| C.L. in Pub. Works | 43.7 | 298 | 37.9 | 1832 |
| Other C. L. | 53.6 | 68,478 | 42.6 | 61,937 |
| Total W. F. | 35.8 | 163,246 | 28.0 | 128,980 |

*Source* See Table 6.17

of students in poor households increased be a mere 0.3 million. To put this differently, the proportion of students in BPL-households fell from 37.4 to 31.6% over this period.

In terms of headcount ratios among workers in different population segments, we had already noted the more than 10% point reduction in the female workforce. For the country as a whole the HCR for the total workforce declined from 35.8 to 28.0%, while in rural India, the decline in headcount ratio for the (male plus female) workforce at 8% points was higher than that for their urban counterparts who experienced a more modest 5% point reduction in HCR-albeit starting from a significantly lower level (25% compared to 35.8% for rural workforce) in 2004–05 (see Table 6.19).

In terms of broad activity-status categories among workers, in the country as a whole, in both years, the poverty ratio is the highest for "Other Casual Labourers" while the lowest head count ratio is recorded by the "Regular Wage/Salary" (or RWS) workers, and this was a mere 11% in 2009–10 (Table 6.20).

In both 2004–05 and 2009–10, the self-employed workers had a significantly lower HCR than the other casual labourers. Numerically, however, in 2004–05, the self-employed constituted the single-largest category among the working poor.

Thanks to a sharp decline in the absolute size of the self-employed workforce—from 258.1 to 233.8 million—and a sizeable (over 8% points) decline in the HCR for such workers, the number of the self-employed poor declined by nearly 27 million between 2005 and 2010. At 56.5 million, the self-employed poor were fewer in number than other casual labourers in BPL households (61.9 million). Taken together, these two categories of workers constituted close to 92% of the total workforce in poor households (Table 6.20).

This all-round reduction in poverty ratios and in the count of the number of the working poor is one of the most important facets of the improvement in the quality of employment over the 2005–2010 period.

## 6.7 Summary and Conclusions

A significant slow-down in the rate of growth of population; a rise in the overall sex ratio (despite a worsening of the sex-ratio of children in the 0- to 6 age-group); and, a sharp rise in the share of urban areas over the 2001–11 decade were highlighted in Sect. 6.2 as some of the key results of the 2011 population census.

Section 6.3 brought out the age-structure shifts—away from children and towards prime working age-groups—consequent on the slow-down in the rate of growth in population and the underlying declines in total fertility rates over the 2001–11 decade. An analysis of the changes in the age-specific worker-population ratios brings out the sharp decline in the WPRs in all the four population segments —especially sharp in the case of rural women—between 2005 and 2010. So that we have a decline in the overall WPRs for women in both rural and the urban areas—though the extent of this decline is moderated by the shift in age-distribution of the population away from children and towards the adult age-groups. In the absence of the moderating impact of the age-structure shifts, the overall WPR for the country as a whole would have been 375 per 1000 instead of 390 per thousand in 2009–10. Seen from this perspective the age-structure shift has, as it were "saved" about 18 million jobs/work opportunities and this could be viewed as a possible measure of the "demographic dividend" flowing from the slow-down in the rate of growth of population and the resultant shift in the age-distribution of the population.

Section 6.4 examined the changes in the size and structure of the workforce on the usual (principal plus subsidiary) status (UPSS for short) between 2004–05 and 2009–10. A key result here is the extremely modest growth in the total workforce over this period reflecting a sharp decline in the female workforce—especially in rural India. This decline in female workforce, in turn, is seen as a consequence of a sharp decline in self-employed women—primarily those working as unpaid workers in family enterprises and that too on the usual subsidiary status. Counterbalancing this modest rise in total workforce is the sharp rise in the student population aided by a sharp rise in the student-population ratios (SPRs for short) in

all the five-year age-groups in the age-interval 5–19 years and a small, but still welcome rise in the SPRs in the 20–24 and the 25–29 age-groups.

An examination of the changes in the industrial distribution of the workforce highlights the sharp decline in the low productivity agriculture sector and in the unorganised segment of the manufacturing sector balanced by a sharp growth in the workforce in the construction sector. To reiterate a point that Professor Tendulkar and I have made in some of our earlier papers on Employment, a slow-growth in employment relative to the growth in value added in individual industries/sectors—especially in low-productivity sectors-is to be welcomed as implying a faster growth in value-added per worker, which, in turn, paves the way for rising real wage rates. This indeed is precisely what happened in the 2005–10 period.

Section 6.5 offers a brief discussion on some issues in the measurement of poverty in India—essentially re-emphasising a point made by Suresh and I some two decades ago that setting of a poverty cut-off in terms of generalised private purchasing power is inherently arbitrary with "a low-enough yet reasonable minimum" as the only guidance still available.

Section 6.6 carries forward the work by Sundaram and Tendulkar on the working poor to examine the changes in the size and structure of the workers, the unemployed, the students and others outside the labour force located in households below the Tendulkar Committee poverty line over the period 2005–2010.

An all-round reduction in poverty ratios and in the count of the number of the working poor over this period is one of the most important facets of the improvement in the quality of employment between 2005 and 2010. A significant increase in labour productivity across sectors, a sizeable rise in the number of workers in organized manufacturing sector and in the number and share of regular wage/salary workers, rising real wage rates for both casual labourers and regular wage/salary workers in all the four population segments, and a reduction in gender gap in wages are the other elements of the improvements in the quality of employment between 2005 and 2010. Any disappointment about the sluggish growth in the total number of workers in the economy over this period must be tempered by an appreciation of all these elements of improvement in employment quality.

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## Annexure Tables

**Table A.6.1** Ratio of census-based estimate to survey-based estimate of population by gender, rural-urban location and states: 2004–05

| State name | Rural | | Urban | |
|---|---|---|---|---|
| | Male ratio | Female ratio | Male ratio | Female ratio |
| Jammu and Kashmir | 1.65 | 1.64 | 1.72 | 1.60 |
| Himachal Pradesh | 1.07 | 1.02 | 1.07 | 1.16 |
| Punjab | 1.05 | 1.02 | 1.23 | 1.18 |
| Chandigarh | 0.73 | 0.74 | 1.15 | 1.11 |
| Uttaranchal | 1.13 | 1.09 | 1.33 | 1.25 |
| Haryana | 1.02 | 0.97 | 1.20 | 1.23 |
| Delhi | 0.80 | 0.85 | 1.31 | 1.34 |
| Rajasthan | 1.11 | 1.07 | 1.15 | 1.08 |
| Uttar Pradesh | 1.09 | 1.04 | 1.18 | 1.15 |
| Bihar | 1.24 | 1.26 | 1.50 | 1.50 |
| Sikkim | 1.12 | 1.11 | 1.53 | 1.50 |
| Arunachal Pradesh | 1.26 | 1.30 | 2.48 | 2.52 |
| Nagaland | 3.01 | 2.97 | 1.77 | 1.74 |
| Manipur | 1.25 | 1.26 | 1.40 | 1.42 |
| Mizoram | 1.14 | 1.19 | 1.79 | 1.75 |
| Tripura | 0.97 | 0.97 | 1.59 | 1.48 |
| Meghalaya | 1.16 | 1.16 | 1.89 | 1.63 |
| Assam | 1.06 | 1.14 | 1.64 | 1.56 |
| West bengal | 1.02 | 0.99 | 1.25 | 1.24 |
| Jharkhand | 1.15 | 1.16 | 1.68 | 1.64 |
| Orissa | 1.05 | 1.02 | 1.22 | 1.22 |
| Chhattisgarh | 0.98 | 0.96 | 1.40 | 1.47 |
| Madhya Pradesh | 1.02 | 1.04 | 1.26 | 1.24 |
| Gujarat | 1.03 | 1.05 | 1.35 | 1.35 |
| Daman & Diu | 1.22 | 1.02 | 2.39 | 1.48 |
| D & N Haveli | 1.02 | 1.07 | 4.19 | 3.14 |
| Maharashtra | 1.06 | 1.06 | 1.22 | 1.20 |
| Andhra Pradesh | 1.06 | 1.04 | 1.28 | 1.24 |
| Karnataka | 1.08 | 1.08 | 1.31 | 1.33 |
| Goa | 1.09 | 0.92 | 1.92 | 1.85 |
| Lakshadweep | 0.82 | 1.12 | 1.22 | 1.16 |
| Kerala | 0.95 | 0.92 | 1.45 | 1.50 |
| Tamil Nadu | 1.07 | 1.03 | 1.39 | 1.40 |
| Pondicherry | 1.21 | 1.12 | 1.35 | 1.35 |
| A & N Islands | 1.41 | 1.28 | 1.27 | 1.21 |

*Source* Computed from Unit Record Data for the NSS 61st and 66th Round Employment Unemployment Surveys, and, Interpolation of population counts from the 2002 and 2011 Population Censuses

**Table A.6.2** Ratio of census-based estimate to survey-based estimate of population by gender, rural-urban location and states: 2009–10

| State name | Rural | | Urban | |
|---|---|---|---|---|
| | Male ratio | Female ratio | Male ratio | Female ratio |
| Jammu and Kashmir | 1.47 | 1.40 | 1.82 | 1.62 |
| Himachal Pradesh | 1.09 | 1.06 | 1.48 | 1.25 |
| Punjab | 1.15 | 1.12 | 1.25 | 1.29 |
| Chandigarh | 0.26 | 0.16 | 1.45 | 1.27 |
| Uttaranchal | 1.01 | 1.08 | 1.35 | 1.36 |
| Haryana | 1.03 | 1.06 | 1.23 | 1.26 |
| Delhi | 0.77 | 0.59 | 1.35 | 1.57 |
| Rajasthan | 1.10 | 1.08 | 1.16 | 1.14 |
| Uttar Pradesh | 1.15 | 1.12 | 1.24 | 1.20 |
| Bihar | 1.24 | 1.26 | 1.32 | 1.34 |
| Sikkim | 0.97 | 1.00 | 2.12 | 2.33 |
| Arunachal Pradesh | 1.20 | 1.29 | 1.39 | 1.39 |
| Nagaland | 1.91 | 1.87 | 1.97 | 1.98 |
| Manipur | 1.22 | 1.26 | 1.41 | 1.57 |
| Mizoram | 1.23 | 1.28 | 1.66 | 1.61 |
| Tripura | 0.99 | 0.99 | 1.65 | 1.53 |
| Meghalaya | 1.12 | 1.20 | 1.45 | 1.26 |
| Assam | 1.07 | 1.15 | 1.50 | 1.54 |
| West bengal | 1.08 | 1.14 | 1.55 | 1.55 |
| Jharkhand | 1.18 | 1.25 | 1.64 | 1.60 |
| Orissa | 1.11 | 1.10 | 1.40 | 1.37 |
| Chhattisgarh | 1.06 | 1.10 | 1.45 | 1.45 |
| Madhya Pradesh | 1.02 | 1.05 | 1.30 | 1.31 |
| Gujarat | 1.05 | 1.09 | 1.19 | 1.23 |
| Daman & Diu | 0.66 | 0.75 | 2.21 | 1.63 |
| D & N Haveli | 1.02 | 0.97 | 2.07 | 2.04 |
| Maharashtra | 1.12 | 1.11 | 1.24 | 1.26 |
| Andhra Pradesh | 1.06 | 1.06 | 1.26 | 1.30 |
| Karnataka | 1.16 | 1.13 | 1.24 | 1.29 |
| Goa | 0.51 | 0.58 | 2.29 | 2.06 |
| Lakshadweep | 0.70 | 0.70 | 1.84 | 1.73 |
| Kerala | 0.83 | 0.81 | 1.85 | 1.84 |
| Tamil Nadu | 1.10 | 1.02 | 1.19 | 1.21 |
| Pondicherry | 1.22 | 1.09 | 1.20 | 1.21 |
| A & N Islands | 1.20 | 1.20 | 1.06 | 1.03 |

*Source* Computed from Unit Record Data for the NSS 66th Round Employment Unemployment Survey, and, Interpolation of population counts from the 2001 and 2011 Population Censuses

**Table A.6.3.R** Percentage share of individual states in all-India population as per census and NSS 61st round by gender, for rural areas: 2004–05

| | Male share | | Female share | | Total share | |
|---|---|---|---|---|---|---|
| | NSS | Census | NSS | Census | NSS | Census |
| Jammu and Kashmir | 0.70 | 1.07 | 0.67 | 1.03 | 0.69 | 1.05 |
| Himachal Pradesh | 0.73 | 0.72 | 0.79 | 0.76 | 0.76 | 0.74 |
| Punjab | 2.26 | 2.19 | 2.16 | 2.07 | 2.21 | 2.13 |
| Chandigarh | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Uttaranchal | 0.79 | 0.82 | 0.85 | 0.87 | 0.82 | 0.85 |
| Haryana | 2.22 | 2.09 | 2.12 | 1.93 | 2.17 | 2.01 |
| Delhi | 0.14 | 0.11 | 0.12 | 0.09 | 0.13 | 0.10 |
| Rajasthan | 5.83 | 6.01 | 5.86 | 5.91 | 5.85 | 5.96 |
| Uttar Pradesh | 18.21 | 18.42 | 18.05 | 17.66 | 18.13 | 18.05 |
| Bihar | 9.15 | 10.51 | 8.67 | 10.25 | 8.92 | 10.39 |
| Sikkim | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| Arunachal Pradesh | 0.11 | 0.12 | 0.10 | 0.12 | 0.10 | 0.12 |
| Nagaland | 0.07 | 0.20 | 0.07 | 0.20 | 0.07 | 0.20 |
| Manipur | 0.20 | 0.23 | 0.20 | 0.23 | 0.20 | 0.23 |
| Mizoram | 0.06 | 0.06 | 0.05 | 0.06 | 0.06 | 0.06 |
| Tripura | 0.39 | 0.35 | 0.38 | 0.35 | 0.38 | 0.35 |
| Meghalaya | 0.24 | 0.26 | 0.25 | 0.27 | 0.24 | 0.26 |
| Assam | 3.21 | 3.15 | 2.95 | 3.16 | 3.08 | 3.16 |
| West Bengal | 8.14 | 7.64 | 8.22 | 7.67 | 8.18 | 7.66 |
| Jharkhand | 2.70 | 2.87 | 2.66 | 2.91 | 2.68 | 2.89 |
| Orissa | 4.25 | 4.12 | 4.50 | 4.29 | 4.37 | 4.20 |
| Chhattisgarh | 2.44 | 2.22 | 2.59 | 2.35 | 2.52 | 2.28 |
| Madhya Pradesh | 6.53 | 6.15 | 6.19 | 6.04 | 6.36 | 6.10 |
| Gujarat | 4.43 | 4.24 | 4.31 | 4.24 | 4.37 | 4.24 |
| Daman & Diu | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Dadra & Nagar Haveli | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Maharashtra | 7.61 | 7.43 | 7.52 | 7.50 | 7.56 | 7.46 |
| Andhra Pradesh | 7.21 | 7.05 | 7.51 | 7.36 | 7.36 | 7.2 |
| Karnataka | 4.58 | 4.56 | 4.65 | 4.70 | 4.61 | 4.63 |
| Goa | 0.08 | 0.08 | 0.10 | 0.08 | 0.09 | 0.08 |
| Lakshadweep | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kerala | 3.00 | 2.64 | 3.43 | 2.98 | 3.21 | 2.81 |
| Tamil Nadu | 4.56 | 4.51 | 4.87 | 4.73 | 4.71 | 4.61 |
| Pondicherry | 0.04 | 0.04 | 0.04 | 0.05 | 0.04 | 0.05 |
| Andaman & Nicobar Islands | 0.02 | 0.03 | 0.02 | 0.03 | 0.02 | 0.03 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Adjusted $R^2$ | 0.995 | | 0.994 | | 0.994 | |

**Table A.6.3.U** Percentage share of individual states in all-India population as per census and NSS 61st round by gender, for urban areas: 2004–05

| | Male share | | Female share | | Total share | |
|---|---|---|---|---|---|---|
| | NSS | Census | NSS | Census | NSS | Census |
| Jammu and Kashmir | 0.70 | 0.93 | 0.67 | 0.85 | 0.69 | 0.89 |
| Himachal Pradesh | 0.25 | 0.21 | 0.21 | 0.19 | 0.23 | 0.20 |
| Punjab | 3.06 | 2.92 | 2.97 | 2.75 | 3.02 | 2.84 |
| Chandigarh | 0.33 | 0.29 | 0.30 | 0.26 | 0.32 | 0.28 |
| Uttaranchal | 0.78 | 0.81 | 0.78 | 0.76 | 0.78 | 0.78 |
| Haryana | 2.45 | 2.28 | 2.22 | 2.14 | 2.34 | 2.21 |
| Delhi | 4.56 | 4.62 | 4.06 | 4.25 | 4.32 | 4.44 |
| Rajasthan | 5.20 | 4.62 | 5.38 | 4.56 | 5.29 | 4.59 |
| Uttar Pradesh | 13.26 | 12.16 | 13.02 | 11.77 | 13.14 | 11.97 |
| Bihar | 2.68 | 3.12 | 2.55 | 3.01 | 2.62 | 3.07 |
| Sikkim | 0.02 | 0.03 | 0.02 | 0.03 | 0.02 | 0.03 |
| Arunachal Pradesh | 0.04 | 0.08 | 0.04 | 0.08 | 0.04 | 0.08 |
| Nagaland | 0.10 | 0.14 | 0.09 | 0.13 | 0.10 | 0.13 |
| Manipur | 0.18 | 0.20 | 0.20 | 0.22 | 0.19 | 0.21 |
| Mizoram | 0.11 | 0.15 | 0.11 | 0.16 | 0.11 | 0.15 |
| Tripura | 0.17 | 0.21 | 0.19 | 0.22 | 0.18 | 0.21 |
| Meghalaya | 0.10 | 0.15 | 0.13 | 0.17 | 0.12 | 0.16 |
| Assam | 0.94 | 1.20 | 0.97 | 1.18 | 0.95 | 1.19 |
| West Bengal | 8.04 | 7.80 | 8.01 | 7.80 | 8.03 | 7.80 |
| Jharkhand | 1.64 | 2.13 | 1.61 | 2.07 | 1.62 | 2.10 |
| Orissa | 2.01 | 1.90 | 2.00 | 1.90 | 2.01 | 1.90 |
| Chhattisgarh | 1.37 | 1.48 | 1.33 | 1.53 | 1.35 | 1.51 |
| Madhya Pradesh | 5.63 | 5.50 | 5.62 | 5.47 | 5.63 | 5.48 |
| Gujarat | 6.48 | 6.81 | 6.24 | 6.58 | 6.36 | 6.70 |
| Daman & Diu | 0.02 | 0.03 | 0.02 | 0.03 | 0.02 | 0.03 |
| Dadra & Nagar Haveli | 0.01 | 0.03 | 0.01 | 0.02 | 0.01 | 0.02 |
| Maharashtra | 15.00 | 14.23 | 14.72 | 13.81 | 14.87 | 14.03 |
| Andhra Pradesh | 7.21 | 7.14 | 7.84 | 7.63 | 7.51 | 7.37 |
| Karnataka | 6.05 | 6.15 | 6.13 | 6.41 | 6.09 | 6.27 |
| Goa | 0.16 | 0.23 | 0.17 | 0.24 | 0.16 | 0.24 |
| Lakshadweep | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Kerala | 2.75 | 3.09 | 3.08 | 3.63 | 2.91 | 3.35 |
| Tamil Nadu | 8.43 | 9.11 | 9.04 | 9.89 | 8.72 | 9.48 |
| Pondicherry | 0.20 | 0.21 | 0.23 | 0.24 | 0.21 | 0.23 |
| Andaman & Nicobar Islands | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Adjusted $R^2$ | 0.994 | | 0.991 | | 0.993 | |

**Table A.6.4.R** Percentage share of individual states in all-India population as per census and NSS 66th round by gender, for rural areas: 2009–10

| | Male share | | Female share | | Total share | |
|---|---|---|---|---|---|---|
| | NSS | Census | NSS | Census | NSS | Census |
| Jammu and Kashmir | 0.84 | 1.11 | 0.84 | 1.06 | 0.84 | 1.09 |
| Himachal Pradesh | 0.74 | 0.72 | 0.79 | 0.76 | 0.76 | 0.74 |
| Punjab | 2.05 | 2.14 | 2.02 | 2.04 | 2.04 | 2.09 |
| Chandigarh | 0.02 | 0.01 | 0.03 | 0.00 | 0.02 | 0.00 |
| Uttaranchal | 0.90 | 0.82 | 0.89 | 0.87 | 0.90 | 0.84 |
| Haryana | 2.21 | 2.06 | 2.01 | 1.91 | 2.11 | 1.99 |
| Delhi | 0.09 | 0.06 | 0.11 | 0.06 | 0.10 | 0.06 |
| Rajasthan | 6.24 | 6.19 | 6.25 | 6.09 | 6.24 | 6.14 |
| Uttar Pradesh | 18.20 | 18.84 | 18.04 | 18.16 | 18.12 | 18.51 |
| Bihar | 9.92 | 11.07 | 9.48 | 10.76 | 9.71 | 10.92 |
| Sikkim | 0.07 | 0.06 | 0.06 | 0.05 | 0.06 | 0.06 |
| Arunachal Pradesh | 0.12 | 0.13 | 0.11 | 0.13 | 0.11 | 0.13 |
| Nagaland | 0.10 | 0.18 | 0.10 | 0.17 | 0.10 | 0.18 |
| Manipur | 0.21 | 0.23 | 0.20 | 0.23 | 0.20 | 0.23 |
| Mizoram | 0.06 | 0.06 | 0.05 | 0.06 | 0.06 | 0.06 |
| Tripura | 0.37 | 0.33 | 0.37 | 0.33 | 0.37 | 0.33 |
| Meghalaya | 0.27 | 0.28 | 0.26 | 0.29 | 0.27 | 0.28 |
| Assam | 3.31 | 3.19 | 3.09 | 3.22 | 3.20 | 3.20 |
| West Bengal | 7.67 | 7.49 | 7.31 | 7.52 | 7.50 | 7.50 |
| Jharkhand | 2.78 | 2.96 | 2.67 | 3.00 | 2.73 | 2.98 |
| Orissa | 4.09 | 4.11 | 4.32 | 4.29 | 4.20 | 4.20 |
| Chhattisgarh | 2.37 | 2.27 | 2.43 | 2.41 | 2.40 | 2.34 |
| Madhya Pradesh | 6.87 | 6.30 | 6.55 | 6.22 | 6.71 | 6.26 |
| Gujarat | 4.40 | 4.18 | 4.23 | 4.18 | 4.32 | 4.18 |
| Daman & Diu | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Dadra & Nagar Haveli | 0.03 | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 |
| Maharashtra | 7.34 | 7.39 | 7.40 | 7.41 | 7.37 | 7.40 |
| Andhra Pradesh | 6.99 | 6.68 | 7.33 | 7.02 | 7.15 | 6.84 |
| Karnataka | 4.25 | 4.46 | 4.53 | 4.60 | 4.39 | 4.53 |
| Goa | 0.15 | 0.07 | 0.14 | 0.07 | 0.14 | 0.07 |
| Lakshadweep | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kerala | 2.82 | 2.10 | 3.28 | 2.39 | 3.04 | 2.24 |
| Tamil Nadu | 4.43 | 4.39 | 5.00 | 4.60 | 4.71 | 4.49 |
| Pondicherry | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Andaman & Nicobar Islands | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Adjusted $R^2$ | 0.995 | | 0.994 | | 0.995 | |

