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Development and urbanization: a revisit of Chenery–Syrquin's patterns of development

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Abstract This paper provides updates on the stylized facts regarding the relationship between urbanization progress and per capita GDP. Our empirical strategy is based on the econometric specification and estimation by using a new cross-country dataset and measured in 1999-priced per capita GDP. While our results corroborate previous findings on the general patterns of development by Chenery and Syrquin (Patterns of development, 1950–1970. Oxford University Press, Oxford, 1975), we are able to provide new insights as to the income contribution of urbanization progress and the patterns of development.

JEL Classification L16 · N30 · R11

1 Introduction

Modern economic development is seen as an identifiable process of growth and change (Solow 1977, p. 491) and defined as 'an interrelated set of long-run processes of structural transformation that accompany growth' (Syrquin 1988, p. 205). In his historical studies of modern economic growth, Kuznets (1966) identified the shift of resources from agriculture to industry as the central feature of this transformation. Since the income elasticity of demand for industrial goods was higher than that for agricultural produce, the demand-side factors reinforced the growth process in industry

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(Kuznets 1973; Kaldor 1975, pp. 348–353). It was further helped by the fact that the productivity increases led to a decline in the price of industrial goods relative to that of agriculture because of competitive pricing (Kaldor 1950, p. 62). The high price-elasticity of demand for industrial goods also accelerated the demand for industrial goods and facilitated the shift of factors from agriculture to industry (Chenery and Syrquin 1979). Because of Engel's law of the declining share of food in consumption with rising income, industrialization must occur unless there is sufficient increase in true value of export of primary products or services to outweigh both the Engel effects of income growth in demand and the intensive use of industrial inputs (Chenery and Syrquin 1975, p. 6). In this sense, a development pattern may better be defined as any systematic variation in the economic and social structure associated with a rising level of per capita income (Syrquin 1986, pp. 436–437).

In an economy continuously in equilibrium, urbanization might appear as the net result of a causative chain of events, beginning with changes in demand and trade which lead to industrialization and result in a steady movement of the labor force from rural to urban occupations (Chenery and Syrquin 1975, p. 53). However, the growth of national output in less developed economies has rarely been sufficiently rapid to keep up with accelerating population growth and prevents a rise in rural underemployment (Lewis 1954). As a consequence, migration from rural to urban locations has taken place ahead of the growth of demand for labor and has been determined increasingly by expected income rather than current wages (Fan 1978). Therefore, it is necessary to treat urbanization as a somewhat separate development process that is affected by the expectation of future income and employment, the distribution of government expenditure, and a variety of social factors, as well as the changing structure of production (Kim 1995, 2004; Kim and Margo 2004).

Try to identify general pattern of development, Chenery and his associates undertook various empirical studies based on cross-country data. The result is the publication of *Patterns of development 1950—1970* (Chenery and Syrquin 1975). In general, however, the Chenery–Syrquin approach on the patterns of development has been subjected to systematic criticism from a variety of perspectives (Diaz Alejandro 1976; Bhagwati 1977, p. 491). In particular, the Chenery and Syrquin patterns of development are rooted in the stylized facts measured in the 1964-priced per capita GNP of 90 countries. Since then the world has witnessed great revolutionary changes in technology, commerce and political geography, but the accumulative effects of wealth changes and inflation have been virtually ignored. For instance, the newly industrializing economies represent the largest number of the countries, with most of the countries ranked in the low and low-middle income groups in the dataset. Over the past decades some of them have grown considerably, raising their per capita income, while others have stagnated and even declined. So far however, little work has been done to determine whether or not previous findings still hold, and there has been even less multi-country analysis to explore the degree of generality (Jones and Kone 1996).

This paper tests whether the Chenery–Syrquin Standard of urban population shares and per capita GDPs still holds. Our empirical strategy is based on the use of a larger and updating dataset of 141 countries prepared by the World Bank (1982, 1987, 1992, 1997, 2001). In addition to "Introduction," the reminder of the paper proceeds as follows. In Sect. 2, the Chenery–Syrquin Standard is first tested for China due to its recently emerged gap between urban population shares and per capita GDP, and then with the cross-country per capita GDPs measured in 1999s price. In Sect. 3, a set of regression equations in the line of Chenery and Syrquin's approach are specified and estimated using a new cross-country dataset, to update the previous findings on the generality of urbanization and development. Section 4 re-examines the patterns of development using the new cross-country dataset. The paper closes with summary and concluding comments.