**Table A.6.4.U** Percentage share of individual states in all-India population as per census and NSS 66th round by gender, for urban areas: 2009–10

| | Male share | | Female share | | Total share | |
|---|---|---|---|---|---|---|
| | NSS | Census | NSS | Census | NSS | Census |
| Jammu and Kashmir | 0.68 | 0.94 | 0.70 | 0.86 | 0.69 | 0.90 |
| Himachal Pradesh | 0.17 | 0.19 | 0.19 | 0.18 | 0.18 | 0.19 |
| Punjab | 2.96 | 2.85 | 2.75 | 2.69 | 2.86 | 2.77 |
| Chandigarh | 0.26 | 0.29 | 0.27 | 0.26 | 0.26 | 0.27 |
| Uttaranchal | 0.80 | 0.83 | 0.77 | 0.79 | 0.78 | 0.81 |
| Haryana | 2.51 | 2.38 | 2.34 | 2.24 | 2.43 | 2.32 |
| Delhi | 4.35 | 4.50 | 3.53 | 4.20 | 3.96 | 4.35 |
| Rajasthan | 5.12 | 4.58 | 5.22 | 4.50 | 5.17 | 4.54 |
| Uttar Pradesh | 12.68 | 12.06 | 12.71 | 11.58 | 12.69 | 11.83 |
| Bihar | 3.12 | 3.16 | 3.00 | 3.04 | 3.06 | 3.10 |
| Sikkim | 0.02 | 0.04 | 0.02 | 0.04 | 0.02 | 0.04 |
| Arunachal Pradesh | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Nagaland | 0.10 | 0.15 | 0.10 | 0.15 | 0.10 | 0.15 |
| Manipur | 0.19 | 0.20 | 0.19 | 0.23 | 0.19 | 0.22 |
| Mizoram | 0.11 | 0.14 | 0.13 | 0.16 | 0.12 | 0.15 |
| Tripura | 0.19 | 0.24 | 0.22 | 0.25 | 0.20 | 0.25 |
| Meghalaya | 0.14 | 0.15 | 0.17 | 0.16 | 0.15 | 0.16 |
| Assam | 1.01 | 1.16 | 1.00 | 1.17 | 1.01 | 1.17 |
| West Bengal | 6.44 | 7.70 | 6.63 | 7.79 | 6.53 | 7.74 |
| Jharkhand | 1.68 | 2.12 | 1.71 | 2.08 | 1.69 | 2.10 |
| Orissa | 1.73 | 1.86 | 1.80 | 1.87 | 1.76 | 1.86 |
| Chhattisgarh | 1.38 | 1.54 | 1.44 | 1.59 | 1.41 | 1.56 |
| Madhya Pradesh | 5.36 | 5.38 | 5.38 | 5.32 | 5.37 | 5.35 |
| Gujarat | 7.58 | 6.95 | 7.09 | 6.63 | 7.35 | 6.80 |
| Daman & Diu | 0.03 | 0.05 | 0.03 | 0.03 | 0.03 | 0.04 |
| Dadra & Nagar Haveli | 0.03 | 0.04 | 0.02 | 0.03 | 0.02 | 0.04 |
| Maharashtra | 14.43 | 13.78 | 14.02 | 13.37 | 14.23 | 13.58 |
| Andhra Pradesh | 7.52 | 7.27 | 7.84 | 7.73 | 7.67 | 7.49 |
| Karnataka | 6.47 | 6.15 | 6.52 | 6.37 | 6.49 | 6.26 |
| Goa | 0.13 | 0.24 | 0.16 | 0.24 | 0.14 | 0.24 |
| Lakshadweep | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Kerala | 2.62 | 3.72 | 3.15 | 4.39 | 2.87 | 4.04 |
| Tamil Nadu | 9.83 | 8.97 | 10.53 | 9.68 | 10.17 | 9.31 |
| Pondicherry | 0.23 | 0.21 | 0.26 | 0.24 | 0.25 | 0.23 |
| Andaman & Nicobar Islands | 0.05 | 0.04 | 0.05 | 0.04 | 0.05 | 0.04 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Adjusted $R^2$ | 0.99 | | 0.988 | | 0.989 | |

## References

Deaton, A., & Dreze, J. (2009). Food and nutrition in India: Facts and interpretations. *Economic and Political Weekly, 44*, 42–65.

Government of India, Annual Survey of Industries, 2004–05, Volume 1; 2009–10, Volume 1, http://mospi.nic.in/Mospi_New/upload/asi/ASI_main.htm?status=1&menu_id=88

Government of India, Ministry of Statistics and Programme Implementation, Central Statistics Office. (2012). National Accounts Statistics 2012 (New Delhi, May 2012).

Government of India, National Sample Survey Organisation. (2006) Report No. 515 (61/10/1): Employment and Unemployment Situation in India 2004–05, NSS 61st Round, (July 2004–June 2005) (September 2006).

Government of India, National Sample Survey Organisation. (2011). NSS Report No. 537 (66/10/1), Employment and Unemployment Situation in India 2009–10, NSS 66th Round, (July 2009–June 2010) (November 2011).

Government of India, Office of the Registrar General of India. (2011). Census of India 2011 Provisional Population Totals, Paper 1 of 2011, India Series 1.

Government of India, Office of the Registrar General of India. (2011). Census of India 2011, Provisional Population Totals, Paper 2 of 2011, Rural-Urban Distribution, India Series 1.

Government of India, Office of the Registrar General of India (2012), Report No. 1 of 2012, Sample Registration System, Statistical Report 2010.

Government of India, Planning Commission. (2009). Report of the Expert Group to Review the Methodology for Estimation of Poverty (November 2009).

Government of India, Planning Commission. (2012). Office Order Setting up of the Expert Group to review the Methodology for Measurement of Poverty (June 2012).

Government of India, Registrar General of India. (2012). SRS-based Abridged Life Tables 2003–07 to 2006–10.

Lewis, W. A. (1954). Economic development with unlimited supplies of labour. Manchester School, *22*, 139–191.

Srinivasan, T. N. (1992). Under-nutrition: Concepts, measurement and policy implications. In S. Osmani (Ed.), *Nutrition and Poverty*. Oxford: Clarendon Press.

Sukhatme, P. V. (1982). Measurement of Undernutrition. *Economic and Political Weekly, 17*, 2000–2016.

Sundaram, K. (2003). On identification of households below poverty line in BPL census 2002: Some comments on the proposed methodology. *Economic and Political Weekly, 38*, 896–901.

Sundaram, K. (2007a). Growth of work opportunities in India, 1983–99/2000. In A. Vaidyanathan, and K. L. Krishna, (Eds.), *Institutions and markets in India's development*, Oxford.

Sundaram, K. (2007b). Employment and poverty in India, 2000–2005. *Economic and Political Weekly, 42*, 3121–3131.

Sundaram, K. (2012). Suresh Tendulkar on poverty, employment and public policy: some thoughts. Paper presented at the 48th The Indian Econometric Society (TIES) conference, Pondicherry, March 1–3, 2012.

Sundaram, K., & Tendulkar, S. D. (1993). Poverty in Asia and the Pacific: Conceptual issues and national approaches to measurement. *Economic Bulletin for Asia and the Pacific, 44*, 42–58.

Sundaram, K., & Tendulkar, S. D. (2002). The working poor in India: Employment-poverty linkages and employment policy options. Issues in Employment as Poverty Discussion Paper no. 4, International Labour Office, Geneva.

Sundaram, K., & Tendulkar, S. D. (2004). Poor in the Indian labour force: Scenario in the 1990's. *Economic and Political Weekly, 39*, 5125–5132.

Suryanarayana, M. H. (2011). Expert group on poverty: Confusion worse confounded. *Economic and Political Weekly, 46*, 36–39.

# Chapter 7
# Estimation of Calorie Norms and Measurement of Food Intakes: Some Implications for the Magnitudes of the Prevalence of Undernutrition in India

**J.V. Meenakshi and Brinda Viswanathan**

**Abstract** This paper highlights the significant measurement issues in the computation of the prevalence of inadequate calorie intakes in India using NSS data. It focuses on the setting of appropriate norms or cut-offs which determine adequacy or inadequacy, as well as the measurement of intakes. Although energy norms for an individual are biologically determined their use as a policy tool necessitates several additional considerations that have not received sufficient attention in the literature. We demonstrate that changes in assumptions regarding age-sex distribution, average heights of adults, and physical activity status can lead to substantial changes in norms. Also important is the way food intakes are measured: changes in food habits that may lead to greater underreporting as the recall period increases, and the increasing trend, even though small, of eating meals outside the home, can exert a significant influence on the trends in the POU over time. With more realistic assumptions, the prevalence of inadequate energy intakes are quite reasonable in magnitude, although still high in absolute terms. The paper also suggests that by accounting for outliers, there is a correlation between anthropometric indicators for adults and food intakes.

**Keywords** Measurement of calorie inadequacy

**JEL Classification** I32

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## 7.1 Introduction: Context and Objectives

In India, the last several decades have seen a consistent decline in food intakes, as measured by calories per capita per day. This trend is primarily due to the steady decline in the consumption of cereals in general, and of coarse cereals in particular. The evidence, summarized in a thought-provoking paper by Deaton and Dreze (2009), suggests further that calories derived from cereals are becoming less and less responsive to changes in income, and that the proportion of every extra rupee devoted to food is declining over time and across the entire income spectrum .There is a switch to more expensive calories, so that the price paid per calorie (derived by dividing food expenditures by the total number of calories) has been rising sharply. Although the Deaton and Dreze analysis pertains to the period 1983 to 2004/5, these trends began even earlier: Sarma et al. (1979) noted for example that there had been a secular decline in the consumption of cereals since the 1960s.[1] Nor do more recent data suggest any arresting of this trend. Figure 7.1, which updates the Deaton and Dreze analysis for the year 2009/10, demonstrates this amply. Relative to 2004/5, the Engel curve for all calories has shifted down in both rural and urban India across much of the expenditure range, except at very low levels of income, where no shift is discernible. Similarly the Engel curve for calories derived from cereals has continued to shift down, and is remarkably flat for 2009/10 in urban India.

That the decrease in calorie intakes should happen at a time when the apparent magnitude of food insecurity is high is a puzzle. Nor does it seem plausible that Indians were constrained by income: the debate about rising incomes—whether in rural or urban India—has largely been about the degree of increase. The expectation therefore is that the increased income would be spent on purchasing food. Clearly, this has not happened.

The implied magnitudes of those undernourished in terms of food intakes are immense. The energy norms on which the poverty line was originally based correspond to 2400 calories per capita per day (henceforth pcpd) for rural areas and 2100 calories pcpd for urban areas, the rural-urban difference being a reflection of the more sedentary (and therefore less energy-demanding) occupations in urban areas. Going by these norms, the prevalence of people whose consumption fell below these norms increased from 66% in 1983 to 81% in 2009/10 in rural India. The corresponding figures for urban India are 61% in 1983 and 66% in 2009/10.

These numbers challenge credibility. That four out of five of people in rural India (and two out of three in urban areas) are undernourished (in this paper we use the term undernourished to refer to those with inadequate calorie intakes, and distinguish it from adverse anthropometric outcomes) seems at variance with reality—even though undernourishment is visibly large. Unlike the case with micronutrient deprivation or 'hidden hunger' where an individual may be unaware that s/he is

[1] In earlier work, we noted that both rural and urban Indians appeared to be exhibiting a change in tastes away from cereals, and towards meats and eggs (Meenakshi 1996a, b).

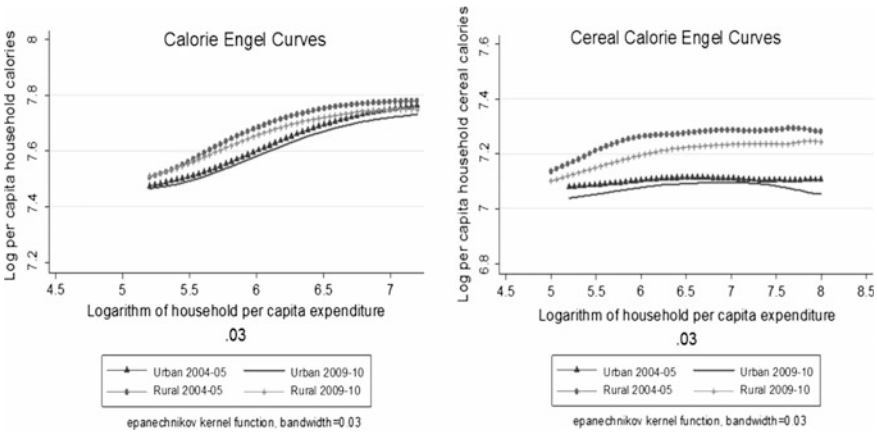


**Fig. 7.1** The calorie and cereal-calorie engel curves, 2004/5 and 2009/10. *Source* Computed from unit record data of the NSS's 61st and 66th rounds

undernourished, insufficient energy intake translates into hunger, causing a person to satiate it by consuming more food: typically cereals, since they are the richest source of calories.

Although not stated explicitly, this was perhaps one factor that led the Expert Committee on Poverty Estimation, Planning Commission (2009) under the chairmanship of Suresh Tendulkar to reject the calorie norm altogether in fixing the new poverty line. The report only notes that "… a conscious decision was taken by the Expert Group to move away from anchoring the PL [poverty line] in calorie norm as in the past because (a) there is overwhelming evidence of downward shift in calorie Engel curves over time and (b) calorie consumption intake as calculated … by NSS has not been found to be well correlated … with the nutritional outcomes…."

Various explanations for these magnitudes and trends have been offered, not only by Deaton and Dreze, but by other authors, including Patnaik (2010), Sen (2005), Eli and Li (2013), Gaiha et al. (2010a, b) and Chand and Jumrani (2013), to cite but a few. Although a comprehensive review of this debate is beyond the scope of this paper, in brief, the literature has focused on two broad sets of explanations. One set relates to changes in food prices and relatedly, a squeeze in the food budgets that is placed by increasing demands on non-food expenditures (see for example, Sen 2005 and Gaiha et al. 2010a). The other focuses on lower requirements for energy arising out of urbanization and increasingly sedentary lifestyles (Deaton and Dreze 2009). For example, a recent and as-yet unpublished paper by Eli and Li (2013) highlights the role of variations in caloric needs in explaining the stagnant or declining caloric intakes in India; they find lower demands on physical activity explains a large part of the difference between urban and rural intakes.

This paper does not directly address these explanations, but instead focuses on two relatively under-researched aspects related to the measurement of the prevalence of under nutrition (hereafter POU), and shows how these affect the

magnitudes of energy intakes and deprivation. In particular, the paper details how the *cut-offs* or *norms* are determined, and demonstrates how sensitive the magnitudes of the POU are with respect to the assumptions underlying these norms (Sect. 7.2). Section 7.3 considers how the method by which *energy intakes* are measured might influence these results. Section 7.4 provides simple correlations between measures of calorie inadequacy and nutritional outcomes, expanding the scope to consider adult outcomes in addition to those of children. Section 7.5 concludes with implications for how these measurement issues might better inform the debate on what has been termed the "calorie puzzle."

## 7.2 Defining the Energy/Calorie Norms

### *7.2.1 Evolution of Indian Norms*

The Indian norms of 2400 rural and 2100 urban calories per capita per day were established nearly four decades ago (Planning Commission 1979). It is perhaps natural to think of these as being biologically determined and therefore invariant over time and across contexts; however this is far from the case. As the Alagh Committee Report (Planning Commission 1979) itself noted, requirements are biologically-determined only within a range, and a whole host of factors can change requirements. The norms derived in the report embed a set of assumptions regarding age-sex distribution, and how physically strenuous various occupations (cultivation in agriculture, manufacturing, and the like) are.

Over time, norms have been updated in light of new scientific evidence on what is thought to be required for various levels of activity. There have been regular revisions to the recommendations on dietary intakes made by the FAO/WHO. For example, in 1971, the FAO and WHO reduced the recommended energy intakes from 3200 calories to 3000 calories per capita per day for the reference male, and from 2300 to 2200 calories for the reference female (cited in Messer 1986).

Even in India, over time, the Indian Council of Medical Research (ICMR) has undertaken periodic revisions to its recommendations for intakes of energy and other nutrients. For example, compared to 1944, the norms were revised upward for men engaged in "very heavy work", revised downward for "generalized heavy work" and were increased for women across most work categories in 1960 and 1971. The most recent revisions to recommendations were made in 2010, and form the basis for the calculations in this paper.

Defining requirements for energy intakes is complicated by the fact that actual intakes are not independent of requirements, which is in contrast to the case with micronutrients. With energy, a person who eats more on a long term basis will gain weight and this in turn implies higher requirements to sustain the increased weight. Therefore in principle the prevalence of undernutrition must be estimated by taking into account the bivariate distribution of intakes and requirements (see Naiken

2002). Since this is not feasible, a pre-specified cut-off level or requirement is applied to the distribution of intakes to estimate the prevalence of undernutrition

Requirements are specified for a healthy individual, with weight proportionate to height. The WHO recommends that a Body Mass Index (BMI)—defined as weight in kilograms divided by height in meters squared—between 18.5 and 25 be considered to reflect the normal range for good health. But because Asians in general appear to be more susceptible to weight-related non-communicable diseases, an upper limit of 23—not 25—is recommended as another marker for possible health intervention; effectively this means that the range for normal BMI for Asians can be taken as 18.5–23 (WHO 2004).

Requirements for a healthy individual are primarily a function of (a) gender, (b) age and (c) physical activity status. The first step, then is to define a 'reference' individual in terms of gender, age, weight and height, and work out the norms for such a person. Thus norms vary by age and gender and also by activity status. An overall average cut-off or norm can then be worked out using the distribution of population across different age groups and gender, and making assumptions about how physically-strenuous or sedentary their lifestyles are. Thus far, the 2001 census demographic structure has been the basis for calculating the average cut-off.

The most recent revision of the recommendations undertaken in 2010 by the ICMR defines a reference adult individual as follows: an adult male between 18 and 29 years old, is 173 cms tall, weighs 60 k, and is engaged in moderate activity. A similarly aged adult woman is 161 cms tall, and weighs 55 k (ICMR 2010, p. 12): as compared to the previous round of recommendations, the reference woman is 5 kilograms heavier. In effect then, the recommended caloric intake per kilogram of body weight for women has declined.

The ICMR takes the current reference heights as the 95th percentile of heights of adults in rural India, as being "representative of well-nourished normal population and considered as standard reference values for India" (ICMR 2010, p. 12).

The FAO methodology in contrast does not specify reference adults, and only provides a range of requirements that vary by height/weight, age and activity status; the underlying equations for determining the BMR (Basal Metabolism Rate) are somewhat different.

These recommendations should be distinguished from the cut-off the FAO uses to determine the prevalence of hunger and the number most at risk of being food insecure; this cut-off reflects a *minimum* energy requirement (emphasis added) and is a uniform 1800 calories pcpd. This cut-off is not directly comparable to the NIN/ICMR FAO/WHO norms that are defined by gender, age and activity status being discussed here.

In a very thoughtful paper Manna (2012) shows that applying the FAO recommendations for reference weights of 60 kg, and given the 2001 age and gender distribution, translates into a norm of 1904 kcal if a sedentary life style is assumed, and 2241 calories if a moderate activity status is taken. When lower body weights are assumed, one obtains a 1781 cal norm with sedentary activity. The Tendulkar Committee, while rejecting the calorie norm as the basis for fixing the poverty line, nevertheless conducted a validation exercise which showed that at the poverty line,

food expenditures would have been adequate to afford the purchase of 1770 calories. While questioning the conceptual basis of the new poverty lines, Manna uses this simple exercise to demonstrate the limitations of the validation exercise.

It is useful to update Manna's exercise, using the ICMR norms this time (which were not available when that paper was written), to see how sensitive the norms—and the resulting prevalence of people with inadequate calorie intakes—are to the assumptions embedded in the norm. As noted above, apart from the assumptions about the heights and weights of the reference adult, and his or her activity status, the third component going into the determination of the norm is the distribution of the population by gender and across various age groups.

Table 7.1 presents figures that show the impact on the implied calorie norm of changing various assumptions regarding (a) the age-gender demographic structure, (b) heights (and therefore ideal weights) of the reference adult, and (c) activity status. In all the exercises that follow, changes in assumptions about weight and physical activity status are applied only to adult women and men aged 18 to 60; the norms for the other age groups are taken as given by the ICMR. For ready reference, the ICMR recommendations are reproduced in Appendix Table 7.5.

### 7.2.2 *Sensitivity of Norms and POU Estimates to Changes in Demographic Structure*

The use of the ICMR's reference adult's (based on the 95th percentile of adult heights) energy requirements, and assuming moderate life styles in rural areas and sedentary in urban, applied to the 2001 age and gender distribution, yields an average cut-off of 2150 and 2010 kcal/cap/day in rural and urban areas, respectively (row 2 of Table 7.1). If instead, one were to use the population weighting diagram derived from the 2011 census,[2] the norm works out to be 2185 calories pcpd in rural and 2020 calories pcpd in urban—an *increase* of 10–35 calories (row 3 of Table 7.1). The increase occurs largely on account of a shift in the distribution of the population towards those needing more calories. In 2001, the population aged 16–60 constituted 55% of the total population; ten years later the proportion had increased to 60%. The calorie requirements for these age groups are much higher than for either older or younger people, thus the average norm is also higher. Correspondingly these increases in the norm translate into an increase in the POU by 3% points in rural areas but only 1% point in urban areas.