2 China's urbanization lag

Since the late 1970s, China has become the fastest growing economy in the world. The rapid economic growth has promoted the expansion of modern industries and changed the structure of the economy. As a result, over 150 millions of populations have moved from the agriculture-based rural areas to the industry- and service-dominated urban areas (State Statistical Bureau of China 2005, SSBC hereafter). On the other hand, urbanization has also promoted economic growth. Densely populated and business- and manufacturing- concentrated urban areas offer economies of scale and agglomeration economies by lowering transportation costs and promoting knowledge and network spillovers. While only 17.92% of population was urbanized in 1978, China has been experiencing a process of rapid urbanization since then, with 41.76% of its population living and working in urbanizing areas (SSBC 2005).[1]

Empirical tests on a world scale have confirmed the strong correlation between urbanization and GDP per capita (Henderson 2000). By the end of 1999, for example, the share of urban population in the total population is 78% for high-income OECD countries and 31% for low income countries (World Bank 2001). But it seems that China is exceptional. As reported in the Statistical Yearbook of China (SSBC 2005), by the end of 2004 China's gross domestic product totaled up to 1931.7 billion U.S. dollars, a per capita term of 1,490 dollars. According to the general standard in the *Patterns of development* by Chenery and Syrquin (1975), Chinese urban population as a percentage of its total population would be over 60% (Table 1). But China was still largely a rural country with only 41.76% of the urbanized by the end of 2004. This urbanization lag behind industrialization has certainly deviated from the Chenery–Syrquin standard. Why has China industrialized to a far greater extent than it has urbanized? Why has Chinese economic development outpaced its urbanization? These questions become a paradox challenging the scholars of Chinese economic development and urbanization (Tang 2001; Chang 2004; Zhang and Song 2003; Fujita et al. 2004; Friedmann 2005; Wu 2006; Chang and Brada 2006).

[1] Data before 1982 were taken from the annual reports of the Ministry of Public Security. Data in 1982–1989 were adjusted on the basis of the 1990 national population census. Data in 1990–2000 were adjusted on the basis of the estimated and the 2000 national population census. Data in 2001–2004 have been estimated on the basis of the annual national sample surveys on population changes. Total population include the military personnel of Chinese People's Liberation Army, the military personnel are classified as urban population in the item of population by residence. For detailed information, see http://www.stats.gov.cn/tjsj/ndsj/ (access: July 14, 2007).

Table 1 The relationship of per capita GNP and urbanization

Per capita GNP	Urban % of population
<$100	12.8 (median)
$100	22.0
$200	36.2
$300	43.9
$400	49.0
$500	52.7
$800	60.1
$1000	63.4
>$1000	68.5 (median)

Source: Chenery and Syrquin (1975)

It is possible, however, that the seriousness of the situation might be exaggerated due to technical flaws in the application of the Chenery–Syrquin approach to the study of Chinese economic development and urbanization. The first technical problem pertains to the population base of country. In the Chenery and Syrquin econometric approach, a standard population base of 10 millions was defined and used as regressor (Chenery and Syrquin 1975, p. 55). While this might be necessary to reflect the average status of cross-country populations in the Chenery–Syrquin empirical study, it certainly is too small when compared to Chinese population of 1.3 billions in 2004, a difference by 130 times.

The second possible technical flaw is the effect of cumulated wealth and inflation which has been ignored in the Chinese study. In the Chenery and Syrquin approach, per capita GNP was calculated in 1950–1970 data and defined at 1964s constant price. Since then the world witnessed great revolutionary changes in technology, commerce and political geography, but the accumulative effects of wealth increase and inflation have been virtually ignored in the current literature. Because of this ignorance, it is unclear to what extent the stylized facts on the relation of urbanization and development are still robust today to ignored inflation effects and wealth changes.

To test the relation of urbanization and development based on the Chenery–Syrquin econometric specification for China, we replaced the standard population base of 10 millions in the Chenery–Syrquin approach by a realistic one of 1.3 billions, and adjusted the values of per capita GDPs to the 1999 constant price. The re-estimating results are listed in Table 2.

China's per capita GDP in 2004 was 1,490 U.S. dollars, and Table 2 suggests a prediction rate of urbanization to be 44.1, i.e., the share of urban population would be 44.1% of Chinese population. The actual percentage of Chinese urban population was 41.76% in 2004, as reported by the State Statistical Bureau of China (SSBC 2005), a percentage difference of 2.34. By 2006 China's per capita GDP surpassed the critical point of $2,000 U.S. in the updated Chenery–Syrquin standard (Table 2), which presumes a percentage of 49.2 for urban population. But the actual urbanized rate of China was 43.9% in 2006, a difference of 5.3% (SSBC 2007).

In search for the causes of China's urbanization lag and deviation from the updated Chenery–Syrquin standard, Jessica Wade attributes it to the unique Chinese characteristics of urbanization process. According to Wade (2007), urbanization in China

Table 2 The relationship of per capita GNP and urbanization

Per capita GNP (1964s price)	Per capita GNP (1999s price)	Urbanization rate (% in 1999s price)
$100	$500	22.1
$200	$1000	36.4
$300	$1500	44.1
$400	$2000	49.2
$500	$2499	53.0
$600	$2999	56.0
$700	$3499	58.4
$800	$3999	60.4
$900	$4499	62.2
$1000	$4999	63.7

Source: Chenery and Syrquin (1975)

differs from urbanization in the developed and developing world. Its main features include the intentional urbanization of small towns rather than major cities, the growth of floating migration rather than permanent urban migration, the constraints on rural-to-urban migration imposed by the *hukou* (household) registration system, and the rapid growth of urban development at the expense of rural welfare. On the other hand, Chang and Brada (2006) considered the lag phenomenon as the consequence of China's recent rapid economic development. Chang and Brada (2006) found that China's urbanization lag began emerging in the late period of reform despite mass migration from rural to urban areas, and its direct cause is the faster growth rate of China's GDP per capita than that of urbanization during the reform period. As one of the world's fastest growing economies during this period, China's GDP per capita has surpassed that of many developing countries that were previously comparable to China in terms of per capita income level. As such, urbanization in China appeared as a net result of modern economic growth and structural transformation during the reform period (Zhang 2002).

It is also possible however that the stringent situation on per capita share of natural resources restrained the country's urbanization process. The rapid growth of urbanized areas as consequences of industrialization over the past decades has caught the attention of the state government, since the per capita share of cultivated land decreased from 1,800 square meters in 1,949 to 1,133 square meters in 1995, a net loss of over one-third within 45 years. Given the lowest man-land ratio in per capita terms, China's land use policy is built on the principle of food self-sufficiency (Hu 1998). The Land Act of China passed in 1998 is a clear message to all types of land use planning other than agricultural purpose. In a similar way, the country's water resources are already under significant stress. At 427 cubic meters, annual per capita water use in China is 50% lower than the global average (Kahrl and Roland-Holst 2006). China's annual water deficit is roughly 40 billion cubic meters in normal years, about half of its cities are facing some degree of water shortage, and the decline in surface and groundwater resources has become an impediment to socioeconomic development (National Development and Reform Commission 2005, NDRC hereafter). Water scarcity in China can be characterized by three overarching features: regional water imbalances, rapid urbanization and growing inter-sectoral competition for water, and deteriorating water quality and low water productivity. Regional supply imbalances and low quality and productivity amplify supply constraints, and rapid urbanization and urban growth lead to increased inter-sectoral competition for water, inducing higher water demand for domestic, industrial, and agricultural use.

But the root cause of China's urbanization lag, according to Friedmann (2005); Fujita et al. (2004) and other sinologists, is the notorious Chinese household registration system (*hukou*). This household registration system started operation in 1955 and represented the State Council's anti-urbanism and strict controls over population mobility (Cheng and Selden 1994; Chan 1994). With the reforms beginning in the late 1978, the State restrictions on mobility were gradually relaxed, which immediately led tens of millions of peasants flooding into coastal cities for waged jobs. Because of their unsecured job and low payment plus urban bureaucracy, most of those migrants failed to register with local Public Security as an urban resident. Without an urban residency under the *hukou* system, those migrants are subject to various forms of discrimination in cities in terms of job opportunities and access to schooling, health care, housing, and so on (Zhang and Song 2003).

The ideological barrier also plays a role in slowing urbanization. Many scholars and Chinese policymakers believe that the existing restrictions on rural–urban migration are necessary, and their fears of an uncontrolled migration to China's cities are responsible for the continuation of the *hukou* system and other migration restrictions (He and Wu 2007; Chang and Brada 2006). For this reason, the presence of migrant was often regarded as a threat to the privileged urban residents. This perception of urban community toward migrants certainly influenced the attitude of local authorities in granting migrants with urban residence registration. As a consequence, economic migrants remained 'floating' between coastal cities, trying to capture the sign of better-paid jobs, drifting with the dynamics of local job markets (Friedmann 2005, pp. 62–66).

Recently in the first China–US Economic Strategic Dialogue, the Vice Primer Wu Yi admitted the lower level of China's urbanization than the world average and promised to raise the ratio to 47% by 2010 (Wu 2006). But since the inauguration of President Hu Jin-tao and Premier Wen Jia-bao in March 2003, rural development has snaked its way to the top of the Chinese government's agenda. The new administration pledges that agriculture, farmers and the rural areas would constitute "top priority of all the work" of central government, and that "Establishing the New Socialist Countryside" (Jian-she she-hui zhu-yi xin nong-cun) would be the leading goal for China in the twenty-first century (Xinhuanet 2006). This slogan represents a deliberate effort to reverse urbanization as both a phenomenon and an unarticulated development strategy of the previous administrations (Wade 2007). As such, the future trend of urban development and thus its impact on China's urbanization lag of economic development remains uncertain.

3 General patterns of urbanization and economic development

We extended our empirical tests with the stylized facts of the Chenery–Syrquin equations from the relationships of urbanization and per capita GDP to basic

Table 3 Correlation analysis of urbanization and development

Variables	Sample size	Correlation	*P* value
Urb vs. PCGDP	141	0.599	0.000
Urb vs. Popu	147	−0.106	0.203
Urb vs. Resources	126	0.023	0.798
Urb vs. Export	126	0.363	0.000

Data sources: World Bank (2001)

Table 4 Correlation analysis of explanatory variables

	PCGDP	Popul	Export	Resources
PCGDP	1.0	0.0073	0.7954	0.5889
Popul		1.0	0.5509	0.5653
Export			1.0	0.7320
Resources				1.0

Data sources: World Bank (2001)

development processes, including total population, net resources flows, and values of exports. Using the data reported by the World Bank (2001), we calculated the relationship of these variables to each other in simple Pearsonian correlation terms.