[2]In computing the age distributions, the number of people whose age is not stated has not been taken into account. The age-sex distribution figures are compiled using Table C13 of the Indian Census 2011 data available at http:// www.censusindia.gov.in/2011census/Age_level_data/Age_level_data.html.

**Table 7.1** Prevalence of undernutrition with cutoffs under alternative assumptions regarding demographic structure, height of reference adult, and physical activity status, 2009/10

| Assumed physical activity level for 18–60 year-olds | | Assumed age-gender-distribution | Assumed reference adult height | Implied per capita norm (calories per capita per day) rural | Implied per capita norm (calories per capita per day) urban | Rural POU (percent) schedule 1 | Urban POU (percent) schedule 1 |
|---|---|---|---|---|---|---|---|
| *Conventionally-used norms* | | | | | | | |
| | (1) | | | 2400 | 2100 | 82 | 65 |
| **BMI of 21 used to derive reference weights of adult males and females** | | | | | | | |
| Assumed to be moderate in rural and sedentary urban | (2) | 2001 census | NIN, 95th percentile | 2150 | 2010 | 66 | 58 |
| | (3) | 2011 census | NIN, 95th percentile | 2185 | 2020 | 69 | 59 |
| | (4) | 2001 census | NIN, median | 2075 | 1940 | 60 | 52 |
| | (5) | 2011 census | NIN, median | 2105 | 1940 | 63 | 52 |
| | (6) | 2011 census | NFHS3, mean | 2120 | 1960 | 64 | 54 |
| Assumed to be moderate in both rural and urban | (7) | 2011 census | NIN, 95th percentile | 2185 | 2245 | 69 | 75 |
| | (8) | 2011 census | NIN, median, | 2105 | 2160 | 63 | 70 |
| | (9) | 2011 census | NFHS3, mean | 2120 | 2175 | 64 | 71 |
| Assumed to be sedentary in both rural and urban | (10) | 2011 census | NIN, 95th percentile, | 1985 | 2020 | 52 | 59 |
| | (11) | 2011 census | NIN median | 1915 | 1940 | 46 | 52 |
| | (12) | 2011 census | NFHS3 mean | 1930 | 1960 | 47 | 54 |
| **BMI of 19 used to derive reference weights of adult males and females** | | | | | | | |
| Assumed to be sedentary in both rural and urban | (13) | 2011 census | NIN median | 1865 | 1885 | 41 | 47 |
| | (14) | 2011 census | NFHS3 mean | 1880 | 1900 | 43 | 48 |

*Notes* 1. The 95th percentile adult male is 1.73 m tall and weighs 60 kg; the 95th percentile adult female is 1.61 m tall and weighs 55 kg (ICMR 2010).

2. The median adult height using the NIN (8-state) data for males is 1.62 m with an implied ideal weight (obtained by using a BMI of 21) is approximately 55 kgs and for women is 1.51 m with a weight of approximately 48 kgs corresponding to a BMI of 21.

3. The mean adult height using NFHS3 data is 1.52 m for women and 1.65 m for men; using a BMI of 21, these translate into weights of 49 and 57 kgs respectively.

*Source* Computed from unit record data of the 66th round of the NSS

### 7.2.3 Redefining the Reference Adult's Weight and Height

As noted earlier, the ICMR uses a 60 kg male as its reference, since it corresponds to the 95th percentile of adult heights in rural India surveyed by the NNMB. However, it could also be argued that since heights are largely determined by the age of 18 to 20—the reference heights should be derived from the median, rather than the 95th percentile. By eating more food, an adult will not gain additional height—only additional weight. The median height is a good 10 cm less than the 95th percentile. From a policy perspective, to the extent that comparison of intakes to the norm is meant to provide an indication of food deprivation at the national (population) level, it can be argued that these calculations be based on *median* heights, rather than the 95th percentile. The 95th percentile norms are a better reflection of the magnitude of food deprivation that would exist if all adults had attained their biological potential. While the latter is more relevant from a long-term perspective, in the short term, assessment of energy inadequacy should be based on average heights.

Therefore, to determine the magnitude of current deprivation in food intakes, an alternative approach is taken here: start with the *median* height, determine the weight that would correspond to good health (a BMI of 21) and use this to determine energy requirements using the formula specified by the ICMR.[3]

The median adult height using the NIN data used for the 2010 recommendations is 1.62 m for men with an implied ideal weight (obtained by using a BMI of 21) of approximately 55 kg and for women is 1.51 m with a weight of approximately 48 kg corresponding to a BMI of 21. Contrast this with the actual median weights of 51 kg for men and 44 kg for women. Since the NIN surveys canvass information only on the rural population, another set of estimates can be obtained using the nationally-representative National Family Health Survey 3 (henceforth NFHS3), which canvassed both rural and urban areas, using instead mean heights for adults. The NFHS3 survey shows mean adult height to be 1.52 m for women and 1.65 m for men.[4] Using a BMI of 21, these translate into weights of 48 and 57 kg respectively.

[3]For example, for women aged 18–30, the calorie requirements are given by (14.0 * Body Weight in kg + 471)*PAL, and for males aged 18–30, the formulas (14.5*Body Weight in kg + 645) *PAL, where PAL takes value 1.53 for sedentary work and 1.8 for moderate work. These refer to non-pregnant non-lactating women only. To the extent that some women in 15–49 age group would be pregnant and therefore require more calories, the average norms would be marginally higher, but declining over time as the total fertility rate falls. Although this aspect is not captured here, note that a birth rate of 22 would translate into higher norms for at most 5–6% of the population.

[4]A more recent survey in 2004–5 conducted by the National Nutrition Monitoring Bureau in the rural areas of the same states finds a median height of 1.63 m (median weight 54.2 kg) for men and 1.52 m (median weight of 46.9 kg) for women. These figures lie between the NNMB and NFHS range discussed in the text.

Since a BMI of 21 represents the mid-point of the normal range of 18.5–23, the figures are recomputed using a BMI of 19, which is just above the lower limit of the normal range, to examine how sensitive the norm is to the choice of BMI value.

For comparison, Table 7.1 also has calculations of the POU using the cut-off implied by the ICMR norm as well as the conventional 2400 (rural) and 2100 (urban) norms in row 1.

The figures in row 5 of Table 7.1 suggest that use of the *median* to determine cut-offs, results in norms that are 80 calories lower in rural and urban areas as compared to using the 95th percentile, using the 2011 census age distribution. This translates into a difference in POU rates of 6–7% points in rural and urban areas. The use of the *mean* height from the nationally-representative NFHS 3 does not make much difference to the numbers: NFHS3 mean-based cut-offs in row 6 are 15 calories higher than the NIN median-based cut-offs, but the difference to the POU is a mere 1–2 percentage points.

A comparison of the norms across the two demographic distributions (2001 census and 2011 census) using the median height in rows 4 and 5 of Table 7.1 shows that the change in demographic structure results in an increased norm; similar to the result obtained with the 95th percentile discussed in the previous subsection: the increase amounts to about 70 calories in rural areas and a negligible amount in urban areas.

### 7.2.4 *Changing Assumptions About the Physical Activity Status and BMI*

The discussion thus far has been based on the assumption of moderate activity status in rural areas and sedentary activity status in urban areas.

Table 7.1 also presents the cut-offs and the corresponding POU if instead of assuming that urban lifestyles are sedentary, they are also assumed to be moderately active. This results in an increase in the norm of about 220 calories in urban areas (compare rows 5 and 8 of Table 7.1). Note that when both urban and rural lifestyles are assumed to be moderately demanding, then urban per capita norms are actually somewhat higher than the rural norms, largely because in proportional terms, there are more adults in urban than rural areas.

Irrespective of whether the 95th percentile, median (NIN) or mean (NFHS3) is used to define the adult heights, or whether the 2001 or 2011 age distribution is used, in *all* cases, the implied norms are far lower than the 2400 and 2100 calories pcpd norm used in rural and urban areas respectively. Correspondingly, the POU rates are also far lower. Using the 2011 age distribution, the POU in rural areas is about 80% when the 2400 cut-off is used, falls to 70% when the cut-offs corresponding to the 95th percentile of heights are used, and further to 64% when cut-off corresponding to the median heights are used. The decreases in urban areas are much less but are nonetheless large.

In large part this is because the conventional norms assume that cultivators and agricultural labourers are engaged in heavy work (rather than moderate as assumed here). The 300 cal difference in the norms used for rural and urban India, derive in large part from assumed differences in lifestyles—urban work being less strenuous on average. But according to the recent ICMR report (2010), "the proportion of population engaging in heavy work is quite small…a majority of rural adults were engaged either in sedentary or moderate activity and a very small population were engaged in heavy activities." [p. 41]. Also, as Sundaram's paper in this volume (Sundaram 2013) notes, there has been a sharp decline in the proportion of women in work, especially in rural areas.

Therefore an equally relevant comparison is to assume that lifestyles in rural areas are also sedentary: these comparisons are presented in rows 10–12 of Table 7.1.

Clearly, the greatest change in the cut-offs is induced by assumptions about activity levels: with the estimated prevalence of undernutrition dropping to about 50% in rural areas—as compared to between 60 and 70% when moderate activity levels are assumed.

However, assuming a lower body weight of the reference man and woman corresponding to a BMI of 19 results in POU estimates that are 41–43% in rural areas and 47–48% in urban areas (see rows 13 and 14 in Table 7.1).

## 7.3 Measuring Nutrient Intakes

Dietary intake surveys based on 24-h recall/weighed food records/diaries are considered the gold standard for assessing nutrient intakes. These have been used by the National Institute of Nutrition (2002) in making its assessments, for example. But the NIN surveys are limited to relatively small sample sizes. It is far more common among researchers (and by the NSS (NSSO 2012)) to compute energy intakes from the NSS consumer expenditure surveys, which are based on 30 day recall, and to compare these with norms derived from ICMR recommendations. To what extent could differences in the way food intakes are measured account for the high and increasing trend of malnutrition in India?

### *7.3.1 Method of Dietary Assessment and Recall Period*

There are methodological differences in the way estimates of consumption are constructed from dietary intake surveys/records and from the consumer expenditure surveys. The latter focus on the household and are constructed in the form of a food balance sheet at the household level. The former focus on direct intakes and are frequently elicited at the individual level. In addition, the recall periods of the two are very different. The common practice with the NSS is to use a 30-day reference

period to compute energy content of foods consumed, whereas the dietary intake surveys of the NNMB have a 24 h recall period. Comparable data for the two methodologies do not exist, unfortunately. As shown in Table 7.2, the NNMB 24-h recall estimates of mean caloric intake are typically lower in magnitude than those indicated by the 30-day consumer expenditure data of the NSS. This is true for individual commodities as well, where the NNMB estimates are lower than those of the NSS. But these differences cannot all be attributed to difference in the way energy intakes are elicited, because there are also differences in the way consumer units are allocated to individuals in the household. The average number of consumer units per household is higher in the NNMB than in the NSS: this would translate into lower calorie intakes for the NNMB simply by virtue of the fact that the divisor used is larger.[5] In addition to these methodological differences, the sample sizes on which the two sets of estimates are based also vary widely: the NNMB has data on fewer than 1000 individuals in each state; the NSS sample sizes are orders of magnitude larger.

Fogel (2004, pp. 48–49) suggests that 24-h recall or record should not be considered the gold standard for estimating energy intakes, and argues instead that estimates based on country-level food balance sheets are the most appropriate for comparing long term trends, at least in historical perspective. However, there does not appear to be other literature that substantiates this, and nor does there appear to be consensus on the superiority of using food balance sheets.

Apart from methodological differences, recall periods themselves influence estimates of consumption. In many countries, the standard practice is to use a week as the reference period for recall. Although it is well known that consumption estimates—and hence poverty estimates—are sensitive to recall period (see Beegle et al. 2010) there is no a priori way to assess whether shortening the recall period would systematically increase or decrease intake estimates.

Several years ago, the NSS conducted a pilot survey to compare the performance of alternative reference periods (week and month), relative to the gold standard of the 24 h (NSS 2002). They concluded that using a 30-day reference period for the *quantity* of cereals was acceptable, since cereals are often purchased in bulk. However, for the *value* of food consumption in rural areas, the week-based estimate was 23% greater than the month-based estimates, and the day-based estimate was 7% higher. The corresponding differences in quantity terms were smaller in magnitude but still large. A shorter recall period makes a greater difference to non-cereal food items. The primary implication is that as long as cereals constituted the bulk of caloric intake, the use of the 30-day recall would yield reliable estimates of total calorie intake; but as diets have diversified, albeit slowly, and the reliance on cereals as a source of energy has declined to less than 40%, the underestimation of energy intakes from other sources of food is likely becoming correspondingly more

[5]Unfortunately, a comparison of the two sets of consumer equivalence units is not possible, as the NNMB units embed assumptions regarding activity levels as well: separate values are assigned to adults engaging in sedentary, moderate and heavy work. While the maximum consumer unit under the NSS is unity, that under the NNMB can go as high as 1.8.

**Table 7.2** Comparing NNMB and NSS Consumption estimates, selected food items, rural areas of eight states

| | Calories per consumer unit per day | Calories per consumer unit per day | Cereals (grams per consumer unit per day) | Cereals (grams per consumer unit per day) | Fish (grams per consumer unit per day) | Fish (grams per consumer unit per day) |
|---|---|---|---|---|---|---|
| | NNMB, 2005/6 | NSS 2004/5 | NNMB, 2005/6 | NSS 2004/5 | NNMB, 2005/6 | NSS 2004/5 |
| Kerala | 1799 | 2014 | 320 | 406 | 56 | 90 |
| Tamil Nadu | 1772 | 1842 | 386 | 460 | 9 | 16 |
| Karnataka | 1912 | 1845 | 429 | 446 | 2 | 29 |
| AP | 2113 | 1995 | 449 | 507 | 5 | 12 |
| Maharashtra | 1647 | 1933 | 329 | 439 | 4 | 13 |
| Gujarat | 1614 | 1923 | 333 | 421 | 2 | 13 |
| MP | 1715 | 1929 | 398 | 487 | 2 | 9 |
| Orissa | 1888 | 2023 | 444 | 582 | 9 | 14 |
| WB | 2071 | 2070 | 477 | 543 | 33 | 29 |

*Source* NSS data computed from unit record data of the 61st round. NNMB data are from National Nutrition Monitoring Bureau (2006), *Diet and nutritional status of population and prevalence of hypertension in rural areas*, NNMB Technical Report 24, National Institute of Nutrition, Hyderabad

important. This implies that not only would the magnitude of the POU vary with recall period, trends in POU over time would tend to have an increasing trend on this account.

Another indication of the impact of recall period on estimates of energy intakes can be gauged from the 66th round of the NSS, which used two sets of reference period to assess intakes. In this round both a 30-day recall (Schedule 1, followed in most quinquennial rounds) and a seven day recall for a subset of food items (Schedule 2, notably meats and eggs, vegetables and fruit) were canvassed. The estimated energy intake under Schedule 2 (with a shorter recall period for a subset of foods) is higher than under Schedule 1. In rural India, the average daily energy intake is 2147 kcal according to Schedule 2, and 2020 kcal according to Schedule 1. For urban India, the corresponding numbers are 2123 and 1946 kcal respectively. Table 7.3 sets out the implications of using Schedule 2 estimates for the POU for a subset of the alternative norms discussed in Table 7.1. For ease of comparison, the Schedule 1 estimates from Table 7.1 are also replicated there. The figures suggest that there are large changes in estimated head count ratios of energy deprivation: in rural India the percentage of population consuming less than 2400 calories is 82% according to Schedule 1, and 74% according to Schedule 2, a difference of nearly 8% points. The corresponding figures for urban India are 65% for Schedule 1, and 55% for Schedule 2. The difference between the Schedule 1 and Schedule 2 estimates of POU is about 10% points if an alternative set of norms, based either on the

95th percentile or on the median are used. With median heights used as the basis of the norm, under sedentary lifestyles in both rural and urban areas, the POU using Schedule 2 is 36% in rural areas and 42% in urban areas. If instead, moderate lifestyles are assumed in rural areas, the POU is 52% in rural areas and 42% in urban areas.

As an aside, it may be interesting to compare these estimates of average intakes with those say in the United States: the National Health and Nutrition Examine Survey results show a mean energy intake among adults of approximately

**Table 7.3** Impact on prevalence of undernutrition of alternative methods of eliciting energy intakes, across different norms

| | | | Assumption: Moderate physical activity in rural and sedentary in urban | | Assumption: Sedentary physical activity in both rural and urban areas | |
|---|---|---|---|---|---|---|
| Reference height based on | | | NIN, 95th percentile | NIN, median | NIN, 95th percentile | NIN, median |
| Norm (rural/urban) | calories pcpd | 2400/2100 | 2185/2020 | 2105/1940 | 1985/2020 | 1915/1940 |
| **2009/10** | | | | | | |
| Schedule 1 (30 day recall) | Rural (%) | 82 | 69 | 63 | 52 | 46 |
| | Urban (%) | 65 | 59 | 52 | 59 | 52 |
| Schedule 2 (mixed 30 and 7 day recall) | Rural (%) | 74 | 59 | 52 | 42 | 36 |
| | Urban (%) | 55 | 48 | 42 | 48 | 42 |
| Accounting for meals outside the home, schedule 1 | Rural (%) | 75 | 61 | 55 | 45 | 39 |
| Accounting for meals outside the home, schedule 2 | Rural (%) | 67 | 51 | 45 | 35 | 29 |
| Accounting for household variations in requirements, schedule 2 | Rural (%) | | | 47 | | 35 |
| | Urban (%) | | | 39 | | 39 |
| **1993/94** | | | | | | |
| Schedule 1 (30 day recall) | Rural (%) | 71 | 59 | 53 | 45 | 39 |
| Accounting for meals outside the home, Schedule 1 | Rural (%) | 69 | 57 | 51 | 42 | 36 |

*Source* Calculated from unit record data of the NSS 66th and 50th rounds

2200 calories per capita per day in 2009/10 (Ford and Dietz 2013). In comparison, the Indian figures do not appear to be appreciably low.

### 7.3.2 Accounting for Meals Taken Outside the Home

There has been a systematic increase in the number of meals taken outside the home —which is not accounted for in the energy intakes that are computed. For example, in 1993/94 an average of 0.23 meals were consumed outside the home per day (either for free or on payment); this accounted for 2% of all meals. In 2009/10, the rural household consumed an average of 0.43 meals outside the home; this constituted about 3.5% of all meals. In rural areas the total number of meals consumed over a 30 day period remained about the same at about 364 in 1993/94 and 360 in 2009/10 (although there is considerable variation in the intervening years). This increase is both on account of meals taken outside the home on payment as well as meals obtained for free in schools or preschool. Even if a conservative 200 calories were ascribed to a meal taken outside the home (see for example Tandon and Landes 2011), this would add approximately 100 calories to rural consumption—indeed a difference of 50 calories (0.43–0.23) would practically eliminate the decrease in calorie consumption observed in rural India between 1993/94 and 2009/10 (of approximately 60 calories pcpd).

Of course, not all households can eat out regularly, and the contribution of such meals can vary significantly by household; it is conceivable that the contribution of purchased meals only affects the consumption of the better-off segments, so that there is no impact on the POU estimates. To examine if this is the case we implement a modification of Minhas's (1991) meal accounting adjustment by computing the ratio of (Meals taken at home + Meals taken outside for free, on payment or from employer) divided by (Meals taken at home + Meals given to non-household members), and applying this ratio to the Schedule 1 cal estimates. These calculations, computed only for rural areas, are also given in Table 7.3, and suggest that accounting for meals results in a further reduction of the POU by nearly 8% points across all the norms. Thus, compared to an unadjusted POU corresponding to the moderately active, median height adult norm of 63%, the POU after accounting for meals is 55%. If these same ratios are applied to aggregate data for Schedule 2, and assuming sedentary lifestyles, the resulting prevalence of undernutrition is far lower at about one-third.

To see if this would also have an impact on the trends in POU over time, the same figures were generated for 1993/94 (50th round). It is clear that although the adjusted POU are predictably lower, the difference relative to the unadjusted POU are not as great as in 2009/10. In no case does the difference in POU between meal-adjusted and unadjusted exceed 2% points. Note that this comparison only pertains to rural areas; the differences would be presumably greater in urban India. It is clear that in rural India, it is not only the rich who are increasingly sourcing

meals from outside the home, and even though such meals account for a mere 3.5% of all meals consumed, its impact on the POU is substantial.

### 7.3.3 The POU Using Household Composition to Derive the Norms

To what extent does the use of a uniform norm on a per capita basis bias estimates of the prevalence of undernutrition? To examine this question, using Schedule 2 estimates of intake, Table 7.3 also presents POU as derived by using a household-specific norm. That is a norm is derived for each household taking into account their demographic composition, and if the caloric intake at the household level falls below this norm, the household is counted as being poor. The figures suggest that this adjustment leads to a further decline in the prevalence of undernutrition of between 2 and 3% points as compared to using unadjusted Schedule 2 figures. Since this result would also hold true with Schedule 1 intake estimates, these are not presented here. Also, if combined with a correction for meal accounting, the prevalence would be lower still, although this is also not presented in the Table. Taken together, adjustments based on shorter recall period even for a subset of items, meal accounting and household specific demographic structure, the prevalence of undernutrition figures, are far more realistic in magnitude.

### 7.3.4 Other Sources of Measurement Error

There are several other sources of measurement error which have varied systematically over time, thus affecting not only the magnitude of the estimated POU at a given point of time, but also the trend in the POU. One example of such measurement error is the reduction in the number of food items for which information is canvassed. Jolliffe (2001) reports that longer lists are associated with higher consumption estimates. In India the distinct number of food items has declined from approximately 160 in 1983 (38th round) to about 140 in 2009/10 (66th round). However, there is no easy way to assess the impact of the changed commodity listing on measured energy intakes, since some commodities have also been redefined.

There are other sources of measurement error as well, although not all would affect comparisons over time. On example is the use of consumer units to convert household food intakes into adult-equivalent units as there has been no recent assessment of the inequities in the intra-household allocation of food. Another example is the contribution of processed foods to household diets, which has been increasing over time. Tandon and Landes (2011) have a discussion.

## 7.4 Relating the Prevalence of Undernutrition to Anthropometric Outcomes

One of the reasons offered by the Tendulkar Committee for moving away from the energy norm is the fact that it appears to be completely unrelated to nutritional outcomes. Meenakshi (2012) suggests that a scatter of children's anthropometric measures such as the prevalence of stunting against per capita calorie intakes shows no appreciable relationship. However, if this same relationship is examined for adults, a somewhat different story emerges. While a rigorous analysis of this relationship is beyond the scope of this paper, an examination of bivariate relationships is instructive. Table 7.4 presents coefficients obtained from the regression of various anthropometric outcome indicators for adults and children on the prevalence of undernutrition.

The anthropometric outcomes are taken at the state level, from the third round of the National Family Health Survey 2005/6. These outcome measures are BMI for adult women and men, using two different cut-offs: 18.5 (the lower limit of the

**Table 7.4** Slope coefficients from regression of prevalence of low adult BMI/wasting among children on prevalence of undernutrition

| Dependent variable | 28 states | After dropping two outliers |
|---|---|---|
| **Adults** | | |
| (1) % women with BMI less than 18.5 | 0.22 (0.90) | 0.55 (2.48) |
| (2) % women with BMI less than 17 | 0.14 (1.16) | 0.32 (2.81) |
| (3) % men with BMI less than 18.5 | 0.16 (0.75) | 0.46 (2.16) |
| (4) % men with BMI less than 17 | 0.09 (0.83) | 0.25 (2.50) |
| **Children** | | |
| (5) % children moderately wasted (below −2SD) | 0.26 (1.87) | 0.25 (1.60) |
| (6) % children severely wasted (below −3SD) | 0.18 (2.55) | 0.11 (1.80) |
| (7) % children moderately underweight (below −2SD) | 0.33 (1.39) | 0.39 (1.52) |
| (8) % children severely underweight (below −3SD) | 0.21 (1.47) | 0.16 (1.08) |

*Notes* 1. t-statistics in parentheses.
2. Percentage of women and women with BMI less than 18.5 (groups (1) and (3)) encompass those with BMI less than 17 (groups (2) and (3)). Similarly, group (5) encompasses group (6). SD refers to standard deviations below the median of the reference populations.
3. In all cases, the right hand side variable is the prevalence of undernutrition using cut-offs of 2400 calories pcpd for rural areas and 2100 calories pcpd for urban areas. The results are robust to choice of other norms in terms of significance, though the magnitudes vary.
*Data Source* Anthropometric outcomes using state level data from NFHS3 for 2005/6; prevalence of undernutrition data from NSS for 2004/5

normal range) and 17 (considered to be thin). For children, the indicator corresponding to BMI is wasting, which measures weight for height. However, because there may well be errors in the measurement of heights, especially for very young children, the weight for age measure is also considered. Even though eliciting age in months is also prone to error, the distribution of ages in this survey does not indicate any pattern of digit preference, which one would expect had there been considerable measurement error. In each of these cases, two different cut-offs corresponding to moderate (less than −2 standard deviations from the reference median) and severe (less than −3 standard deviations from the reference median) malnutrition are compared. Each of these eight outcomes is regressed separately on a single variable: the prevalence of undernutrition. This has been estimated at the state level using the 55th round of the NSS corresponding to the year 2004/5, which is the nearest thick round to 2005/6. Although the state-level POU corresponding to the several different cut-offs considered in this paper were computed, the table only presents coefficients from the conventional 2400/2100 norms because the results are qualitatively robust to the choice of other norms. The total number of states for the regression is 28.

When adult BMI outcomes are considered, for both men and women, the coefficients are all insignificant. However, this is driven entirely by two outliers: Sikkim and Meghalaya. When these two observations are dropped, the regression yields significant slope coefficients. Interestingly, the coefficients for women are higher than for men, for both indicators. However, regressions for childhood wasting tend to be significant when all states are considered, but when outliers are dropped, lose significance, at least at the 5% level. Childhood underweight coefficients are all insignificant, irrespective of whether outliers are dropped or not.

Thus there is a significant association between prevalence of undernutrition and prevalence of thinness among adults, but not for children. The bivariate relationships here should not be over interpreted, but clearly more research in this area is called for; if these figures are robust, they have implications for how food and other inputs are allocated to children.

## 7.5 Conclusions

This paper has attempted to highlight the significant measurement issues in the computation of the prevalence of undernutrition in India using NSS data, from the perspective of setting appropriate norms, and measuring intakes. Although energy norms for an individual are biologically determined (which in themselves have changed over time), their use as a policy tool necessitates several additional considerations that have not received much attention in the literature. The changing

demographic structure—with a greater share of adults in the population—translates into higher norms. However, the key assumption made in this paper on norms is the use of median heights (for India as a whole) to derive recommended dietary intakes for a healthy reference individual. One could vary other factors as well: for example, one could attempt using different heights for rural and urban areas, and also consider the impact of interstate variations in heights. This exercise illustrates that relatively small changes in assumptions can lead to large changes in norms, with corresponding consequences for the magnitude of the POU.

Also important is the way food intakes are measured: changes in food habits that may lead to greater underreporting as the recall period increases (unlike the cereal based diets which tended to be not as sensitive to choice of recall period), and the increasing trend, even though small, of eating meals outside the home, all can exert a significant influence on the trends in the POU over time. A third factor influencing the magnitude of the POU is the assumption of sedentary lifestyles. While the sensitivity of the POU estimates to these has been dealt with one at a time in this paper, it is clear that if taken together, these could lead to estimates of POU in the 25–30% range, which, while not small by any means, are at least quite credible. The paper also suggests that in comparing caloric intakes with anthropometric measures, what is relevant are outcomes for adults—not those for children.

This is not to negate the importance of economic drivers behind changes in food consumption patterns, nor to deny that in absolute terms the POU is high. Caloric intakes of the poorest tercile have not changed appreciably. But a serious re-think on the issue of norms is warranted, and a new consensus needs to emerge on this, among not just social scientists but the nutrition and medical communities. And subject to the caveat of the need for empirical work on the relationship between anthropometric outcomes and energy intakes, the evidence presented in Sect. 7.4 suggests a rethink on whether the new poverty line should be completely divorced from food affordability is also warranted.

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# Appendix

**Table 7.5** Energy requirements for Indians specified by the ICMR, 2010

| Gender | Age group | Physical activity level | Body weight (kgs) | Requirements (kcal per day) |
|---|---|---|---|---|
| Male and female | Infants 0–6 months | Not applicable | 5.4 | 500 |
| Male and female | Infants 6–12 months | Not applicable | 8.4 | 670 |
| Male and female | Children 1–3 years | Not applicable | 12.9 | 1060 |
| Male and female | Children 4–6 years | Not applicable | 18.1 | 1350 |
| Male and female | Children 7–9 years | Not applicable | 25.1 | 1690 |
| Male | 10–12 years | Not applicable | 34.3 | 2190 |
| Female | 10–12 years | Not applicable | 35.0 | 2010 |
| Male | 13–15 years | Not applicable | 47.6 | 2750 |
| Female | 13–15 years | Not applicable | 46.6 | 2330 |
| Male | 16–17 years | Not applicable | 55.4 | 3020 |
| Female | 16–17 years | Not applicable | 52.1 | 2440 |
| Male | Adult | Sedentary | 60 | 2320 |
| Male | Adult | Moderate | 60 | 2730 |
| Male | Adult | Heavy | 60 | 3490 |
| Female | Adult | Sedentary | 55 | 1900 |
| Female | Adult | Moderate | 55 | 2230 |
| Female | Adult | Heavy | 55 | 2850 |

*Note* For pregnant women 350 calories, and for lactating women 520–600 calories are to be added to norms

*Source* Indian Council of Medical Research (2010), *Nutrient requirements and recommended dietary allowances for indians: a report of the expert group of the Indian Council of Medical Research,* National Institute of Nutrition, Hyderabad

## References

Beegle, K., Weerdt, De J., Friedman, J., & Gibson, J. (2010). *Methods of household consumption measurement through surveys: Experimental results from Tanzania*. Policy research working paper 5501, the World Bank.

Chand, R., & Jumrani, J. (2013). Food security and undernourishment in India: Assessment of alternative norms and income effect. *Indian Journal of Agricultural Economics, 68*, 39–53.

Deaton, A., & Dreze, J. (2009). Nutrition in India: Facts and Interpretations. *Economic and Political Weekly, 44*, 42–65.

Eli, S., & Li, N. (2013). *Can caloric needs explain three food consumption puzzles? Evidence from India*. New York: Mimeo.

Fogel, R. (2004). *The escape from hunger and premature death, 1700–2100, Europe, America and the third world.* Cambridge: Cambridge University Press.

Ford, E. S., & Dietz, W. H. (2013). Trends in energy intake among adults in the United States: Findings from NHANES. *American Journal of Clinical Nutrition, 11*, 848–853.

Gaiha, R., Jha, R., & Kulkarni, V. S. (2010a). *Prices, expenditure and nutrition in India*. ASARC working paper 2010/15.

Gaiha, R., Jha, R., & Kulkarni, V. S. (2010b). *Diet, nutrition and poverty: The Indian experience*. ASRC working paper 2010/20.

Indian Council of Medical Research. (2010). *Nutrient requirements and recommended dietary allowance for Indians. A Report of the Expert Group of the Indian Council of Medical Research*. National Institute of Nutrition, Hyderabad.

Jolliffe, D. (2001). Measuring absolute and relative poverty: The sensitivity of estimated household consumption to survey design. *Journal of Economic and Social Measurement*, *27*(1), 1–23.

Manna, G. C. (2012). On some contentious issues of the new poverty line. *Economic and Political Weekly, 47*, 11–14.

Meenakshi, J. V. (1996a). How important are changes in taste? A state-level analysis of food demand. *Economic and Political Weekly, 31*, 3265–3269.

Meenakshi, J. V. (1996b). Food consumption trends in India: Towards a better quality of diet? *Journal of the Indian School of Political Economy, 8*, 3533–3550.

Meenakshi, J. V. (2012), Undernutrition. In K. Basu, & A. Maertens (Eds.), *The new Oxford companion to economics in India*. Oxford: Oxford University Press.

Messer, E. (1986). the "Small but healthy" hypothesis: Historical, political and ecological influences on nutritional standards. *Human Ecology, 14*, 57–75.

Minhas, B. S. (1991). On estimating the inadequacy of energy intakes: Revealed food consumption behaviour versus nutritional norms (Nutritional status of Indian people in 1983). *Journal of Development Studies, 28*, 1–38.

Naiken, L. (2002). Keynote paper: FAO methodology for estimating the prevalence of undernourishment. In FAO, *Summary of Proceedings: Measurement and Assessment of Food Deprivation and Undernutrition, International Scientific Symposium.*

National Institute of Nutrition. (2002). *Diet and nutritional status of rural population*, *NNMB Technical Report 21*. Indian Council of Medical Research, Hyderabad.

National Sample Survey Organisation. (2002). *Results of a pilot survey on suitability of different reference periods for measuring household consumption*, *NSS Report 475*.

National Sample Survey Organization. (2012). *Nutritional intake in India 2009/10*. Ministry of Statistics and Programme Implementation.

Patnaik, U. (2010). On some fatal fallacies. *Economic and Political Weekly, 45*, 81–87.

Planning Commission. (1979). *Report of the task force on projections of minimum needs and effective consumption demand,* Government of India.

Planning Commission. (2009). *Report of the expert group to review the methodology for the estimation of poverty*, Government of India.

Sarma, J. S., Roy, S., & George, P.S. (1979), *Two analyses of Indian foodgrain production and consumption data, IFPRI research report 12*.

Sen, P. (2005). Of calories and things: Reflections on nutritional norms, poverty lines and consumption behaviour in India. *Economic and Political Weekly, 40*, 4611–4618.

Sundaram, K. (2013). Some recent trends in population, employment and poverty in India: An analysis. *Indian Economic Review*, this volume.

Tandon, S., & Landes, M. (2011). The sensitivity of food security in India to alternate estimation methods. *Economic and Political Weekly, 46*, 92–99.

WHO Expert Consultation. (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet*.

# Part III
# Development and Trade

# Chapter 8
# Capital Flows and Exchange Rates: The Indian Experience

**Pami Dua and Partha Sen**

**Abstract** This paper examines the relationship between real exchange rate and the level as well as volatility of capital flows for the Indian economy for the period 1993Q2 to 2010Q4. Other variables include fiscal policy, monetary policy and external balance indicators. Estimation results indicate that the variables are co-integrated and each Granger-causes the real exchange rate. The generalized variance decompositions show that determinants of the real exchange rate, in descending order of importance include net capital inflows and their volatility (jointly), government expenditure, money supply and the current account surplus. An analysis on similar lines is also performed for the foreign exchange reserves held by the Reserve Bank of India.

**Keywords** Real exchange rate · Capital flows · Foreign exchange reserves · Co-integration

**JEL Classification** C32 · F31 · F41

## 8.1 Introduction

The 1990s witnessed an upsurge in international capital flows the world over. This was made possible by several factors such as financial liberalization and innovations, spread of information technology, globalization and proliferation of institutional investors. A noteworthy feature of the increased flows to developing countries was that private (equity and debt) flows rather than official flows became a dominant source of financing large current account imbalances. Furthermore, equity flows gained importance in comparison to debt flows.

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At the same time, capital flows to developing countries have been very volatile in the past. This is evident from historical episodes of financial crises such as the East Asian crisis of 1997–98, followed by the turmoil in global fixed income markets, the collapse of Argentina's currency board peg in 2001, and more recently, the slowdown resulting from the subprime crisis in 2008.

Against this backdrop of an increase in the magnitude and variability of capital flows, this study examines the trends and compositional shifts in capital flows with respect to the Indian economy. It also analyses the impact of changes in the levels and volatility of capital flows on the Indian exchange rate.

There is very little recent empirical work[1] grounded in macroeconomic theory for the external sector in the Indian context. The study estimates the exchange rate as a semi reduced form of a dynamic macroeconomic model with both forward-looking and backward-looking variables in it.

This paper is divided into the following sections. Section 8.2 sketches the trends in global capital flows with respect to the developing, East Asian and South Asian countries. Within the global backdrop, we also discuss the Indian experience with capital flows. Section 8.3 discusses the theoretical link between capital flows and exchange rates with specific reference to their relationship with monetary policy through intervention instruments. Section 8.4 describes the econometric methodology and Sect. 8.5 the empirical estimates and analysis of intervention activity for the period 1993Q2 to 2010Q4. In Sect. 8.6 we note the main findings of the paper.

## 8.2 Trends in Capital Flows

### *8.2.1 Global Backdrop*

Until the beginning of 1970s, international capital flows were primarily confined to industrial countries. In the early 1970s, capital flows towards developing countries began rising soon after the first oil price shock but these were mainly debt flows in the form of syndicated bank lending. There was a subsequent increase in the debt of the developing countries leading up to the Latin American debt crisis of 1982 after which capital flows and especially commercial bank lending to developing countries slowed down considerably. At about the same time, foreign direct investment (FDI) inflows to developing countries started to rise while net portfolio flows were virtually non-existent. In the 1990s, however, there was a tremendous increase in the mobility of international capital with private capital flows dominating official capital flows. Furthermore, in response to financial reforms, liberalization and globalization and the consequent pursuit of portfolio diversification combined with high returns, the composition of international capital flows tilted towards portfolio investment. This, together with the financial crises during the 1990s, exacerbated

[1]Earlier works include Krishnamurty and Pandit (1997).

**Table 8.1** Official net resource flows and private net resource flows (US $ Billion)

| | Official net resource flows (average) | | | Private net resource flows (average) | | |
|---|---|---|---|---|---|---|
| Year | All developing countries | East Asia & Pacific | South Asia | All developing countries | East Asia & Pacific | South Asia |
| 1975–79 | 22.54 | 2.76 | 3.60 | 39.01 | 4.33 | 0.33 |
| 1980–84 | 35.17 | 5.02 | 4.68 | 42.73 | 8.53 | 1.89 |
| 1985–89 | 42.08 | 6.89 | 6.96 | 33.61 | 11.57 | 3.61 |
| 1990–94 | 53.27 | 9.80 | 5.86 | 122.76 | 47.83 | 5.47 |
| 1995–99 | 37.93 | 10.23 | 4.08 | 240.35 | 62.62 | 7.80 |
| 2000–04 | 29.40 | 0.36 | 4.01 | 261.86 | 69.63 | 14.25 |
| 2005 | 0.60 | −3.30 | 2.90 | 483.00 | 212.30 | 25.80 |
| 2006 | −5.20 | −9.30 | 3.60 | 562.80 | 248.90 | 73.50 |
| 2007 | 1.50 | −3.40 | 4.40 | 1131.70 | 305.00 | 111.90 |
| 2008 | 29.50 | −1.00 | 8.80 | 805.70 | 212.70 | 56.00 |
| 2009 | 80.50 | 3.70 | 11.00 | 594.40 | 231.60 | 75.20 |
| 2010 | 71.20 | 3.40 | 9.60 | 1058.50 | 443.70 | 102.00 |

*Source* Global Development Finance, 2012

*Notes* 1. **All developing countries** include 128 developing countries from Europe and Central Asia (23), Latin America and the Caribbean (27), Middle East and North Africa (9), Sub-Saharan Africa (45), East Asia and Pacific (16) and South Asia (8)

2. **East Asia and Pacific** includes Cambodia, China, Fiji, Indonesia, Lao PDR, Malaysia, Mongolia, Myanmar, New Guinea, Philippines, Samoa, Solomon Islands, Thailand, Tonga, Vanuatu and Vietnam

3. **South Asia** includes Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka

the financial vulnerability of the developing economies and drew attention towards the impact of capital flows on exchange rates, interest rates, foreign exchange reserves, money supply and other key economic variables.

These trends emerge clearly from Tables 8.1 and 8.2. Table 8.1 shows that while official flows to developing countries[2] reduced from US $35 billion in the early 1980s to negligible in 2007, private capital flows jumped more than 25 times during the same period. In 2008, private capital flows declined in response to the global sub-prime crisis, but soon bounced back to pre-crisis levels in 2010. On the other hand, official flows soared in 2008 and 2009 touching a record high of US $80 billion in 2009.

With regard to official and private capital flows, the trends in South Asia are similar to the trends in the developing countries (Figs. 8.1 and 8.2). Private resource flows rose till 2007 after which they declined in 2008 and 2009, followed by a revival in 2010. Official net resource flows to South Asia and developing countries

[2]**All developing countries** include 128 developing countries from Europe and Central Asia (23), Latin America and the Caribbean (27), Middle East and North Africa (9), Sub-Saharan Africa (45), East Asia and Pacific (16) and South Asia (8).

**Table 8.2** Net Foreign direct investment and net portfolio flows (US $ Billion)

| | Net FDI flows (averages) | | | Net portfolio equity flows (averages) | | |
|---|---|---|---|---|---|---|
| Year | All developing countries | East Asia & Pacific | South Asia | All developing countries | East Asia & Pacific | South Asia |
| 1975–79 | 7.40 | 1.05 | 0.09 | 0.00 | 0.00 | 0.00 |
| 1980–84 | 11.28 | 2.65 | 0.18 | 0.03 | 0.01 | 0.00 |
| 1985–89 | 16.44 | 6.48 | 0.36 | 1.58 | 0.74 | 0.08 |
| 1990–94 | 66.34 | 32.87 | 1.35 | 18.03 | 2.02 | 2.12 |
| 1995–99 | 164.49 | 54.73 | 3.88 | 18.51 | 2.99 | 2.23 |
| 2000–04 | 174.48 | 53.82 | 6.02 | 17.80 | 8.74 | 4.58 |
| 2005 | 280.80 | 142.40 | 11.20 | 67.50 | 25.70 | 12.20 |
| 2006 | 324.70 | 151.70 | 26.10 | 107.70 | 56.20 | 10.00 |
| 2007 | 508.10 | 198.90 | 32.70 | 133.00 | 35.10 | 36.10 |
| 2008 | 587.10 | 214.10 | 51.10 | −53.40 | −7.30 | −15.80 |
| 2009 | 354.10 | 137.50 | 39.40 | 108.80 | 28.90 | 20.50 |
| 2010 | 506.00 | 227.70 | 28.90 | 128.40 | 40.50 | 39.40 |

*Source* Global Development Finance, 2012

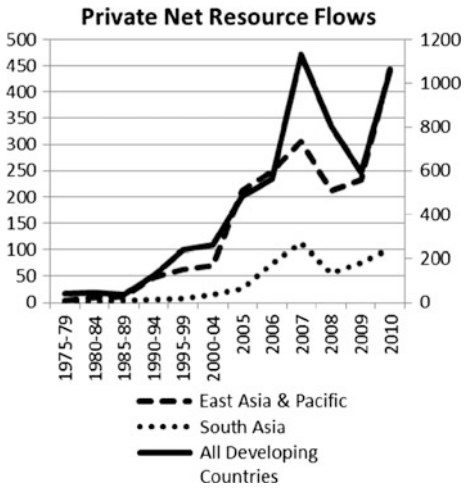


**Fig. 8.1** Private net resource flows. Note: East Asia and Pacific and South Asia on primary (*LHS*) axis and All Developing Countries on secondary (*RHS*) axis. The units are US $ Billion

have been on the rise till the 1990s, after which they started declining. But 2006 onwards they started rising.

Within private capital flows, Table 8.2 shows that FDI flows to developing countries witnessed an increase of more than 45 times from 1980s to 2007, while portfolio flows, which were roughly non-existent in the 1980s, grew more than 7 times between the early 1990s and 2007. In 2008 when the global sub-prime crisis hit the world economy, portfolio flows turned negative but recovered in 2009.