As suggested in Table 3, the variable of per capita GDP (PCGDP) bears out the strongest expected relationship ($r = 0.599$) with the dependent variable of urbanization (Urb), while the variable of total values of exports (Export) also achieves a quite fair correlation coefficient (0.363) with Urb. On the other hand, the variable of net resources flows (Resource) obtains a very low correlation coefficient (0.023), while the size of population (Popul) even exhibits a negative relationship (−0.106) with the dependent variable.

To avoid model misspecification and biased estimation, we need to consider the possible presence of multicollinearity. Table 4 gives the relationship of these explanatory variables to each other in Pearsonian correlation terms, based on a dataset of 86 samples. It seems that the variable of PCGDP are highly correlated with the variables of Export ($r = 7954$) and Resource ($r = 0.5889$), respectively. On the other hand, Export is also highly correlated with Resources ($r = 0.732$). Apparently, incorporation of the two variables into the model in the presence of PCGDP may cause the multicollinearity problem. On the other hand, although the calculated correlation between PCGDP and Popul is negligible of 0.0073, the latter is negatively correlated with the dependent variable of Urb. Hence, the only variable to be chosen as regressor of urbanization rate (Urb) is PCGDP.

To examine the nature of observational data on the two variables in scatter plot, we applied the curve–fit function of the SPSS software package to derive their fitting curves. Figure 1 shows a non-linear relation between the urbanization rate by country and its per capita GDP measured in 1999s priced US dollars. But in Fig. 2, when the measures of per capita GDP are transformed into logarithms, we obtained a linear pattern, which in turn leads to the following econometric specification:

$$\text{Urb} = \beta_0 + \beta_1 \ln(\text{PCGDP}) + \varepsilon \tag{1}$$

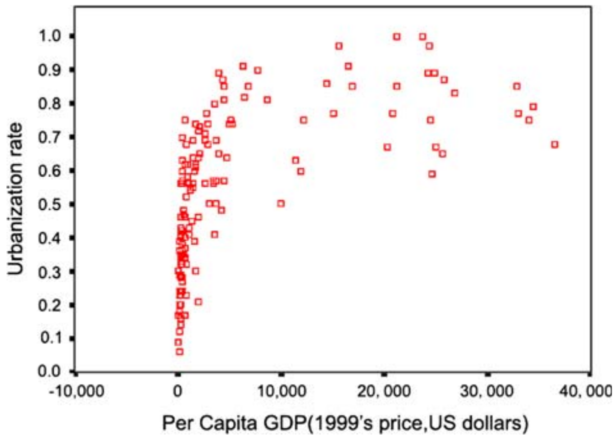

Fig. 1 A scatter-plotted pattern of urbanization and per capita GDP

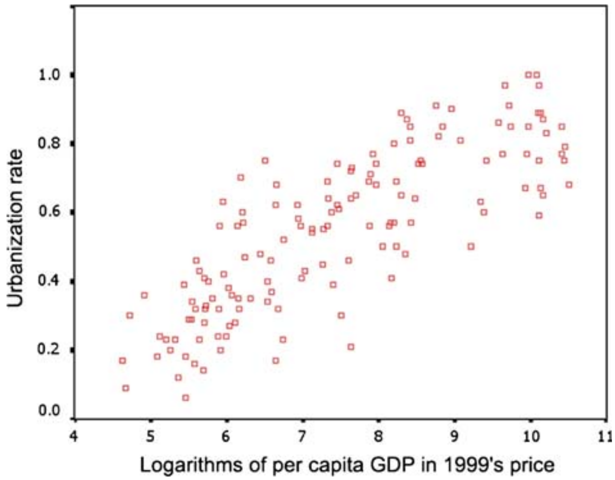

Fig. 2 A scatter-plotted pattern of urbanization and logarithmic per capita GDP

where Urb is the share of urban population, PCGDP is per capita terms gross domestic product, β_0, β_1 are parameters to be estimated, and ε is a stochastic disturbance term. Based on the cross-country data in 1999 (World Bank 2001), we estimated the models using ordinary least squares, with results listed in Table 5.