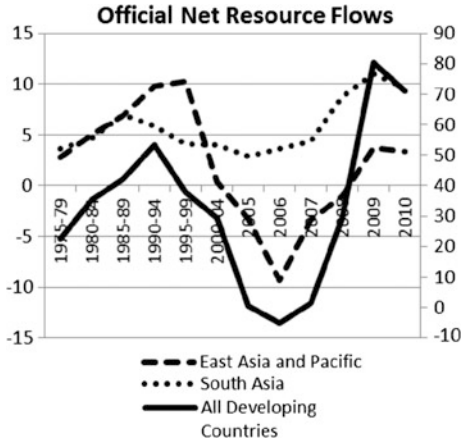


**Fig. 8.2** Official net resource flows. Note: East Asia and Pacific and South Asia on primary (*LHS*) axis and All Developing Countries on secondary (*RHS*) axis. The units are US $ Billion

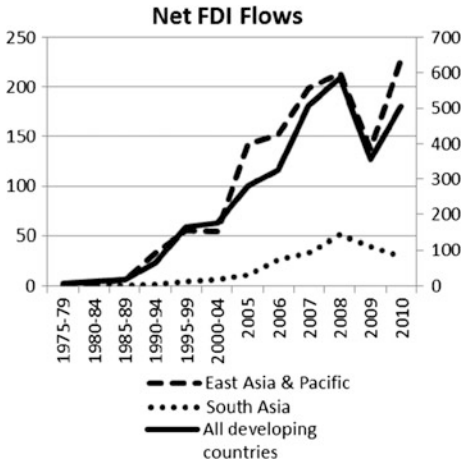


**Fig. 8.3** Net FDI flows. Note: East Asia and Pacific and South Asia on primary (*LHS*) axis and All Developing Countries on secondary (*RHS*) axis. The units are US $ Billion

However, FDI flows grew in 2008 displaying their initial resilience to the crisis. In the following year, FDI flows dipped but immediately recovered back to pre-crisis levels in 2010.

The trends in FPI and FDI flows to South Asia are similar to those of all developing countries (Figs. 8.3 and 8.4). FPI flows to South Asia as well as all developing countries depicted a rising trend till 2007, but displayed a sharp reversal in 2008 due to the impact of the global crisis. These flows bounced back to pre-crisis levels in 2009 and 2010.

FDI flows to South Asia and all developing countries displayed a rising trend till 2007, remaining high in 2008 as well, indicating the resilience of FDI flows to the global crisis. In 2009, FDI flows declined moderately. However in 2010, while FDI flows to developing countries started rising, FDI to South Asia declined slightly.

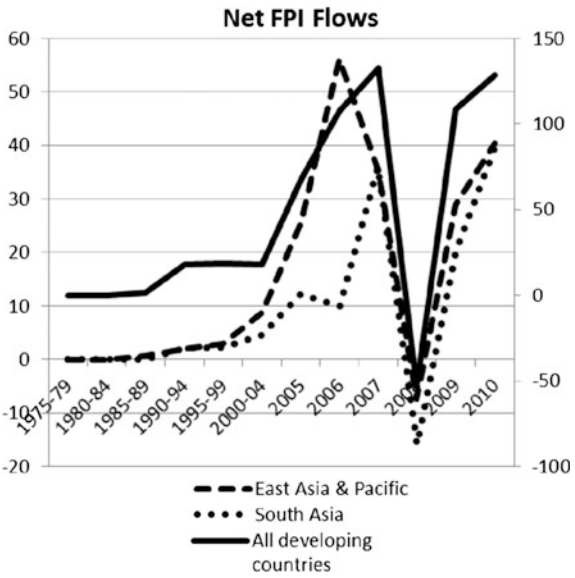


**Fig. 8.4** Net FPI Flows Note: East Asia and Pacific and South Asia on primary (*LHS*) axis and All Developing Countries on secondary (*RHS*) axis. The units are US $ Billion

### *8.2.2 Indian Experience*

India has encouraged capital flows ever since it embarked on the path of liberalization in 1991. Emphasis has been laid on inducing long-term capital flows rather than short term volatile flows. Up to the early 1980s, India relied largely on multilateral and bilateral concessional finance. During the 1980s, there was also an increase in commercial loans as well as short-term borrowings and deposits from non-resident Indians that resulted in a high ratio of short-term debt to total external debt. Nevertheless, during the decade of 1980s, net capital inflows to India were almost negligible.

The Indian economy experienced a surge in net capital flows following the introduction of reforms in the 1990s. Net capital inflows more than doubled from an average of US $4 billion in the 1980s to an average of approximately US $9 billion during 1993–2000. The proportion of non-debt flows in total capital flows has increased from 5 percent in the second part of 1980s to 40% during early 1990s and further to about 61% in 1997–98 to 2002–03. From 2003–04 to 2006–07, non-debt creating flows increased from 73.5 to 159% of total capital inflows. Table 8.3 shows details of the division between non-debt and debt creating flows.

As shown in Table 8.3, within non-debt creating flows, the proportion of portfolio investment in total capital flows was more than 50% in 2003–04 to 2006–07, up from 18.8% in 1997–98 to 2002–03. The proportion of portfolio flows remained low from 1997–98 to 2002–03 and again from 2007–08 to 2010–11, due to the East Asian crisis and the global subprime crisis respectively. A rise in the proportion of portfolio investment during the mid-2000s imparted increased volatility to the total

**Table 8.3** India's capital inflows: composition [as percentage of total capital inflows (net)], annual average

| Indicators/period | 1990–91 to 1996–97 | 1997–98 to 2002–03 | 2003–04 to 2006–07 | 2007–08 to 2010–11 |
|---|---|---|---|---|
| 1. Non debt creating flows | 39.7 | 60.6 | 73.5 | 159 |
| (a) Foreign direct investment | 21.5 | 41.8 | 21.6 | 144.7 |
| (b) Portfolio investment | 18.2 | 18.8 | 51.9 | 14.3 |
| 2. Debt creating flows | 57.7 | 35.3 | 20.6 | 62 |
| 3. Other capital | 2.7 | 4.2 | 5.8 | −121 |
| 4. Total (1 to 3) | **100** | **100** | **100** | **100** |

*Note* Debt Creating Flows include external assistance, external commercial borrowing, NRI deposits, and rupee debt service
*Source* RBI Handbook of Statistics, 2012, Report on Currency and Finance, Various Issues

**Table 8.4** Foreign direct investment and portfolio investment in India with averages and standard deviation (US $ Billion)

| Years | FDI | FPI | FDI | | FPI | |
|---|---|---|---|---|---|---|
| | | | AVG | STDEV | AVG | STDEV |
| 1990–91 | 0.10 | 0.01 | 0.49 | 0.50 | 1.53 | 1.98 |
| 1991–92 | 0.13 | 0.00 | | | | |
| 1992–93 | 0.32 | 0.24 | | | | |
| 1993–94 | 0.59 | 3.57 | | | | |
| 1994–95 | 1.31 | 3.82 | | | | |
| 1995–96 | 2.14 | 2.75 | 2.63 | 0.59 | 2.17 | 1.37 |
| 1996–97 | 2.82 | 3.31 | | | | |
| 1997–98 | 3.56 | 1.83 | | | | |
| 1998–99 | 2.46 | −0.06 | | | | |
| 1999–00 | 2.16 | 3.03 | | | | |
| 2000–01 | 3.27 | 2.59 | 3.46 | 0.86 | 5.23 | 4.75 |
| 2001–02 | 4.73 | 1.95 | | | | |
| 2002–03 | 3.22 | 0.94 | | | | |
| 2003–04 | 2.39 | 11.36 | | | | |
| 2004–05 | 3.71 | 9.29 | | | | |
| 2005–06 | 3.03 | 12.49 | 8.87 | 6.51 | 15.66 | 10.55 |
| 2006–07 | 7.69 | 7.06 | | | | |
| 2007–08 | 15.89 | 27.43 | | | | |
| 2008–09 | 22.37 | −14.03 | 16.56 | 6.62 | 16.22 | 26.22 |
| 2009–10 | 17.96 | 32.40 | | | | |
| 2010–11 | 9.36 | 30.29 | | | | |

*Source* RBI Handbook of Statistics, 2012, Report on Currency and Finance, Various Issues

capital flows as indicated by Table 8.4 that reports the averages and standard deviations of FDI and FPI during the 1990s and through 2010–11. Clearly, the standard deviations associated with portfolio investment are much higher than those related to FDI. This increase in volatility of capital flows especially the portfolio flows has made the Indian economy more vulnerable to external flows and also warrants an active exchange rate management policy.

Both FDI and FPI flows were negligible in the pre-liberalisation period and it was only after 1990–91 that these started increasing. FDI flows to India increased consistently from 1990s to 2006–07, exhibiting a significant jump in 2007–08 and remained high in 2008–09, despite the occurrence of the global crisis. In 2009–10, FDI flows declined marginally due to the impact of the global subprime crisis. This reflects that FDI flows have been more or less resilient during the crisis. The increase in both FDI and FPI in the post-liberalisation period was mainly a result of a shift in trade, industrial and investment policies that were both restrictive and exclusive.

At the same time, the quest for high returns and globalization of financial markets that went hand in hand with the liberalisation, increased the flow of portfolio investment. The downsides of portfolio investment already discussed above are the increase in volatility of capital flows and speculative trading.

### *8.2.3 Exchange Rate Policy*

Since 1993 the exchange rate policy has relied on the underlying demand and supply factors to determine the exchange rate with continuous monitoring and management by the Reserve Bank of India. Aims of the exchange rate policy are to curb excess volatility, maintain an orderly foreign exchange market, ensure an adequate level of reserves, maintain international competitiveness of the rupee and restrain destabilizing speculative activities.

From time to time, the central bank (Reserve Bank of India) uses both direct and indirect interventions to manage the exchange rate. The most frequently used tool is direct intervention in the foreign exchange rate market through purchases and sales in the intervention currency in both spot and forward markets. This is often combined with indirect intervention such as quantitative restrictions, reserve requirements and interest rate changes to smoothen temporary mismatches between demand and supply of foreign currency.

In the backdrop of an increase in the level and variability of capital flows to India and a managed exchange rate, we examine the link between capital flows and exchange rates in the post-liberalisation period. The relationship between capital flows and the central bank's intervention policy is also examined using foreign exchange acquisitions as measures of intervention policy. A theoretical model outlining the linkage between the two variables in a multivariate framework is described in the next section. This is followed by the empirical estimation of the proposed relationships.

## 8.3 Capital Flows and Exchange Rates: A Theoretical Model

To focus on the issue of capital flows, we need a model of imperfect asset substitutability between domestic and foreign assets. We abstract from the role of capital markets and investment—the industrial structure of the Indian economy has been quite dynamic and does not permit incorporation in a small macro model.

We define a household's real wealth as:

$$W \equiv \frac{M + B + (F/E)}{Q} \tag{8.1}$$

where W is real wealth, M the nominal money supply, B the supply of (all short) government bonds, F is the net foreign assets of the private sector, E is the nominal exchange rate (here, the foreign currency price of domestic currency—an appreciation of the rupee is a rise in E[3]) and $Q = P^a (P^*/E)^{1-a}$ is the price index.[4]

There are three assets and by the balance sheet constraint, if the markets for two of these are in equilibrium, then so is the third one.

$$\frac{M}{Q} = L\left(i, i^* - \dot{E}/E, Y, W\right) \tag{8.2}$$

where L is the real demand for money, i (i*) is the domestic (foreign) nominal interest rate, Y is the output level. A dot over a variable is its time derivative. Similarly, there is a market-clearing condition for the domestic bond market.

$$\frac{B}{Q} = \mathrm{J}\left(i, i^* - \dot{E}/E, Y, W\right) \tag{8.3}$$

Here, $L_1, L_2 < 0$, $L_3 > 0$; $0 \leq L_4 \leq 1$; $J_1 > 0$, $J_2 < 0$, $J_3 < 0$,[5] $0 \leq J_4 \leq 1$.

Goods market equilibrium is represented by an IS relationship:

$$Y = A(Y, i - \pi, G) + TB\left(Y, Y^*, \frac{P^*}{EP}\right) \tag{8.4}$$

[3]That is how the data is reported in India.

[4]In an open economy the real values are obtained by deflating nominal variables by a price index Q that is a weighted average of the price of the domestic good (P) and the domestic currency price of the imported good (P*/E). The weights of the two goods are a and 1 − a respectively.

[5]Demand for government bonds J(.) depends negatively on Y since we assume assets are gross substitutes. An increase in Y increases transactions demand for money, and given wealth, people reduce holdings of both bonds (domestic and foreign).

where A is domestic absorption, Y (Y*) is the domestic (foreign) output, P is the expected rate of inflation, G government expenditure, TB the trade balance and P*/EP is the relative price of foreign goods.

There are two dynamic equations—a Phillips Curve and a foreign asset accumulation equation.

$$\frac{\dot{P}}{P} = H(Y - \bar{Y}) + \frac{\dot{Q}_e}{Q} \tag{8.5}$$

In Eq. (8.5) $\frac{\dot{Q}_e}{Q}$ is the expected rate of inflation of the price index.

$$\frac{\dot{F}}{EQ} = TB() + \frac{i^* F}{EQ} \tag{8.6}$$

The system (1) to (6) can be solved for 3 dynamic variables $\frac{EP}{P^*}$, F and $\frac{M+B}{Q}$

A semi-reduced form for $\frac{P^*}{EP}$ would look like the following[6]:

$$\frac{EP}{P^*} = \Psi\left(F, \frac{M}{Q}, \frac{B}{Q}, G_t, G_{t+1}, \ldots, i_t^*, i_{t+1}^*, \ldots, \mu_t, \mu_{t+1}\right) \tag{8.7}$$

where the forcing variables are i*, G and μ (the growth rate of money).

The above is true for a freely floating exchange rate model. Where intervention takes place EP/P* becomes jointly determined with the intervention variable. In the Indian context with the Reserve bank of India intervening continuously to maintain a constant effective exchange rate, we can invert Eq. (8.7) to get the level of foreign exchange as the endogenous variable

$$F^C = \Phi\left(\frac{EP}{P^*}, F, \frac{M}{Q}, \frac{B}{Q}, G_t, G_{t+1}, \ldots, i_t^*, i_{t+1}^*, \ldots, \mu_t, \mu_{t+1,\ldots}\right) \tag{8.8}$$

Equation (8.8) can be thought of as a semi-reduced form for EP/P* with the Central Bank's reaction function inserted in it. Or equivalently, it is the Exchange Market Pressure Model with the variable of interest (for us) being the central Bank's stock of foreign exchange reserves.

Higher real balances are associated with a real depreciation, and therefore are negatively associated with the holding of foreign exchange (insofar as the Central Bank sells foreign exchange to prevent this). Similarly, for the country's stock of foreign assets, we should expect a positive relationship. In the estimated equation, we should expect capital inflows and government expenditure to be positively

[6]A semi-reduced form is a term used for this expression because to obtain this we have solved the system of differential equations. The expression for the real exchange rate depends on the state variables B/Q and F (endogenous over time) and the current and expected future exogenous variables.

associated with the foreign exchange reserves since any factor that leads to an appreciation will result in foreign exchange acquisitions. Finally, in keeping with the exchange market pressure literature, an acquisition of foreign exchange takes place when the real value of the currency is high.

In principle, in an extended model, we could estimate the relationship between the forcing variables, our state variables and some measure of stock prices and a Tobin's q kind of relationship could be estimated. Here, the only (non-predetermined) variable of interest to us is the real exchange rate.

## 8.4 Econometric Methodology

Based on the model in the previous section, we evaluate the relationship between real effective exchange rate, net capital inflows and their volatility, fiscal policy indicator, monetary policy indicator, and a measure of external balance in a VAR framework. Tests for non-stationarity are first conducted, followed by tests for co-integration, estimation of a vector error correction model, tests for Granger causality, generalized impulse responses and variance decompositions.

### *8.4.1 Tests for Non-stationarity*

The classical regression model requires that the dependent and independent variables in a regression be stationary in order to avoid the problem of what Granger and Newbold (1974) called 'spurious regression' characterized by a high $R^2$, significant t-statistics but results that are without economic meaning. A stationary series exhibits mean reversion, has a finite, time invariant variance and a finite covariance between two values that depends only on their distance apart in time, not on their absolute location in time. If the characteristics of the stochastic process that generated a time series change overtime, i.e. if the series is nonstationary, it becomes difficult to represent it over past and future intervals of time by a simple algebraic model. Thus, the first econometric exercise is to test if all the series are nonstationary or have a unit root.

Several tests have been developed to test for the presence of a unit root. In this study, we focus on the Dickey-Fuller GLS or DF-GLS test (Elliott et al. 1996) since it has improved power as compared to the standard ADF (Dickey and Fuller 1979, 1981) test.

The DF-GLS procedure relies on demeaning and/or DE trending a series prior to the implementation of the auxiliary ADF regression as follows:

$$y_t^d = y_y - \phi Z_t'$$

For detrending, $z_t = (1,\ t)'$ and $\phi_0$ and $\phi_1$ are estimated by regressing $[y_1, (1-\bar{\rho}L)y_z], \ldots, (1-\bar{\rho}L)y_T]$ on $[z_1, (1-\bar{\rho}L)z_z, \ldots, (1-\bar{\rho}L)z_T]$ where $\bar{\rho} = 1 - \left(\frac{c}{T}\right)$ with on $c = -13.5$, and L is the lag operator. For demeaning, $z_t = (1)'$ and the same regression is run with $c = -7.0$ (see, Elliot et al. 1996 for details). The augmented Dickey-Fuller regression is then computed using the $y_t^d$ series:

$$\Delta y_t^d = \gamma y_{t-1}^d + \theta t + \sum_{i=2}^{p} \beta_i \Delta y_{t-i+1}^d + \varepsilon_t$$

Critical values for the GLS de-trended test are taken from Elliott et al. (1996). Critical values for the GLS demeaned test are the same as those applicable to the no-constant, no trend ADF test.

### 8.4.2 Co-integration and Granger Causality

Co-integration refers to a long-run equilibrium relationship between nonstationary variables that together yield a stationary linear combination. Although the variables may drift away from the equilibrium for a while, economic forces act in such a way so as to restore equilibrium. The possibility of a co-integrating relationship between the variables is tested using the Johansen and Juselius (1990, 1992) methodology.

If the variables are indeed co-integrated, an error correction model can be estimated with the lagged value of the residual from the co-integrating relationship as one of the independent variables (in addition to lagged values of other variables described above), the left-hand side variable being as above. The error correction model captures the short term dynamics of the variables in the system. These dynamics represent the movements of at least some of the variables in the system in response to a deviation from the long run equilibrium. Movements in these variables ensure that the system returns to the long run equilibrium.

The concept of Granger causality (Granger 1986, 1988) can be tested in the framework of the error correction model. The Granger causality approach analyses how much of the current variable $y_t$ can be explained by its own past values and tests whether adding lagged values of other variables can improve its forecasting performance. If adding lagged values of another variable, $x_t$ does not improve the predictive ability of $y_t$, we say that $x_t$ does not Granger cause $y_t$. In the error correction framework, Granger-causality can be tested by a joint $\chi^2$ test of the error correction term and the lags of $x_t$.

We now turn to the impulse responses and variance decompositions. While co-integration gives the long-run relationship between the variables and Granger-causality throws light on the predictive ability of other variables,

innovation accounting methods that include impulse responses and variance decompositions capture the dynamic relationships between the variables.

### 8.4.3 Impulse Response Analysis

The impulse response function traces the effect of a one standard deviation shock to one of the variables on current and future values of all the endogenous variables. A shock to any variable in the system does not only affect that variable directly but is also transmitted to all of the endogenous variables through the dynamic structure of the VAR. This function thus measures the time profile of the effect of shocks on the future states of a dynamical system.

The innovations are, however, usually correlated, so that they have a common component, which cannot be associated with a specific variable. A common method of dealing with this issue is to attribute all of the effect of any common component to the variable that comes first in the VAR system (Sims 1980, 1981; Lutkepohl 1991). In this approach, the underlying shocks to the VAR model are orthogonalized using the Cholesky decomposition of the variance-covariance matrix of the errors. The drawback is that the orthogonalized impulse responses, in general, depend on the order of the variables in the VAR.

This problem of dependence on the ordering of the variables in the VAR is overcome in the generalized impulse response method (see Koop et al. 1996; Pesaran and Pesaran 1997; Pesaran and Shin 1998). The generalized impulse responses are uniquely determined and take into account the historical pattern of correlations observed amongst the different shocks. We therefore use the generalized impulse response method for our analysis.

Once the impulse response of a variable to one standard error shock in another variable is computed, it is important to analyse whether the response is statistically significant or not. In order to test the statistical significance of the impulse response functions, bootstrapped confidence intervals are computed. The impulse response function along with the upper and the lower percentiles indicate the significance of the impulse response functions. In this study the upper 90% and the lower 10% percentiles are used to test for the significance of the impulse response functions.

### 8.4.4 Variance Decomposition Analysis

While impulse response functions trace the effects of a shock to one endogenous variable on other variables in the VAR, variance decomposition breaks down the variance of the forecast error into components that can be attributed to each of the endogenous variables. Specifically, it provides a breakdown of the variance of the n-step ahead forecast errors of variable $i$ which is accounted for by the innovations in variable $j$ in the VAR. As in the case of the orthogonalized impulse response

functions, the orthogonalized forecast error variance decompositions are also not invariant to the ordering of the variables in the VAR. Thus, we use the generalized variance decomposition which considers the proportion of the n-step ahead forecast errors of $x_t$ which is explained by conditioning on the non-orthogonalized shocks but explicitly allows for the contemporaneous correlation between these shocks and the shocks to the other equations in the system.

As opposed to the orthogonalized decompositions, the generalized error variance decompositions can add up to more or less than 100% depending on the strength of the covariance between the different errors.

## 8.5 Empirical Results

The variables used in the paper are the real effective exchange rate, net capital inflows and their volatility, fiscal policy indicator, monetary policy indicator, and real current account surplus. The REER index is the weighted average (36-country) of the bilateral nominal exchange rates of the home currency in terms of foreign currencies adjusted by domestic to foreign relative local-currency prices. The exchange rate of a currency is expressed as the number of units of Special Drawing Rights (SDRs) that equal one unit of the currency (SDRs per currency). A fall in the exchange rate of the rupee against SDRs therefore represents a depreciation of the rupee relative to the SDR. Similarly, a rise in the exchange rate represents an appreciation of the rupee. The sum of foreign institutional investment and foreign direct investment has been taken as the proxy for net capital inflows. To compute real net capital flows, nominal capital flows are deflated by the consumer price index.

Volatility of real net capital inflows has been calculated by using the 3-period moving standard deviation:

$V_t = \left[(1/m)\sum_{i=1}^{m}(Z_{t+i-1} - Z_{t+i-2})^2\right]^{1/2}$, where $m = 3$ and $Z$ denotes net capital inflows measured by the sum of net FDI and FPI. Government expenditure and high-powered money are the fiscal and monetary policy indicators respectively. All the variables are in real terms are computed by deflating the nominal variables by the consumer price index.