As can be seen in Table 5, the estimating of Eq. (1) achieved a fairly acceptable R^2 measure of model fit, and a further standard regression diagnostics also reveals no problem on the tests of error normality (Jarque–Bera), residual heteroskedasticity (Breusch–Pagan), and model specification robustness (White). Using the observed data and the predicted values of Eq. (1), Fig. 3 delineates a pattern of the relationship between degrees of urbanization and levels of per capita GDP. Based on the estimated results, we list the average of urbanization progresses corresponding to the levels of per capita GDP in Table 6. It should be noted that due to the presence of residuals

Table 5 Ordinary least-squares estimating

Variable	Coefficient	SD	Test	*P* value
Constant	−0.3148	0.0533	−5.911(*t*)	0.0000
Log(PCGDP)	0.2660	0.0161	16.548(*t*)	0.0000
R^2	0.6633		273(*F*)	0.0000
Residuals		0.1343		
Diagnostics for normality of errors (Jarque–Bera)			1.6455	0.4392
Diagnostics for heteroskedasticity (Breusch–Pagan)			0.2188	0.6400
Specification robust test (White test)			1.9120	0.3844

Data sources: World Bank (2001)

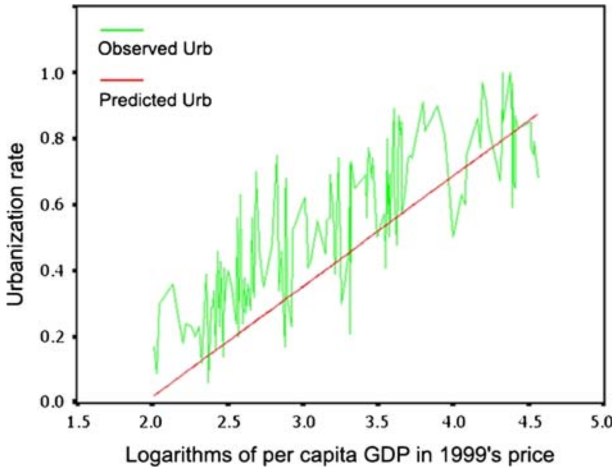

Fig. 3 A logarithmic curve fitting of urbanization and per capita GDP

between the observed and predicted values, the average of urbanization progresses we suggested in Table 6 is not an exact number but a proper range being centered at that number. Since the calculated standard deviation of regression residuals is 0.1343, the statistical confidence interval thus is $\hat{y} \pm 9.0\%$ for Eq. (1).

4 Patterns of development

In the *Patterns of development* suggested by Chenery and Syrquin (1975), the share of urban population is closely related to the sectoral composition of employment (p. 55). The population typically becomes predominantly urban above $500 (in 1964s price) per capita income, and the labor force employed in industry typically exceeds that in primary production above $700. It is only after the level of income has passed $2000, however, that these transitional processes have been completed. In particular, the relatively highly urbanized countries have development patterns classified as either

Table 6 Per capita GDP and urbanization

PCGDP (1999s price)	Urbanization rate based on Eq. (1)	PCGDP (1999s price)	Urbanization rate based on Eq. (1)
$100	21.7	$2000	56.3
$200	29.7	$3000	61.0
$300	34.4	$4000	64.3
$400	37.7	$5000	66.9
$500	40.3	$8000	72.4
$800	45.8	>$8000	84.9
$1000	48.3		

Data sources: World Bank (2001)

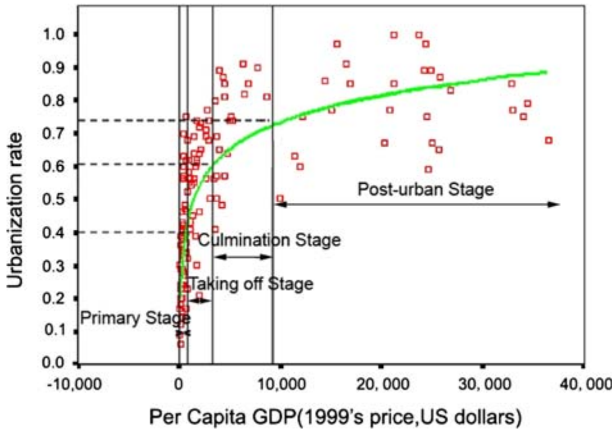

Fig. 4 Patterns of development and urbanization stages

"industry oriented" or "import substitution." Similarly, most of the countries that are less urbanized than predicted are classed as either "primary oriented" or "balanced."

Using the information provided in Table 6, we classified the World Bank dataset of 141 countries (World Bank 2001) into four stages of urbanization progress: primary, take-off, culmination, and post-urbanization. Figure 4 provides a disaggregated view of country locations between development and urbanization. As can be seen in Fig. 4, there appears a co-movement trend in a country's location between its per capita GDP and urbanization rate. This co-movement trend progresses along the southwest-northeast direction as the national per capita GDP increases from 100 to 40,000 in the 1999 priced US dollars, which has confirmed the Chenery–Syrquin Standard that countries with high per capita income will foster urbanization progress, and vice versa (Chenery and Syrquin 1975, p. 53).

Looking into the details in Fig. 4, the "primary" pattern occupies the left-bottom of the figure. This pattern consists of 44 countries, almost all have their geographical locations falling within the subtropical zones or the Sub-Saharan Africa. Because their geographical locations are unfavorable to economic development (Gallup and Sachs 1998), this pattern had the lowest group averages in both the per capita GDP (302 US dollars) and the urbanization rate (0.32), as shown in Appendix. Therefore, this group of countries has been recognized the world's least developed and poorest country club.

The second pattern "take-off" adjoins the "primary" on its right border and includes 34 countries (see Fig. 4). In general, this pattern occupies a better geographical location than the poorest club. A better geographical location certainly is favorable to economic development. This pattern had half of its group population living in cities, and its per capita GDP of 1,089 dollars tripled that of the poorest club (Appendix).

The middle part of the figure occupies the "culmination" belt, which includes 35 countries. Because its averaged-group per capita GDP (3,857 dollars) and urbanization rate (0.68) were both high (Appendix), this belt may be recognized the world's newly industrializing cub.

Moving up across the "culmination" belt in Fig. 4 is the "post-urban" zone which includes 29 highly industrialized countries. This zone of countries enjoyed the highest averaged-group per capita GDP (21,939 dollars), with 79% of its people living in urbanized areas (Appendix). This group hence has been recognized the world's highly developed and urbanized club.

It is interesting to note that not all of the "post-urban" countries had high urbanization rate over the sample period. This is particularly true for a small cluster of countries locating on the up-right part of the figure. This small cluster, consisting of Switzerland, Japan, Norway, United States and Denmark, truly represented the world's richest country club over the sample period. Although each enjoyed a high per capita GDP over 30,000 dollars as shown in the Appendix, none of the countries in this club had its urbanization rate above the "predicted line." The same situation also occurs with other countries in the "post-urban" stage, including Sweden, Austria, Finland, Ireland, France, Canada, Italy, Spain, Greece, Portugal, and Slovenia. On the other hand, countries such as Germany, Netherlands, Belgium, United Kingdom, Australia, Hong Kong, Singapore, United Arab Emirates, Israel, Kuwait, New Zealand, and South Korea, all had their urbanization rates above the "predicted line" although with a similar per capita GDP level.

This evidence of deviation from the general pattern challenges the conventional wisdom on the development and urbanization relationship. To examine the details, we used the same regression model [Eq. (1)] and estimated the development-urbanization relation for each of the four stages, with their results given in Table 7.

In Table 7, the first two rows show sample sizes and sample means for each 'stage'. Beginning with row 3, a correlation analysis between urbanization and per capita GDP suggests that only two stages of primary ($r = 0.533$) and culmination ($r = 0.511$) obtain meaningful results in terms of Pearsonian correlation coefficient. On the other hand, for the stages of take-off ($r = 0.287$) and post-urban ($r = 198$), the urbanization and per capita GDP correlation has not been statistically confirmed.

A subsequent OLS estimation of regression models suggests a similar empirical finding. As shown in Table 7, a standard regression diagnostics reveals no problem on the tests of model specification, error normality and residual heteroskedasticity. Therefore, we can safely interpret the estimates based on their statistical inference. The estimates associated with Log(PCGDP) turn out to be highly significant for the "primary" ($P = 0.0002$) and the "culmination" ($P = 0.002$), respectively. This implies that the Log(PCGDP) proves statistically to be the driving force of urbanization in the

Table 7 Statistical characteristics of four stages of urbanization and development

Stages of development PCGDP (1999s price)	Primary $200–500	Take-off $500–2000	Culmination $2000–8000	Post-urban $8000–40000
Sample size	44	34	35	29
Sample means				
Per capita GDP	302	1,089	3,857	21,939
Urbanization rate	0.32	0.50	0.68	0.79
Pearson-correlation				
Urb versus PCGDP	0.533	0.287	0.511	0.198
OLS regression				
R^2 (P value)	0.284 (0.0002)	0.082 (0.105)	0.261 (0.002)	0.039 (0.304)
Constant (P value)	−0.714 (0.007)	−0.212 (0.624)	−1.096 (0.043)	0.140 (0.823)
Log(PCGDP) (P value)	0.421 (0.0002)	0.238 (0.105)	0.498 (0.002)	0.151 (0.304)
Regression diagnostics				
Jarque–Bera (P value)	1.578 (0.454)	0.542 (0.763)	2.609 (0.271)	1.031 (0.597)
Breusch–Pagan (P value)	2.2303 (0.135)	0.335 (0.563)	2.710 (0.100)	0.685 (0.408)
White (P value)	4.118 (0.128)	0.378 (0.828)	3.191 (0.203)	1.401 (0.496)

Data sources: World Bank (2001)

two stage, their estimated coefficients of 0.421 for the “primary” and 0.498 for the “culmination” measure in average the gains of urbanization progress for every unit increase of per capita GDP.

On the other hand, this causal–effect relation is not confirmed in the stages of take-off and post-urban, since their estimates of Log(PCGDP) are not statistically different from zero (Table 7); in other words, an increase in per capita GDP does not necessarily lead to a faster urbanization progress. This empirical evidence finding corroborates previous findings on the general patterns of the Third World development generalized in Fan’s early study. In a systems simulation designed specifically for less-developed economies, Fan (1978) surprisingly found that the dynamics of economic development and urbanization were uncorrelated, due to increasingly unbalanced spatial distribution of population, ever-worsening distribution of income, unemployment and under-employment in both rural and urban areas, and other familiar features of the developing world unexplained by comparative-static equilibrium models.