We examine the relationship between trade based REER, net capital inflows and their volatility in the presence of fiscal and monetary policy indicators and real current account surplus. As discussed in the introduction, net capital inflows were negligible until the beginning of 1990s and picked up only thereafter. Since then they have been on the rise, except for some aberrations. REER has also exhibited an upward trend since 1992–93. FDI rose significantly in the early 1990s while FII flows started only in 1993. Both have been on the rise ever since except recently in 2008 when foreign portfolio flows showed a sharp reversal following the subprime crisis. Figure 8.5 shows the trends in REER and the volatility of capital inflows (as

against nominal trends discussed in the earlier sections). It is clear that both variables generally moved in tandem.

Now, we turn to the empirical estimates that are based on quarterly data from 1993Q2 to 2010Q4. We first test for non-stationarity of the variables included in the analysis. Results of the unit root test are summarized in Table 8.5 that shows that, all the variables can be treated as nonstationary. Testing for stationarity of differences of each variable confirms that all the variables are integrated of order one.

We use Johansen's FIML technique to test for co-integration between REER, real net capital inflows (sum of FII and FDI) and their volatility, real money supply, real government expenditure, and real current account surplus.[7] After ascertaining that the variables are integrated of the same order, we select the order of the VAR using the likelihood ratio test that suggests an optimal lag length of 3.

We find that all of the variables in the co-integrating vector have the expected signs, as suggested by the theoretical model. The co-integrating vector suggests that while REER is positively related to real net capital inflows and their volatility, real government expenditure,[8] and real current account surplus, it is negatively related to money supply.[9] The signs are therefore economically plausible. The co-integrating equation is as follows:

$$\mathbf{REER} = \mathbf{0.25377} * \mathbf{cap_{fii\&fdi}} + \mathbf{0.6460} * \mathbf{vol} - \mathbf{0.0364} * \mathbf{m} + \mathbf{0.0558} * \mathbf{g} + \mathbf{0.0611} * \mathbf{cac}$$

where **REER** is the trade based REER (36-country), $\mathbf{cap_{fii\&fdi}}$ is real net capital inflows defined as sum of real net FII and FDI, **vol** is the 3-quarter moving standard

[7]Alternative measures of all the variables were also tried. For instance, to capture capital inflows foreign exchange reserves were employed. Volatility was measured by the three-period and four-period moving average coefficient of variation. Alternative monetary policy measures included M3, M1 and domestic credit. Fiscal policy measures included a measure of fiscal stance as described by Joshi and Little (1998) as well as fiscal deficit. Various measures of interest rate differential we have tried—three-month and one-year differential between the Treasury bill rate and LIBOR, difference between commercial paper rate and three-month LIBOR, three-month LIBOR and one-year LIBOR. The variables selected and reported gave the most satisfactory results.

[8]Increased government expenditure directed towards the domestic good, creates excess demand for the latter. A real appreciation is a rise in the price of the domestic good in terms of the imported good. This result also comes out of an alternative definition of the real exchange rate where it the relative price of the non-traded good (the Salter-Swan Model). There if the government expenditure is directed towards the non-traded, the real exchange rate (now defined as its price in terms of the traded good) must appreciate.

[9]The theoretical effect along the dynamic path of the economy of an increase in money supply (with sticky prices and an increase in real balances) and the real exchange rate is ambiguous. On the one hand, an increase in money supply through portfolio balance would cause an excess demand for foreign assets. This is achieved, inter alia, through a depreciation of the currency. On the other hand, an increase in capital inflows would tend to appreciate the currency, lower the transactions demand for money and lead to lower real balances (see Buiter and Miller 1981).

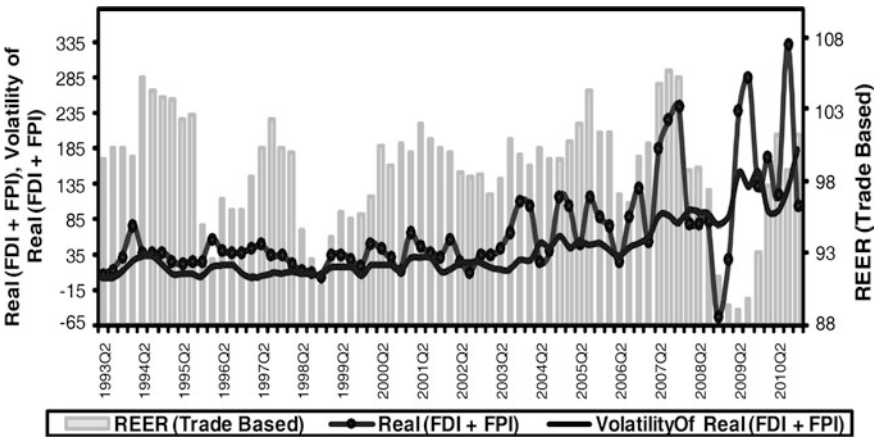


**Fig. 8.5** Real (FDI + FPI), Volatility of Real (FDI + FPI) Inflow & REER (Trade Based). *Source* RBI Handbook of Statistics, 2012

**Table 8.5** DF-GLS unit root test

| Variables | Levels (T&I) | First difference (T&I) | Inference at 5% |
|---|---|---|---|
| REER | −2.600 | −5.169*** | I(1) |
| $Cap_{fii\&fdi}$ | −0.823 | −5.125*** | I(1) |
| Vol | −0.781 | −5.848*** | I(1) |
| m | −1.219 | −3.041** | I(1) |
| g | −2.170 | −14.543*** | I(1) |
| ca | −1.180 | −4.428*** | I(1) |
| Forexacq | −2.297 | −10.363*** | I(1) |

*Note* ***, **, * denotes significance at 1, 5 and 10% level implying that the null of unit root is rejected

deviation of $\mathbf{cap_{fii\&fdi}}$, **m** is real M0, **g** is real government expenditure, and **cac** is real current account surplus.

In the above co-integrating vector, real net capital inflows, real money supply, real government expenditure, current account surplus and volatility of capital flows are all significant at 1%.

Using the vector error correction model, we test whether the variables individually Granger cause REER. For this, we test for the joint significance of the lagged terms of each variable along with the error correction term. The results reported in Table 8.6 indicate that the null hypothesis of no Granger causality is strongly rejected in all the cases in both models.

An investigation of the dynamic interaction of various shocks in the post sample period is examined using the variance decomposition and the impulse response functions. Instead of the orthogonalized impulse responses, we use the generalized impulse responses and variance decompositions.

**Table 8.6** Granger causality tests model: REER = f ($Cap_{fii\&fdi}$, Vol, m, g, cac)

| Null hypothesis | Number of lags | $\chi^2$ (calculated) | Conclusion |
|---|---|---|---|
| REER = f($Cap_{fii\&fdi}$, vol, m, g, cac) | | | |
| REER is not Granger caused by $Cap_{fii\&fdi}$ | 2 | 7.1132[0.068] | Reject Ho at 10% |
| REER is not Granger caused by Vol | 2 | 9.3890[0.025] | Reject Ho at 5% |
| REER is not Granger caused by m | 2 | 10.2523 [0.017] | Reject Ho at 5% |
| REER is not Granger caused by g | 2 | 12.8836 [0.005] | Reject Ho at 1% |
| REER is not Granger caused by cac | 2 | 8.9212[0.030] | Reject Ho at 5% |

**Table 8.7** Generalized forecast error variance decomposition for REER model: REER = f ($Cap_{fii\&fdi}$, Vol, m, g, cac)

| Horizon | REER | $Cap_{fii\&fdi}$ | Vol | m | g | cac |
|---|---|---|---|---|---|---|
| 0 | 1.0000 | 0.0612 | 0.0063 | 0.0175 | 0.0016 | 0.0192 |
| 1 | 0.8886 | 0.0964 | 0.0964 | 0.0940 | 0.0555 | 0.0097 |
| 4 | 0.8122 | 0.1001 | 0.1482 | 0.1258 | 0.1143 | 0.0036 |
| 8 | 0.8114 | 0.0908 | 0.1511 | 0.1258 | 0.1254 | 0.0021 |
| 12 | 0.8109 | 0.0880 | 0.1532 | 0.1272 | 0.1284 | 0.0016 |
| 16 | 0.8094 | 0.0883 | 0.1550 | 0.1285 | 0.1294 | 0.0013 |
| 20 | 0.8100 | 0.0879 | 0.1549 | 0.1286 | 0.1298 | 0.0011 |
| 24 | 0.8105 | 0.0873 | 0.1549 | 0.1287 | 0.1301 | 0.0010 |
| **Normalized: 24** | 61.7503 | **6.6548** | **11.8035** | **9.8067** | **9.9080** | **0.0768** |

*Note* Entries in each row are the percentages of the variances of the forecast error in REER that can be attributed to each of the variables indicated in the column headings. The decompositions are reported for one, four-, six-, twelve-, and twenty four-quarter horizons. The extent to which the generalized error variance decompositions add up to more or less than 100% depends on the strength of the co-variances between the different errors. The last row denotes the values for horizon 24 normalized to sum to 100

***Generalized Variance Decompositions and Impulse Response Analysis***

Results in Table 8.7 provide variance decompositions for a 24-quarter time horizon. The last row of the table also provides the normalized decompositions.

At the end of the 24-quarter forecast horizon, around 62% of the forecast error variance of REER is explained by its own innovations. Real net capital inflows and their volatility together explain about 18% of the total variation after 24 quarters.[10] The determinants of REER in descending order of importance include net capital

[10]Note that the generalized forecast error variance decompositions add to more than 100%. The magnitude of the sum depends on the strength of the covariance between the different errors.

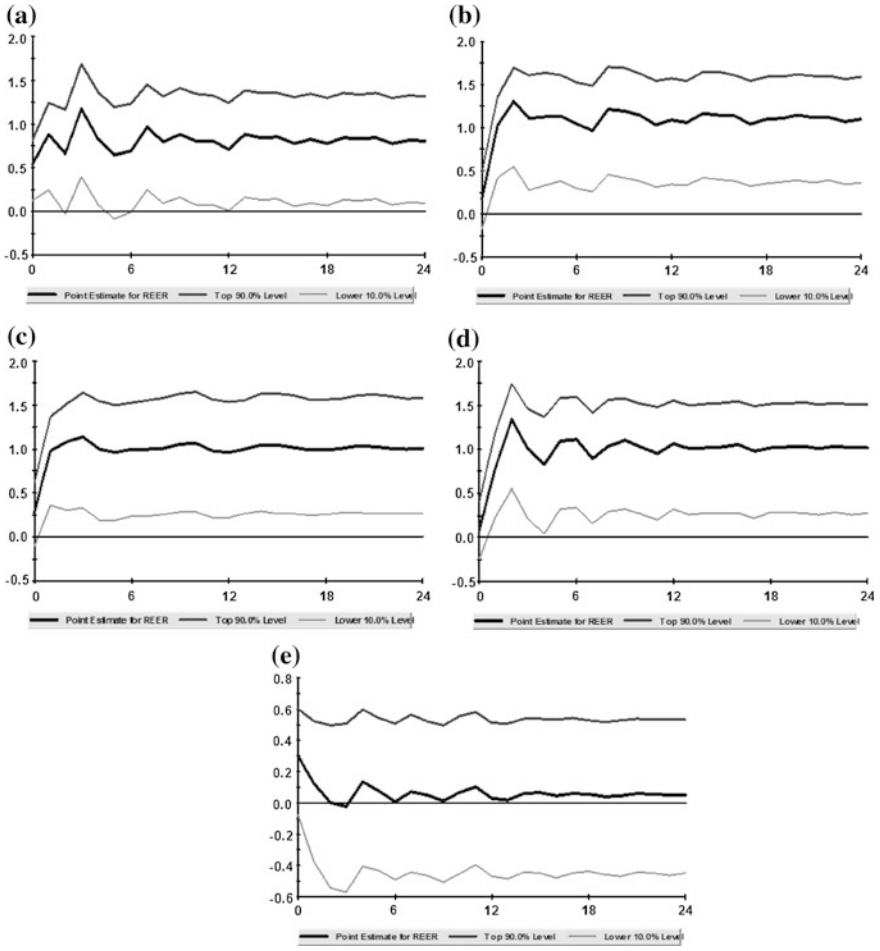


**Fig. 8.6** **a–e** Impulse response analysis. **a** Generalized impulse responses of REER to one standard error shock to $cap_{fii\&fdi}$. **b** Generalized impulse responses of REER to one standard error shock to $vol_{fdifii}$. **c** Generalized impulse responses of REER to one standard error shock to M0. **d** Generalized impulse responses of REER to one standard error shock to *g*. **e** Generalized impulse responses of REER to one standard error shock to *cac*

inflows and their volatility (jointly), government expenditure, money supply and current account balance.

Impulse responses for model 1 are shown in Fig. 8.6a–e. The directions of changes observed in the impulse responses conform to the signs obtained earlier in the co-integrating vector for most of the variables. The immediate and long-run effect of a one standard deviation shock to net capital inflows on REER is positive and significant. The net impact of a one standard deviation shock to the volatility is significantly positive in the short-run as well as in the long-run. The immediate and

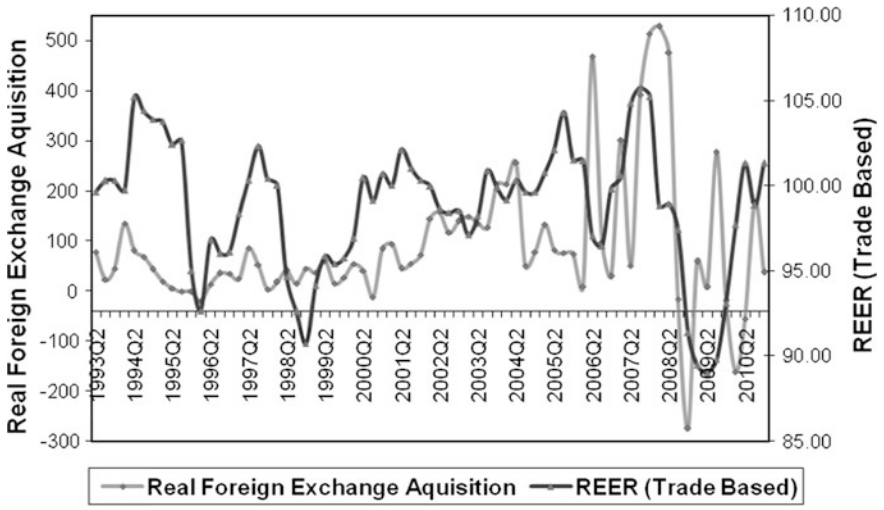


**Fig. 8.7** Real Foreign Exchange Acquisition & REER (Trade Based).
*Source* RBI Handbook of Statistics, 2012

permanent effect of a one standard deviation shock to government expenditure is positive and significant. A one standard deviation shock to the current account surplus has a positive effect initially as well as in the long run but the effect is insignificant. A one standard deviation shock to real money supply has a long run positive and significant impact on REER. The impulse response of REER to a unit shock in money supply is positive which is different from the results obtained from the long run co-integrating vector. The difference arises due to the fact that impulse response functions capture the direct as well as indirect effects of a shock to money supply. This is because a unit shock to a variable (money supply) not only influences the variable of interest (REER) directly but also influences the other endogenous variables in the system, which in turn influences the variable of interest (REER).

Now, we turn to the results that capture the intervention by the Reserve bank of India. For this we look into the relationship between real foreign exchange acquisitions, trade based REER (36-countries), net capital inflows, fiscal policy indicator, monetary policy indicator, and real current account surplus. Figure 8.7 shows the trends in REER and real foreign exchange acquisition that captures intervention by the Reserve Bank of India. The unit root test concludes that real foreign exchange acquisition is nonstationary. Therefore, we use Johansen's FIML technique to test for co-integration between foreign reserve acquisitions, REER, real net capital inflows (sum of FII and FDI), real money supply, real government expenditure, and real current account surplus. We select the order of the VAR using the likelihood ratio test that suggests an optimal lag length of 3.

The maximum eigenvalue test statistic selects one co-integrating relation between the variables. We find that all of the variables have the expected signs, as suggested by the theoretical model. The co-integrating vector suggests that while

real foreign exchange acquisitions is positively related to REER, real net capital inflows, real government expenditure, and real current account surplus, it is negatively related to money supply. The signs are therefore economically plausible. The cointegrating equation[11] is as follows:

**Model A**

$$\mathbf{forexacq} = 32.337 * \mathbf{REER} + 5.560 * \mathbf{cap_{fdi\&fii}} - 0.468 * \mathbf{m} + 2.834 * \mathbf{g} + 2.026 * \mathbf{cac}$$

All the variables in the above co-integrating vector are significant at 5% level and have the correct signs—i.e., in accordance with our theoretical presumption.

**Model B: Model A + volatility of REER**

$$\mathbf{forexacq} = 95.354 * \mathbf{REER} + 215.23 * \mathbf{Vol_{REER}} + 5.402 * \mathbf{cap_{fdi\&fii}} - 0.503 * \mathbf{m} + 5.5176 * \mathbf{g} + 5.816 * \mathbf{cac}$$

**Model C: Model B–REER**

$$\mathbf{forexacq} = 94.8 * \mathbf{Vol_{REER}} + 12.446 * \mathbf{cap_{fdi\&fii}} - 1.291 * \mathbf{m} + 8.745 * \mathbf{g} + 7.130 * \mathbf{cac}$$

Tables 8.8, 8.9 and 8.10 present the results of test of Granger Causality for models A, B and C. In general, the results indicate that the variables Granger cause foreign exchange acquisition.

It is clear from the earlier sections that increasing integration of the Indian economy with the world economy has resulted in a surge in capital flows to the Indian economy. A persistent inflow of foreign exchange essentially means that the world demand for rupees exceeds its supply. Without intervention in the foreign exchange market, this excess demand would cause the rupee to appreciate relative to other foreign currencies and make Indian exports less competitive in foreign markets.

Intervention, however, can have other undesirable effects. If the Reserve Bank of India intervenes by buying dollars, every dollar purchased by the RBI releases additional rupees into the system, increases money supply and can be inflationary. The central bank has simultaneously implemented a policy of sterilisation that involves the sale of government securities to counteract the increased money supply caused by its intervention in the foreign exchange market.

[11]Real foreign exchange acquisitions are denoted by **forexacq**.

**Table 8.8** Granger causality tests Model A: Forexacq = f (REER, $Cap_{fii\&fdi}$, m, g, cac)

| Null hypothesis | Number of lags | $\chi^2$ (calculated) | Conclusion |
|---|---|---|---|
| MODEL A: Forexacq = f(REER, $Cap_{fii\&fdi}$, m, g, cac) | | | |
| Forexacq is not Granger caused by REER | 3 | 12.6232 [0.013] | Reject Ho at 5% |
| Forexacq is not Granger caused by $Cap_{fii\&fdi}$ | 3 | 32.1274 [0.000] | Reject Ho at 1% |
| Forexacq is not Granger caused by m | 3 | 12.9057 [0.012] | Reject Ho at 5% |
| Forexacq is not Granger caused by g | 3 | 13.2839 [0.010] | Reject Ho at 1% |
| Forexacq is not Granger caused by cac | 3 | 14.8587 [0.005] | Reject Ho at 1% |

**Table 8.9** Granger causality tests Model B: Forexacq = f (REER, $vol_{REER}$, $Cap_{fii\&fdi}$, m, g, cac)

| Null hypothesis | Number of lags | $\chi^2$ (calculated) | Conclusion |
|---|---|---|---|
| MODEL B: Forexacq = f(REER, $vol_{REER}$, $Cap_{fii\&fdi}$, m, g, cac) | | | |
| Forexacq is not Granger caused by REER | 3 | 8.9692 [0.062] | Reject Ho at 5% |
| Forexacq is not Granger caused by $vol_{REER}$ | 3 | 6.5145 [0.164] | Reject Ho at 20% |
| Forexacq is not Granger caused by $Cap_{fii\&fdi}$ | 3 | 25.3312 [0.000] | Reject Ho at 5% |
| Forexacq is not Granger caused by m | 3 | 8.5778 [0.073] | Reject Ho at 1% |
| Forexacq is not Granger caused by g | 3 | 9.9337 [0.042] | Reject Ho at 1% |
| Forexacq is not Granger caused by cac | 3 | 10.2970 [0.036] | Reject Ho at 1% |

In the estimated REER equation, increased capital inflows tend to cause a real appreciation, as do increased real current account balances and expansionary fiscal policy. An appreciation is associated with a higher volatility in the real exchange rate. It would be, however, interesting to see whether this relationship holds in the recent time period marked by higher volatility and a trend of real exchange rate depreciation.

In model B of the intervention equation, we find that foreign exchange acquisition is positively related to the exchange rate (appreciation causes intervention), positively related to the volatility (again it would be interesting to see what this looks like in the more recent period of the RBI losing foreign exchange), capital

**Table 8.10** Granger causality tests Model C: Forexacq = f ($vol_{REER}$, $Cap_{fii\&fdi}$, m, g, cac)

| Null hypothesis | Number of lags | $\chi^2$ (calculated) | Conclusion |
|---|---|---|---|
| MODEL C: Forexacq = f($vol_{REER}$, $Cap_{fii\&fdi}$, m, g, cac) | | | |
| Forexacq is not Granger caused by $vol_{REER}$ | 3 | 4.3094 [0.366] | Do not Reject Ho |
| Forexacq is not Granger caused by $Cap_{fii\&fdi}$ | 3 | 21.6097 [0.000] | Reject Ho at 1% |
| Forexacq is not Granger caused by m | 3 | 9.1184 [0.058] | Reject Ho at 10% |
| Forexacq is not Granger caused by g | 3 | 9.3937 [0.052] | Reject Ho at 10% |
| Forexacq is not Granger caused by cac | 3 | 8.5350 [0.074] | Reject Ho at 10% |

flows and the current account. The negative coefficient on real balances is a result of intervention in the foreign exchange market—the larger is the acquisition, the lower are the real balances (actually nominal balances, because of price stickiness). The positive coefficient on g is probably an indirect effect working through the effects of g on REER and its effect of raising the real interest rate.

There is very little empirical work grounded in macroeconomic theory for the external sector in the Indian context. We have attempted here to estimate the exchange rate as a semi-reduced form of a dynamic macroeconomic model with booth forward-looking and backward-looking variables in it. As mentioned above, an extension of this could include the stock market also.