For China in this particular study, it still belongs to the “take-off” stage of development, as can be seen in the Appendix. Therefore, Fan’s prediction on the disequilibrium dynamics of development and urbanization in developing countries may help explain the Chinese urbanization lag.

5 Conclusion

In this paper, we have provided updates on the stylized facts regarding the relationship between urbanization progress and per capita GDP. Our empirical strategy was based on the econometric specification and estimation by using a new cross-country data set and measured in 1999-priced per capita GDP. While our results corroborate previous findings on the general patterns of development by Chenery and Syrquin (1975), we are able to provide new insights as to the paradox of China's urbanization lag of economic development, the income contribution of urbanization progress, and the patterns of development.

The role of income increase in the accompanying urbanization process is of inherent intellectual interest. Even in an applied sense, a timely updated understanding of the divergent cross-country patterns in urbanization and development is extremely vital to enable developing countries to follow proper paths in the economic development and urbanization process.

Acknowledgments We would like to thank anonymous referees and the editor of this journal for their very constructive critiques and valuable comments on the early draft of this paper.

Appendix

See Table 8.

Table 8 Development stages based on per capita GDP and urbanization

Country name	Development stage	Urbanization rate	Group average	Per capita GDP	Group average
Switzerland	4	0.68	0.79	36,415	21,939
Japan	4	0.79	0.79	34,336	21,939
Norway	4	0.75	0.79	33,987	21,939
United States	4	0.77	0.79	32,898	21,939
Denmark	4	0.85	0.79	32,883	21,939
Sweden	4	0.83	0.79	26,818	21,939
Germany	4	0.87	0.79	25,724	21,939
Austria	4	0.65	0.79	25,700	21,939
Finland	4	0.67	0.79	24,935	21,939
Netherlands	4	0.89	0.79	24,917	21,939
Ireland	4	0.59	0.79	24,582	21,939
France	4	0.75	0.79	24,442	21,939
Belgium	4	0.97	0.79	24,353	21,939
United Kingdom	4	0.89	0.79	24,232	21,939
Hong Kong, China	4	1.00	0.79	23,723	21,939
Australia	4	0.85	0.79	21,265	21,939
Singapore	4	1.00	0.79	21,236	21,939
Canada	4	0.77	0.79	20,816	21,939
Italy	4	0.67	0.79	20,329	21,939
United Arab Emirates	4	0.85	0.79	16,869	21,939
Israel	4	0.91	0.79	16,531	21,939
Kuwait	4	0.97	0.79	15,564	21,939

Table 8 continued

Country name	Development stage	Urbanization rate	Group average	Per capita GDP	Group average
Spain	4	0.77	0.79	15,125	21,939
New Zealand	4	0.86	0.79	14,382	21,939
Puerto Rico	4	0.75	0.79	12,211	21,939
Greece	4	0.60	0.79	11,913	21,939
Portugal	4	0.63	0.79	11,372	21,939
Slovenia	4	0.50	0.79	10,006	21,939
Korea, Rep.	4	0.81	0.79	8,677	21,939
Argentina	3	0.90	0.68	7,737	3,857
Saudi Arabia	3	0.85	0.68	6,900	3,857
Oman	3	0.82	0.68	6,505	3,857
Uruguay	3	0.91	0.68	6,305	3,857
Trinidad and Tobago	3	0.74	0.68	5,284	3,857
Czech Republic	3	0.75	0.68	5,156	3,857
Mexico	3	0.74	0.68	5,008	3,857
Hungary	3	0.64	0.68	4,796	3,857
Croatia	3	0.57	0.68	4,539	3,857
Chile	3	0.85	0.68	4,498	3,857
Brazil	3	0.81	0.68	4,473	3,857
Venezuela, RP	3	0.87	0.68	4,313	3,857
Costa Rica	3	0.48	0.68	4,208	3,857
Poland	3	0.65	0.68	4,009	3,857
Lebanon	3	0.89	0.68	4,007	3,857
Botswana	3	0.50	0.68	3,748	3,857
Estonia	3	0.69	0.68	3,738	3,857
Slovak Republic	3	0.57	0.68	3,650	3,857
Gabon	3	0.80	0.68	3,627	3,857
Mauritius	3	0.41	0.68	3,537	3,857
Malaysia	3	0.57	0.68	3,482	3,857
Panama	3	0.56	0.68	3,413	3,857
South Africa	3	0.50	0.68	3,115	3,857
Turkey	3	0.74	0.68	2,883	3,857
Lithuania	3	0.68	0.68	2,874	3,857
Russian Federation	3	0.77	0.68	2,746	3,857
Belarus	3	0.71	0.68	2,682	3,857
Jamaica	3	0.56	0.68	2,650	3,857
Latvia	3	0.69	0.68	2,608	3,857
Tunisia	3	0.65	0.68	2,205	3,857
Colombia	3	0.73	0.68	2,087	3,857
Dominican Republic	3	0.64	0.68	2,071	3,857
Thailand	3	0.21	0.68	2,066	3,857