## 8.6 Conclusions

India is a developing economy that has embarked on a path of integration with the world economy. This integration has proceeded in both the trade sector and in financial openness. In this paper, we first set up a theoretical model where the exchange rate functions like an asset price in well a developed financial market. In the empirical setup, we modified this to take into account some developing country features. These include: (1) the well-known excessive volatility of macroeconomic variables in developing countries relative to the more advanced ones. In a less developed financial sector in the initial stages of integration with the world economy, volatility of capital flows matter a lot—our empirical analysis bears this out. (2) In developed capital markets, as mentioned above, the stocks of assets determine the exchange rate along with the other financial assets. In the initial stages of

development, however, flows are "sizeable" relative to stocks.[12] So, we introduce the current account as a determinant of exchange rate as well. Our empirical analysis shows that this also works well empirically.

Thus, our estimated equations refer to a hybrid model of a well-developed financial market and a more primitive one. The model performs successfully in the estimated period. Given that there are almost no models of exchange rate determination based on theoretical underpinnings,[13] we believe that our paper gives encouraging results.

Ideally, one requires the estimation of a forward-looking structural model. At this stage, that is a pipe dream mainly because of data limitations.

The policy prescriptions that emerge for our analysis suggest that capital inflows (both in levels and variability) have appreciated the real exchange rate. In addition the loose fiscal stance of the government has also contributed to this. One needs to look no further than the huge trade deficit that India runs for the consequences of this appreciation. If India is to regain competitiveness, both capital flows may need to be managed as well as fiscal policy would need to be less expansionary.

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## References

Buiter, W. H., & Miller, M. H. (1981). Real exchange rate overshooting and the output cost of bringing down inflation. *The Warwick Economics Research Paper Series (TWERPS)* 204. University of Warwick, Department of Economics.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*, 427–431.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49*, 1057–1072.

Elliott, G., Rothenberg, T., & Stock, J. H. (1996). Efficient tests for an autoregressive unit root. *Econometrica, 64*, 813–836.

Granger, C. W. J. (1986). Developments in the study of co-integrated variables. *Oxford Bulletin of Economics and Statistics, 48*, 213–227.

Granger, C. W. J. (1988). Some recent developments in the concept of causality. *Journal of Econometrics, 39*, 199–212.

Granger, C. W. J., & Newbold, P. (1974). Spurious regressions in econometrics. *Journal of Econometrics, 35*, 143–159.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on co-integration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics, 52*, 169–209.

[12]This statement is not quite accurate because stocks and flows have different time dimensions.

[13]For instance, see Kletzer and Kohli (2000) who estimate a fully flexible exchange rate monetary model after discussing at length the RBI's intervention!

Johansen, S., & Juselius, K. (1992). Testing structural hypothesis in a multivariate co-integration analysis of PPP and the UIP for UK. *Journal of Econometrics, 53*, 211–244.

Joshi, V., & Little, I. M. D. (1998). *India: Macroeconomics and political economy, 1964–1991* (pp. 231–234). Oxford: Oxford University Press.

Kletzer, K., & Kohli, R. (2000). *Exchange rate dynamics with financial repression: A test of exchange rates models for India*. Indian Council for Research in International Economic Relations, Working Paper No. 52.

Koop, G., Pesaran, M. H., & Potter, S. M. (1996). Impulse response analysis in nonlinear multivariate models. *Journal of Econometrics, 74*, 119–147.

Krishnamurty, K., & Pandit, V. (1997). Exchange rate, tariff and trade flows: Alternative policy scenarios for India. *Journal of Asian Economics, 8*, 425–454.

Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics*, *54*, 159–178. Lutkepohl, H. (1991). *Introduction to multiple time series analysis*. New York: Springer.

Pesaran, M. H., & Pesaran, B. (1997). *Working with Microfit 4.0: An interactive econometric software package*. Oxford: Oxford University Press.

Pesaran, M. H., & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. *Economics Letters, 58*, 17–29.

Report on Currency and Finance, Reserve Bank of India, Various Issues.

Sims, C. (1980). Macroeconomics and reality. *Econometrica, 48*, 1–48.

Sims, C. (1981). An autoregressive index model for the US 1948–1975. In J. Kamenta & J. B. Ramsey (Eds.), *Large scale macro-econometric models*. The Netherlands: North-Holland.

# Chapter 9
# Determinants of Import Intensity of India's Manufactured Exports Under the New Policy Regime

**Bishwanath Goldar**

**Abstract** This paper attempts to understand the factors behind the significant increase in import intensity of India's manufactured exports that has taken place in the post-reform period. The industry-level analysis indicates that the increase in import intensity of manufactured exports is attributable partly to changes in product composition of exports and partly to growing export orientation of Indian manufacturing industries. A major contributing factor appears to be the liberalization of import policy in India. Firm-level econometric analysis reveals that exporting firms are more import intensive than non-exporting firms. A significant positive impact of export intensity on import intensity of firms is clearly indicated. The econometric results also show that firms' decisions to import and export are interdependent. Both decisions may be rooted in firm heterogeneity.

**Keywords** Import intensity · Manufactured exports · India

**JEL Classification** F13 · F14

## 9.1 Introduction

There have been a number of studies on import intensity of India's exports. These include Bhattacharya (1989), Siddharthan (1989), Dholakia et al. (1992), Sathe (1995, 1997), Burange (2001), Bhat et al. (2007) and Bhat and Paul (2009). A majority of these studies were based on input-output tables (published by the Central Statistical Office, Government of India). Some studies used company-level balance-sheet data. However, only three of these have covered the period beyond

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1991, the year that marks the introduction of major economic reforms in India. Based on the estimates of import intensity of exports available in these studies, one may conclude that the import intensity of exports of India's manufacturing sector has increased significantly over the post reform period. Bhat and Paul (2009), for instance, show that the import intensity of manufactured exports[1] which was 12.9% in 1993–94, increased to 16.8% in 1998–99 and further to 24% in 2003–04. An estimate of the import intensity of manufactured exports for 2006–07 made in the present study (discussed later) turns out to be about 29%. Thus, between 1993–94 and 2006–07, import intensity of manufactured exports has more than doubled.

The significant liberalization of imports that has taken place in India since 1991 with lower tariffs and removal of quantitative restrictions on imports was obviously expected to increase the use of imported intermediate inputs in India's domestic manufacturing. There are studies that have found a favourable impact of import liberalization on productivity of Indian industries through greater access to imported intermediate inputs (e.g., Topalova and Khandelwal 2011). Some studies have also found a positive impact of productivity on exports among Indian manufacturing firms[2]. Thus, there is basis to expect an upward trend in the use of imported intermediate inputs in Indian manufacturing in the post reform period coupled with growing manufacturing exports, the former helping the latter and consequently giving rise to increasing import intensity of exports. Yet, the increase in import intensity of India's manufactured exports in the post-reform period indicated by the available estimates may appear somewhat larger than expected, motivating the need for a closer scrutiny.

This paper attempts to understand the factors behind the observed upward trend in import intensity of India's manufactured exports in the post-reform period. The investigation is carried out in two steps. First, an industry-level analysis of import intensity is carried out with the help of input-output tables. The main aim is to assess how changes in the product composition of manufactured exports have impacted the import intensity of aggregate manufactured exports. Second, an analysis of import intensity is carried out at firm-level using data on manufacturing companies. The purpose of this part of the analysis is to connect the firm import behaviour with the trends observed at the aggregate manufacturing sector level. The rest of the paper is organized as follows. Section 9.2 presents an industry-level analysis of import intensity of manufactured exports. Section 9.3 presents a firm-level analysis of import behaviour of manufacturing firms. Finally, Sect. 9.4 summarizes and concludes.

[1]Ratio of direct and indirect requirements of imports divided by the value of exports.

[2]E.g., Goldar and Kato (2009), Ranjan and Raychaudhuri (2011), Haidar (2012).

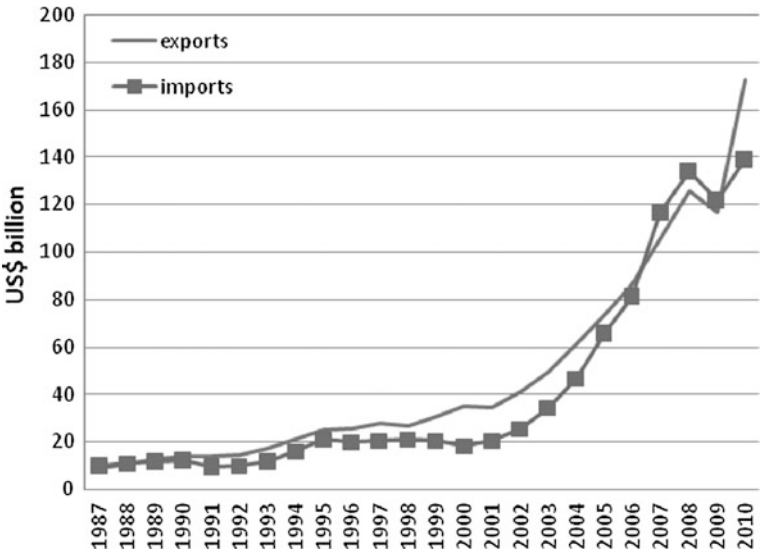


**Fig. 9.1** India's imports and exports of manufactured products (excluding petroleum products), 1987–88 to 2010–11.
*Sources* Author's calculations based on trade data reported in *Handbook of Statistics on Indian Economy*, RBI.
*Note* Imports and exports are in value terms (US$) in current prices

## 9.2 Industry-Level Analysis

Before embarking on an industry-level analysis of import intensity, it would be useful to examine the trends in exports and imports of manufactured products at the aggregate level. Figure 9.1 depicts the trends in India's aggregate imports and exports of manufactured products, expressed in US dollars, in the period 1987–88 to 2010–11. The series have been formed on the basis of imports and exports data for different product groups reported in the *Handbook of Statistics on Indian Economy* published by the Reserve Bank of India (RBI). For the purpose of the analysis, petroleum products have been excluded from both exports and imports.[3]

Figure 9.1 brings out clearly that growth in manufactured exports and manufactured imports have both accelerated since the early 2000s. The growth in manufactured imports has been faster than that in manufactured exports. During 2000–01 to 2010–11, the trend growth rate in manufactured exports was about 18% per annum while that in manufactured imports was about 26% per annum. However, when the entire post reform period, 1991–92 to 2010–11, is considered, the trend

[3]Exports of tea, coffee, processed fruits, and sugar and molasses have been included as a part of manufactured exports. Thus, the coverage of 'manufactured exports' adopted here is wider than that in the RBI *Handbook of Statistics*.

growth rates in manufactured exports and manufactured imports do not differ much; it is about 13% per annum for exports and about 15% per annum for imports.

From the examination of trends in aggregate imports and exports of manufactured products, not much insight is gained into the causes of growing import intensity of India's manufactured exports in the post-reform period, since both series by and large move together. Hence, to take this analysis a step further, trends in exports have been analysed for the manufactured product groups that rank relatively low in terms of import intensity, contrasted with the manufactured product groups that rank relatively high in terms import intensity. This is depicted in Fig. 9.2. For preparing the figure, data have been drawn from the RBI data source mentioned above. The following products group have been included under the first category (low import intensity): Tea, Coffee, Processed fruits, Sugar and molasses, Leather and manufactures of leather, Cotton textiles, Silk textiles, Jute textiles, Woolen textiles, Coir and coir manufactures, Carpets, and Readymade garments. The following product groups have been included in the second category (high import intensity): Basic chemicals, pharmaceuticals and cosmetics, Plastics and linoleum products, Iron and steel, Manufacture of metals, Non-electrical machinery, Electrical machinery, and Gems and jewellery.

It is interesting to observe from Fig. 9.2 that the exports of the two above mentioned categories of manufactured products moved by and large at the same

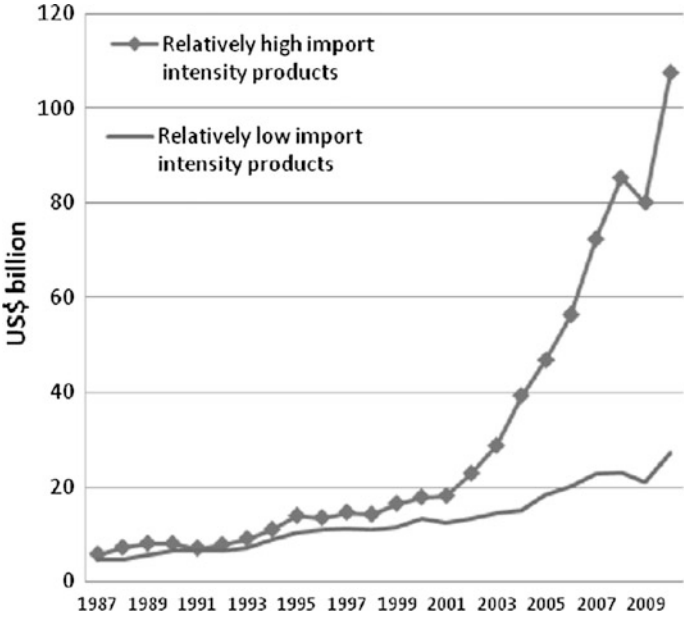


**Fig. 9.2** Exports of manufactured products, by category, 1987–88 to 2010–11.
*Sources* Author's calculations based on trade data reported in *Handbook of Statistics on Indian Economy*, RBI.
*Note* Imports and exports are in value terms (US$) in current prices

pace in the period 1987–88 to 2000–01. In the period since 2000–01, the exports of manufactured products that rank high in terms of import intensity have grown much faster. The trend growth rate in exports of products belonging to this category in the period 2000–01 to 2010–11 was about 21% per annum,[4] whereas the trend growth rate of exports of manufactured products that rank low in terms of import intensity was only about 8% per annum. This is consistent with the observed faster growth in manufactured imports than manufactured exports in the period 2000–01 to 2010–11 in Fig. 9.1. It has been noted earlier that import intensity of India's manufactured exports increase from about 17% to about 29% between 1998–99 and 2006–07. Evidently, there is consistency between the hike in the import intensity of India's manufactured exports between 1998–99 and 2006–07 and the trends in manufactured exports in the 2000s depicted in Fig. 9.2.

The analysis presented above clearly points to the possibility that the changes in export composition may have been responsible in part for the hike in import intensity of exports of the manufacturing sector in the period 1993–94 to 2006–07. To make an assessment of this possible impact of changes in export composition, a weighted average of import intensity of different manufacturing industries have been computed for the years 1993–94, 1998–99, 2003–04 and 2006–07 under the assumption that the import intensity of each product group has remained unchanged at the 1993–94 level. The industry level import intensity coefficients for 1993–94 have been taken from Bhat et al. (2007) and the export composition of different years has been taken from the input-output tables. The weighted average import intensity for manufactured exports (considering only reallocation effect) is found to be 12.9% for 1993–94, 12.2% for 1998–99, 15.9% for 2003–04, and 17.2% for 2006–07. It appears therefore that the observed increase in import intensity of manufactured exports between 1998–99 and 2006–07 is attributable partly to changes in export composition. The changes in export composition explain about 40% of the increase that has taken place in the import intensity of manufactured exports between 1998–99 and 2006–07. The rest is traceable to increases in import intensity of individual industries. A comparison of import intensity at industry level between 1998–99 and 2006–07 reveals that import intensity (considering both direct and indirect imports) increased in 59 out of 65 industries into which manufacturing is divided.[5] The increase is by more than 10%

[4]The trend growth rate goes up to 24% per annum if petroleum products (which have high import intensity) are included in this category of industrial products.

[5]The import intensity estimates for individual industries for 1998–99 have been taken from Bhat et al. (2007). Similar estimate for 2003–04 and 2006–07 have been made in this study using input-output tables and import flow matrices for these two years and applying the same methodology as in Bhat et al. (2007) and Bhat and Paul (2009). The sectoral classification in the input-output tables for 2003–04 and 2006–07 are slightly different from those in the input-output tables for 1993–94 and 1998–98. Therefore, in certain cases, sectors have been merged to obtain comparable sectors. This has reduced the number of sectors constituting manufacturing to 65.

points in nine cases out of 65. Taking a longer period, 1993–94 to 2006–07, the contribution of export composition changes to increase in import intensity of manufactured exports was about 25%. In 63 out of 65 cases, the import intensity increased between 1993–94 and 2006–07. In 26 cases, the increase was by more than 10 percentage points.

An issue worth investigating next is the impact of growing export orientation of Indian industries on their import intensity. The ratio of exports to value of production (export intensity) of the manufacturing sector increased from about 11% in 199,394 to about 18% in 2006–07. It is reasonable to expect that the industries in which the increase in export intensity was relatively higher were the ones which had a relatively higher increase in import intensity. To test this hypothesis, the following regression equation has been estimated:

$$MI_{it} = \alpha_i + \lambda_t + \beta XI_{it} + \gamma MPR_{it} + \varepsilon_{it} \tag{9.1}$$

In this equation, MI denotes import intensity, XI export intensity, MPR import penetration ratio (obtained as the ratio of imports to availability which is measured as domestic production plus imports less exports, and taken as an indicator of import competition faced by the industry), and e the random error term. While the focus is on the relationship between MI and XI, the MPR variable is included in the regression equation as a control variable. The subscript i is for industry and t for time (year). The intercept is allowed to vary across industry to pick up the influence of industry specific factors. The intercept is allowed to vary over time to pick up the influence of intertemporal changes taking place in the import policy regime, i.e. the changes in tariff rates, quantitative restrictions etc.

Equation (9.1) has been estimated by pooling data for four years, 1993–94, 1998–99, 2003–04 and 2006–07, the years for which input-output tables are available.[6] The results of regression analysis are presented in Table 9.1.

The regression results in Table 9.1 indicate a significant effect of export intensity of industries on their import intensity. The coefficient of export intensity is statistically significant at 1% level in all four regressions shown in the table. The coefficients of year dummy variables, 1993–94 being taken as the base, are also statistically significant at 1% level. The numerical value of the coefficients is positive. The coefficient for 2003–04 exceeds that for 1998–99 and the coefficient for 2006–07 exceeds that for 2003–04. Thus, it appears from the results for year dummy variables that policy reforms, particularly import policy reforms, have been an important cause of the increasing import intensity of manufactured exports.

The coefficient of the import penetration variable turns out to be statistically insignificant. The coefficient is positive in one of the regressions and negative in another. Therefore, no definite conclusion can be drawn on whether increased

[6]At the time of writing this paper, the input-output table for 2007–08 had become available. However, the import flow matrix was not available. Therefore, data for this year have not been included in the analysis.

**Table 9.1** Panel data regression results, explaining import intensity at industry-level (dependent variable: import intensity; no. of observation = 260)

| Explanatory variable | Regressions | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Export intensity | 0.074<br>(3.17)*** | 0.107<br>(6.31)*** | 0.117<br>(5.74)*** | 0.113<br>(3.69)*** |
| Import penetration ratio | | | −0.022<br>(−0.92) | 0.048<br>(1.38) |
| Dummy for 1998–99 | 2.71<br>(1.90)* | 2.63<br>(4.59)*** | 2.68<br>(4.66)*** | |
| Dummy for 2003–04 | 6.17<br>(4.32)*** | 6.00<br>(10.37)*** | 5.99<br>(10.36)*** | |
| Dummy for 2006–07 | 8.78<br>(6.16)*** | 8.69<br>(15.17)*** | 8.82<br>(14.94)*** | |
| Industry dummies included | No | Yes | Yes | Yes |
| Adjusted-$R^2$ | 0.17 | 0.87 | 0.87 | 0.69 |
| Test: coefficients of industry dummies are equal, F-ratio and probability (P) | | F = 21.82<br>P = 0.000 | F = 18.94<br>P = 0.000 | F = 7.96<br>P = 0.000 |

*Notes* (1) Data for 65 industries for four years (1993–94, 1998–99, 2003–04 and 2006–07) have been used for the regression analysis. (2) Figures in parentheses are t-ratios. These are based on simple standard errors computed for the coefficients without any correction for heteroscedasticity. For regression (3), which is the preferred model, the robust standard errors (corrected for heteroscedasticity) have also been computed. The t-ratio for the export intensity variable is then 4.72 and that for the import penetration variable is −0.58. The t-ratios for the coefficients of dummies for 1998–99, 2003–04 and 2006–07 are 4.27, 9.66 and 14.84 respectively
Coefficients marked * and *** are statistically significant at 10 and 1% respectively
*Source* Author's computation based on Input-output tables

import competition faced by domestic industries induced them to go for imported intermediate inputs (although this seems likely).

## 9.3 Firm-Level Analysis

The analysis presented in the previous section, being based on input-output tables, suffered from one serious limitation that production technology for goods sold in the domestic market was assumed to the same as that for similar goods sold in the export markets. This limitation is there because in an input-output framework commonly used, each industry has only one technology which is represented by the column for the industry in the input-output coefficients matrix. Whether the output of the industry meets domestic consumption or it is exported, the technology

remains the same. A firm-level analysis has the advantage that the assumption of identical technologies between export-oriented firms and domestic-market oriented firm can be relaxed. Indeed, the firm-level data can be employed to verify if the assumption of identical technology, particularly in respect of use of imported inputs, is true. Accordingly, the input-output table based analysis of the previous section is followed by a firm-level analysis in this section. The data on manufacturing firms have been taken from *Capitaline* (see www.capitaline.com). Data for the period 1999–00 to 2010–11 are used for the analysis. Data could be obtained for about 3300–4500 manufacturing firms for different years in the period under study. This is an unbalanced panel and the firms included in the dataset vary from year to year. In all, data on about 6400 manufacturing firms are used for the analysis.

This section is divided into three sub-sections. Section 9.3.1 deals with the difference in import intensity between exporting and non-exporting manufacturing firms. Section 9.3.2 looks into determinants of import intensity. It is based on estimation of an econometric model in which export intensity is included as an explanatory variable. Finally, Sect. 9.3.3 goes into the issue of interdependence between export and import decisions of a firm. While Sect. 9.3.2 is concerned with import intensity of a firm, Sect. 9.3.3 is concerned with the interaction between the decision to import inputs and the decision to export.

### *9.3.1 Import Intensity of Exporting Versus Non-exporting Firms*

A comparison of import intensity of exporting firm with that of non-exporting firms is made in Table 9.2. This is shown for each year between 1999–00 and 2010–11. The table brings out clearly that import intensity of exporting firms is significantly higher than that of non-exporting firms, and the gap has been growing over time. The gap was about 4% points in 1999–00, which increased to about 8% points in 2010–11. This is consistent with an upward trend in import intensity of manufactured exports noted in the previous section.

One shortcoming of the comparison of import intensity between exporting and non-exporting firms presented in the first three columns of Table 9.2 is that it does not take into account industry affiliation of the firms. It is needless to say that the comparison of import intensity between exporting and non-exporting firms will be meaningful only if both belong to the same industry. In other words, if the industry wise distribution of exporting firms differs from that of non-exporting firms, then a simple comparison of import intensity between all exporting firms and all non-exporting firms may not correctly show the gap that exists.

To take care of this limitation of the import intensity comparison presented in the first three columns of Table 9.2, an alternate estimate of the gap in import intensity

**Table 9.2** Import intensity, comparison between exporting and non-exporting manufacturing firms, 1999–00 to 2010–11

| Year | Import intensity of non-exporting firms | Import intensity of exporting firms | Difference | Difference estimated by regression analysis (t-ratios in parentheses) |
|---|---|---|---|---|
| 1999–00 | 5.23 | 9.16 | 3.93 | 2.01(4.07) |
| 2000–01 | 5.20 | 9.52 | 4.32 | 2.27(5.12) |
| 2001–02 | 4.81 | 9.59 | 4.78 | 2.86(6.79) |
| 2002–03 | 4.72 | 9.74 | 5.02 | 2.89(6.73) |
| 2003–04 | 4.85 | 10.73 | 5.88 | 3.69(8.11) |
| 2004–05 | 5.21 | 11.22 | 6.01 | 4.02(8.35) |
| 2005–06 | 5.08 | 12.24 | 7.15 | 4.73(9.31) |
| 2006–07 | 4.72 | 12.57 | 7.85 | 5.05(9.42) |
| 2007–08 | 5.92 | 12.87 | 6.95 | 5.17(8.29) |
| 2008–09 | 5.90 | 13.67 | 7.77 | 5.75(9.09) |
| 2009–10 | 5.41 | 13.11 | 7.70 | 5.33(9.17) |
| 2010–11 | 5.46 | 13.60 | 8.14 | 5.92(9.70) |

*Source* Author's computation based on *Capitaline* data

between exporting firms and non-exporting firms has been made with the help of regression analysis. The model is specified as:

$$MI_{it} = \alpha_j + \beta DUMX_{ij} + \gamma Z_{ij} + \varepsilon_{ij} \tag{9.2}$$

In this equation, $MI_{ij}$ is the import intensity (imports of intermediate goods to sales ratio) of the *i*th firm of *j*th industry, and $DUMX_{ij}$ is a dummy variable showing export status of the *i*th firm of *j*th industry, which takes value one if the firm is exporting and zero otherwise. $Z_{ij}$ is a vector of other control variables for the *i*th firm in *j*th industry and $\varepsilon_{ij}$ is the random error term. Two control variables have been included: size of the firm (measured by logarithm of sales) and year of incorporation (to reflect the age of the firm). The corresponding coefficients are denoted by vector g. The intercept term $\alpha_j$ is allowed to vary across industries and thus takes care of differences in industry wise distribution between exporting and non-exporting firms. The coefficient of the dummy variable DUMX measures the gap in import intensity between exporting and non-exporting firms after controlling for other factors. The equation has been estimated for each year separately. The estimates of are shown in the last column of Table 9.2 along with the t-ratios of the coefficients.

The estimates of β obtained by estimating Eq. (9.2) given above indicate that the gap in import intensity between exporting and importing firms was about 2% points in 1999–00. This gap widened over time and it reached about 6% points by 2010–11. Thus, the gap in import intensity between exporting and non-exporting obtained by a simple comparison as well as that obtained by regression analysis show an

upward trend in the period 1999–00 and 2010–11. Both set of results show clearly that import intensity of exporting firms is higher than that of non-exporting firms.

### 9.3.2 A Model of Import Intensity

While there have been several econometric studies on export intensity of Indian manufacturing firms (e.g., Siddharthan 1989; Aggarwal 2002; Dholakia and Kapur 2004; Kumar and Pradhan 2007; Goldar and Kato 2009), there has very little research on import behaviour of Indian manufacturing firms. Tucci (2006) is probably the only study in which import behaviour of Indian manufacturing firms has been modelled. Since the focus of this paper is on import intensity of manufactured exports in India, a modelling of import behaviour of Indian manufacturing firms and bringing out the difference between exporting and non-exporting firms is important. This was partly addressed in Sect. 9.3.1. A more comprehensive analysis of this aspect is done in this section.

For analysing import behaviour of manufacturing firms, a regression equation has been estimated. The model is specified as follows:

$$MI_{ij,t} = \alpha_{ij} + \lambda_t + \beta XI_{ij,t} + \delta(t.XI_{ij,t}) + \gamma Z_{ij,t} + \varepsilon_{ij,t} \tag{9.3}$$

In this equation $MI_{ij,t}$ denotes import intensity (ratio of imported intermediate inputs, including materials, stores and spares, and finished goods, to sales) of *i*th firm in *j*th industry in year t, $X_{ij,t}$ is the export intensity (exports to sales ratio) of *i*th firm in *j*th industry in year t, and $\varepsilon_{ij,t}$ is the random error term. The variable *t* denotes year (starting year, 1999–00 is taken as zero). By including in the regression equation, an interaction term involving export intensity and time, it becomes possible to allow the impact of export intensity on import intensity to change over time. Z denotes a vector of other explanatory variables (representing various firm characteristics) and $\gamma$ is the corresponding vector of parameters. The following explanatory variables have been chosen to comprise Z:

- Firm size (SIZE): logarithm of sales;
- Energy cost proportion (E_COST): expenses on power and fuel divided by sales;
- Labour cost proportion (L_COST): Wages and salaries divided by sales;
- Technology import intensity (TECH): Royalty and technical fees paid in foreign exchange divided by sales;
- Capital goods import intensity (K_IMPORT): Imports of capital goods divided by sales;
- Age of machinery (M_AGE): Accumulated depreciation as a ratio to gross fixed assets is taken as a proxy;

- New firms (NEW_FIRM): Dummy variable; Takes value one if the year of incorporation is 1991 or later, distinguishing firms set up in the post-reform period from those set up earlier;
- R&D intensity (RD_1, RD_5): Two dummy variables are used. One of them takes value one if R&D to sales ratio exceeds 1%, zero otherwise; the other takes value one if the R&D ratio is more than 5%, zero otherwise. These dummy variables are assigned zero value if the firm has not reported R&D expenditure (as it is assumed to be small); and
- Foreign holding in equity (FORGN_EQY): The percentage of equity held by foreign investors (the data for latest available year used). As constructed, this variable does not vary over years.

The estimation of the regression equation has been done by the fixed effects model. Cross-section effects are brought in through $a_{ij.}$ In one regression estimate, $a_{ij}$ is replaced by $a_j$, thus allowing for industry effects rather than firm effects. The year effects are brought in through $l_t$. In addition to the fixed effects models, a random effects to bit model has been estimated allowing for firm and year effects. Since import intensity is zero in about one-third of the observations, the to bit model has an advantage over the fixed effects model. The regression results are reported in Table 9.3.

From the results obtained, a significant positive coefficient of export intensity is found. The results suggest that production for exports has 10–18% points higher import intensity than production for domestic sales.[7] Also, there is evidence that this gap has increased over time (since the interaction term involving export intensity and time has a positive and statistically significant coefficient in two of the three models estimated).

The results indicate that import intensity is relatively higher for firms that incur a relatively higher expenditure on technology imports and/or capital goods imports. Also, there is indication that import intensity bears a positive relationship with firm size and foreign equity holding. Firms set up in the post-reform period are relatively more import intensive than firms set up earlier, after controlling for other factors. Similarly, a firm that has relatively new plant and machinery has higher import intensity than a firm that has relatively old plant and machinery.

Import intensity is found to be related negatively with energy cost and labour cost proportions. This might mean that if materials, stores and spares cost out of total production cost is relatively high in a firm, it would be induced to import a greater portion of its materials, stores and spares. This follows from the observed negative effect of energy cost and labour cost proportions. A fall in the costs of labour and energy out of total production cost implies an increase in the share of

[7]This inference is drawn by comparing export intensity levels of zero and one. Alternatively, one may contrast a typical exporting firm (exporting about 23% of its sales) and a typical non-exporting firm. The difference in import intensity between these two firms, after controlling for other variables, is expected to be in the range of 2.3–4.1% points.

**Table 9.3** Panel data regression results, explaining import intensity of Indian manufacturing firms (dependent variable: import intensity; no. of observations = 42,961)

| Explanatory variables | Fixed effects model (industry and year fixed effects) | | Fixed effects model (firm and year fixed effects) | | Random effects Tobit model (firm and year effects) | |
|---|---|---|---|---|---|---|
| | Coefficient | t-ratio | Coefficient | t-ratio | Coefficient | t-ratio |
| XI | 0.121*** | 23.5 | 0.103*** | 19.2 | 0.179*** | 29.9 |
| XI * TIME | 0.005*** | 7.0 | 0.005*** | 8.3 | 0.0008 | 1.07 |
| SIZE | 0.012*** | 28.5 | 0.006*** | 8.0 | 0.031*** | 37.9 |
| TECH | 0.659*** | 9.4 | 0.450*** | 6.1 | 0.789*** | 7.6 |
| K_IMPORT | 0.088*** | 13.1 | 0.057*** | 11.2 | 0.077*** | 12.3 |
| RD_1 | −0.011** | −2.4 | – | | – | |
| RD_5 | −0.043*** | −4.7 | – | | – | |
| FORGN_EQY | 0.0005*** | 5.3 | – | | – | |
| L_COST | −0.053*** | −8.0 | −0.018** | −2.2 | −0.064*** | −5.3 |
| E_COST | −0.094*** | −9.2 | −0.029** | −2.3 | −0.056*** | −3.3 |
| NEW_FIRM | 0.010*** | 6.4 | – | | – | |
| M_AGE | −0.025*** | −6.5 | −0.002 | −0.5 | −0.020*** | −3.5 |
| Constant | 0.041*** | 14.6 | 0.054*** | 13.7 | −0.093*** | −17.1 |
| R-squared | 0.11 | | 0.09 | | | |
| Wald chi-squared | | | | | | 3893.9 (degrees of freedom = 8) |

*Notes* (1) Data for the period 1999–00 to 2010–11 are used for the analysis. An unbalanced panel dataset covering about 3300–4500 firms for different years are used. In all, data on about 6400 firms are used for the analysis. (2) In the second and third models, RD_1, RD_5, FORGN_EQY and NEW_FIRM dummy variables have been dropped (because of the presence of firm effects). (3) XI = export intensity, the abbreviations used for other variables are explained in the text
Coefficients marked ** and *** are statistically significant at 5 and 1% respectively
*Source* Author's computation based on *Capitaline* data

materials, stores and spares in the total production cost, and going by the regression results, this is associated with a hike in import intensity.

The coefficients of the R&D dummy variables turn out to be negative and statistically significant. The reason for the negative effect of R&D intensity on import intensity observed in the regression results is unclear. Since technology imports are found to bear a positive relationship with intermediate inputs import intensity, a positive relationship between in-house R&D and intermediate inputs imports is expected. Evidently, this issue needs further investigation.

### *9.3.3 Determinants of Decisions to Export and Import*

In the analysis above, it has been assumed that a firm's decisions regarding exports influences its decisions regarding imports. In several earlier studies on export

intensity of Indian firms, the opposite has been assumed: firms first decide about portion of intermediate inputs to import from abroad, and this impacts their export competitiveness which finally determines their export intensity (see, for instance, Dholakia and Kapur 2004). It seems that a more appropriate way of modelling export and import behaviour of industrial firms is to treat the decision to export and the decision to import as interdependent. The firms take a decision on exports and imports jointly, taking into account a number of factors including firm productivity and certain other characteristics of the firm. Accordingly, a model of export and import decision of manufacturing firms in India has been specified as follows:

$$M\_D_{i,t} = f(M\_D_{i,t-1}, X\_D_{i,t-1}, Z_{i,t}) + u_{i,t} \tag{9.4}$$

$$X\_D_{i,t} = g(M\_D_{i,t-1}, X\_D_{i,t-1}, Z_{i,t}) + v_{i,t} \tag{9.5}$$

Export decision (X_D) and import decision (M_D) are taken as dummy variables. For a specific firm i in year t, the import decision variable takes value one if the firm had made imports (of materials/stores and spares/finished goods/others). This does not cover imports of capital goods or technology. Export decision variable is similarly defined. The decision to export and the decision import depend on the status in the previous year. Thus, the decision variables with one year lag are taken as explanatory variables in the model. Z is a set of control variables comprising firm characteristics. The Z variables used for the analysis are the same as those used in the analysis in the previous section.

To implement the above equations empirically, a bivariate probit model has been estimated in which the export and import decisions are jointly determined by firm characteristics and the decisions of the previous year. The model involves the assumption that the error terms u and v have a bivariate normal distribution with zero mean, variance $\sigma_u^2$ and $\sigma_v^2$ respectively, and a correlation coefficient denoted by $\rho$.

The decision to export among Indian manufacturing firms has been analysed econometrically by Srinivasan and Archana (2009) and Ranjan and Raychaudhuri (2011) among others. Tucci (2006) has analysed both export and import decisions of Indian manufacturing firms. She has estimated the probit model separately for the decision to export and the decision to import. The empirical model adopted here is better than that used by Tucci (2006) because the use of bivariate probit model incorporates into the analysis the inter-correlation between the random disturbance terms of the export and import decision models.

The results of the estimated model are presented in Table 9.4. The results reveal a high degree of interdependence between the decision to import and the decision to export. The decisions to export and import bear a significant positive relationship with the export and import status in the previous year. Also, the estimated correlation coefficient between the two error terms is 0.36 which is statistically significant at 1% level.

As regard the results for other explanatory variable, firm size and foreign equity holding are found have a positive influence on the import and export decisions.

**Table 9.4** Bivariate probit model, explaining decisions to export and import, Indian manufacturing firms, panel data regression results (dependent variables: export and import decisions; no. of observations = 37,119)

| Explanatory variables | Decision to export | | Decision to import | |
|---|---|---|---|---|
| | Coefficient | t-ratio | Coefficient | t-ratio |
| Export status previous year | 2.393*** | 123.6 | 0.377*** | 18.8 |
| Import status previous year | 0.279*** | 13.0 | 2.081*** | 104.3 |
| SIZE | 0.128*** | 21.8 | 0.194*** | 32.3 |
| TECH | 0.821 | 0.9 | 6.171*** | 5.3 |
| K_IMPORT | 0.164* | 1.7 | 0.598*** | 4.7 |
| RD_1 | 0.293*** | 4.1 | 0.311*** | 3.8 |
| RD_5 | 0.304* | 1.7 | −0.291* | −1.9 |
| FORGN_EQY | 0.004*** | 2.9 | 0.003** | 2.31 |
| L_COST | −0.032 | −0.4 | −0.445*** | −5.7 |
| E_COST | −0.434*** | −3.7 | 0.094 | 0.8 |
| NEW_FIRM | −0.086*** | −3.9 | −0.012 | −0.6 |
| M_AGE | −0.044*** | −0.8 | 0.062 | 1.2 |
| Constant | −1.738 | −44.4 | −1.682*** | −43.2 |
| Rho (standard error) | 0.361(0.013) | | | |
| Wald chi-squared (degree of freedom = 24) | 33,858.1 | | | |

*Notes* (1) Data for the period 1999–00 to 2010–11 are used for the analysis. An unbalanced panel dataset covering about 3300–4500 firms for different years are used. In all, data on about 6400 firms are used for the analysis. Since lagged values of the export and import status variables enter as explanatory variables, the number of observations is less than that in Table 9.3 (as the observations for 1999–00 get dropped). (2) The abbreviations used for various explanatory variables have been explained in Sect. 9.3.2

Coefficients marked *, ** and *** are statistically significant at 10, 5 and 1% respectively

*Source* Author's computation based on *Capitaline* data

Imports of technology and capital goods are found to bear a positive relationship with the decision to import. This is in agreement with the results of econometric analysis of import intensity presented in the previous section. The same applies to the labour cost variable; it has a significant negative impact on the decision to import as in the results reported in Table 9.3.

The dummy variables representing R&D intensity are found to have significant positive coefficient in the case of 1% cut-off. The variable based on 5% cut-off has a positive coefficient the equation for exports, but a negative coefficient in the equation for imports. In both cases, the coefficient is statistically significant only at 10% level. It appears reasonable therefore to infer that R&D has a positive impact on both decision to import and decision to export. It probably has a greater impact on the decision to export than on the decision to import.

A comment is needed here on the impact of energy cost proportion and labour cost proportion on import intensity. In the results presented in Table 9.3, a significant negative coefficient was found for both variables. In the results reported in Table 9.4, a significant negative effect of labour cost is found on the decision to

import but not on the decision to export. For energy cost, by contrast, a significant negative effect is found on the decision to export but not on the decision to import. But, it should be pointed out here that there is a strong interdependence between the decisions to export and decision to import. Hence the negative effect of high energy cost on the decision to export also translates into a negative effect on the decision to import. Accordingly, it may be argued that the results of Table 9.4 in respect of the labour cost and energy cost variables are broadly consistent with those reported in Table 9.3.

## 9.4 Conclusion

Import intensity of India's manufactured exports has increased significantly in the post-reform period. It increased from about 13% in 1993–94 to about 29% in 2006–07. An industry-level analysis was carried out in the paper using input-output tables to ascertain the sources of this increase in import intensity of manufactured exports. This was followed by firm-level analysis to gain an understanding of the firm import behaviour and connect it to the observed upward trend in import intensity of manufactured exports at the aggregate level.

The industry-level analysis revealed that the increase in import intensity of manufactured exports in the post-reform period was attributable partly to changes in product composition of exports. The product composition of manufactured exports changed over time in favour of products that are more import intensive. Another contributing factor was the growing export orientation of Indian manufacturing industries in the post-reform period. Increases in export orientation are associated with higher import intensity because production for export in an industry is often more import intensive than production for the domestic market. However, these two factors are able to provide only a partial explanation, and leave a large part of the observed increase in import intensity of manufactured exports unexplained. It seems that this unexplained gap is mostly attributable to the liberalization of import policy in India.

Firm-level analysis revealed that exporting firms are more import intensive than non-exporting firms, thereby supporting the findings of industry level analysis. Econometric results indicated a significant positive impact of export intensity on import intensity of firms. It was also found that import intensity of firms bears a positive relationship with firm size, foreign equity participation, and imports of technology and capital goods.

An important finding of the study is that firms' decisions to import and export are interdependent. It appears that both decisions may be rooted in firm heterogeneity. Both imports and exports may contribute to productivity improvements in firms. The decision to export and decision to import are both impacted by the level of productivity of the firm. The implication is that impediments to imports tend to impede exports too. Again, policy measures directed at boosting exports will tend to increase also imports, limiting thereby the gains in balance of trade.

## References

Aggarwal, A. (2002). Liberalization, multinational enterprises and export performance: Evidence from Indian manufacturing. *Journal of Development Studies, 38*, 119–137.

Bhat, T. P., Guha, A., Paul, M., & Sahu, P. P. (2007). *Estimates of import intensity in India's manufacturing sector: Recent trends and dimensions*. Working paper no. 2007/08, Institute for Studies in Industrial Development, New Delhi.

Bhat, T. P., & Paul, M. (2009). Measurement of import intensity of exports in India. *Journal of Income and Wealth, 31*, 81–92.

Bhattacharya, M. (1989). Import-intensity of exports: A case study of Indian economy. *Indian Economic Journal, 36*, 94–98.

Burange, L. G. (2001). Import-intensity in the registered manufacturing sector of India. *Indian Economic Journal*, *49*, 42–52.

Dholakia, R. H., Dholakia, B. H., & Kumar, G. (1992, November 28). Issues in strategy for export promotion: An inter–industry analysis. *Economic and Political Weekly*, *27*, M149155.

Dholakia, R. H., & Kapur, D. (2004). *Determinants of export performance of Indian firms-A strategic perspective*. IIMA working paper no. 2004/08/01, Indian Institute of Management, Ahmedabad.

Goldar, B., Kato, A. (2009). Export intensity of Indian industrial firms in the post-reform period. In S.R. Hashim, K. S. Chalapati Rao, K. V. K. Ranganathan, & M. R. Murty (Eds.), *Indian industrial development and globalisation: Essays in honour of Professor S. K. Goyal*. New Delhi: Academic Foundation.

Haidar, J. I. (2012). Trade and productivity: Self-selection or learning-by-exporting in India. SSRN Paper. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2065603. Accessed 17 November 2012 (forthcoming in *Economic Modelling*).

Kumar, N., & Pradhan, J. P. (2007). Knowledge-based exports from India: Recent trends, patterns and implications. In N. Kumar & K. J. Joseph (Eds.), *International competitiveness and knowledge-based industries in India*. New Delhi: Oxford University Press.

Ranjan, P., & Raychaudhuri, J. (2011). Self-selection vs learning: Evidence from Indian exporting firms. *Indian Growth and Development Review, 4*, 22–37.

Sathe, D. (1995). Impact of diversification of composition of exports: An analysis of the linkages of Indian exports. *Journal of lndian School of Political Economy, 7*, 94–103.

Sathe, D. (1997). Import intensity of India's exports: some fresh evidence. *Economic and Political Weekly, 32*, M31–M44.

Siddharthan, N. S. (1989). Impact of import liberalisation on export intensities—A study of the Indian private corporate sector. *Indian Economic Journal, 37*, 103–111.

Srinivasan, T. N., & Archana, V. (2009). *India in the global and regional trade: Determinants of aggregate and bilateral trade flows and firms' decision to export*. Working paper no. 232, Indian Council for Research on International Economic Relations, New Delhi.

Topalova, P., & Khandelwal, A. (2011). Trade liberalization and firm productivity: The case of India. *Review of Economics and Statistics, 93*, 995–1009.

Tucci, A. (2006). Trade, foreign network and performance: A firm level analysis for India. In *Third Conference of the RTN 'Trade, Industrialization and Development'*, 27–29 January 2006, Centre for Economic Policy Research, London.