Table 8 continued

Country name	Development stage	Urbanization rate	Group average	Per capita GDP	Group average
Peru	3	0.72	0.68	2,061	3,857
EI Salvador	3	0.46	0.68	2,011	3,857
Namibia	2	0.30	0.5	1,809	1,089
Iran, Islamic Rep.	2	0.61	0.5	1,759	1,089
Macedonia, FYR	2	0.62	0.5	1,726	1,089
Jordan	2	0.74	0.5	1,718	1,089
Guatemala	2	0.39	0.5	1,641	1,089
Algeria	2	0.60	0.5	1,596	1,089
Ecuador	2	0.64	0.5	1,532	1,089
Bulgaria	2	0.69	0.5	1,513	1,089
Romania	2	0.56	0.5	1,512	1,089
Paraguay	2	0.55	0.5	1,434	1,089
Egypt, Arab Rep.	2	0.45	0.5	1,422	1,089
Morocco	2	0.55	0.5	1,241	1,089
Syrian Arab Republic	2	0.54	0.5	1,234	1,089
Bosnia and Herzegovina	2	0.43	0.5	1,125	1,089
Albania	2	0.41	0.5	1,081	1,089
Kazakhstan	2	0.56	0.5	1,063	1,089
Philippines	2	0.58	0.5	1,030	1,089
Bolivia	2	0.62	0.5	1,028	1,089
Honduras	2	0.52	0.5	855	1,089
Sri Lanka	2	0.23	0.5	840	1,089
China	2	0.32	0.5	789	1,089
Ukraine	2	0.68	0.5	773	1,089
Congo, Rep.	2	0.62	0.5	764	1,089
Papua new Guinea	2	0.17	0.5	763	1,089
Uzbekistan	2	0.37	0.5	726	1,089
Cote d’lvoire	2	0.46	0.5	723	1,089
Angola	2	0.34	0.5	689	1,089
Indonesia	2	0.40	0.5	688	1,089
Turkmenistan	2	0.75	0.5	668	1,089
Cameroon	2	0.48	0.5	625	1,089
Haiti	2	0.35	0.5	552	1,089
Senegal	2	0.47	0.5	511	1,089
Azerbaijan	2	0.57	0.5	501	1,089
Georgia	1	0.60	0.32	498	302
Armenia	1	0.70	0.32	486	302
Guinea	1	0.32	0.32	477	302
Zimbabwe	1	0.35	0.32	471	302
Nicaragua	1	0.56	0.32	463	302

Table 8 continued

Country name	Development stage	Urbanization rate	Group average	Per capita GDP	Group average
India	1	0.28	0.32	448	302
Pakistan	1	0.36	0.32	431	302
Lesotho	1	0.27	0.32	416	302
Ghana	1	0.38	0.32	414	302
Yemen, Rep.	1	0.24	0.32	401	302
Benin	1	0.42	0.32	388	302
Mongolia	1	0.63	0.32	382	302
Vietnam	1	0.20	0.32	370	302
Mauritania	1	0.56	0.32	368	302
Kenya	1	0.32	0.32	362	302
Bangladesh	1	0.24	0.32	360	302
Sudan	1	0.35	0.32	335	302
Zambia	1	0.40	0.32	318	302
Togo	1	0.33	0.32	305	302
Gambia, Thw	1	0.32	0.32	302	302
Tajikistan	1	0.28	0.32	302	302
Central African Republic	1	0.41	0.32	301	302
Uganda	1	0.14	0.32	298	302
Nigeria	1	0.43	0.32	283	302
Lao PDR	1	0.23	0.32	281	302
Moldova	1	0.46	0.32	270	302
Tanzania	1	0.32	0.32	266	302
Cambodia	1	0.16	0.32	264	302
Kyrgyz Republic	1	0.34	0.32	255	302
Mali	1	0.29	0.32	252	302
Madagascar	1	0.29	0.32	246	302
Rwanda	1	0.06	0.32	236	302
Burkina Faso	1	0.18	0.32	235	302
Mozambique	1	0.39	0.32	230	302
Nepal	1	0.12	0.32	213	302
Chad	1	0.23	0.32	204	302
Niger	1	0.20	0.32	192	302
Guinea-Bissau	1	0.23	0.32	182	302
Malawi	1	0.24	0.32	168	302
Eritrea	1	0.18	0.32	161	302
Sierra Leone	1	0.36	0.32	137	302
Congo, Dem. Rep.	1	0.30	0.32	112	302
Burundi	1	0.09	0.32	107	302
Ethiopia	1	0.17	0.32	103	302

Data source: World Bank (2001)

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