

# FDI, services trade and economic growth in India: empirical evidence on causal links

Ranjan Kumar Dash · P. C. Parida

Received: 4 November 2009 / Accepted: 5 June 2012 / Published online: 8 August 2012  
© Springer-Verlag 2012

**Abstract** This article examines the linkages between inward FDI, services trade (export and import) and economic output using co-integration and VECM causality test. These linkages have been explored both at the aggregate and at the sectoral levels (manufacturing and services). The empirical findings confirm the long-run relationship among these variables. Causality results indicate the presence of bi-directional causal relationship between FDI and economic output as well as between services exports and economic output. The results also bring out feedback relationship between services export and FDI, reconfirming the presence of complementary relationship between the two. At the sectoral level, we find at least a unidirectional causality from FDI and services exports to both manufacturing and services output and also cross-sectoral spillover effects from manufacturing output to services output and vice versa.

**Keywords** FDI · Services trade · Economic growth · Co-integration · VECM causality

**JEL Classification** E23 · E24 · F13 · F2 · O54

---

The views expressed in this article are those of the authors and not of the institutions they are affiliated with. All errors and omissions are the authors' responsibility.

---

R. K. Dash (✉)  
ICRIER, New Delhi, India  
e-mail: rkumardash@yahoo.com

P. C. Parida  
NCAER, New Delhi, India  
e-mail: paridapc@yahoo.co.in

## 1 Introduction

Services has emerged as one of the fastest growing sectors in the global economy during the last two decades, contributing more than 60% of global output and, in many countries, even larger share of employment (Hoekman and Mattoo 2008).<sup>1</sup> This sector has not only produced higher growth and employment but also has attracted huge amount of foreign direct investment (FDI) into it (UNCTAD 2009).<sup>2</sup> Besides, the sector has also contributed a chunk of services to the international trade. The ratio of world's services trade to goods trade, which was around 20% in 1980, increased to 27% in 2010 (WDI 2011).

Similar to the world economy, the Indian economy has experienced major improvement in services-led economic growth during the last two decades. After the country embarked upon the structural reform policies in the early 1990s, the economy registered around 6% growth in the first decade, which in recent years has been around 9%. The services sector in India assumes a central role in this growth story. During the 1990s, the Indian services sector grew at an average annual rate of 8.1%, contributing nearly 50% to the overall economic growth (Gordon and Gupta 2004). In general, such a trend is experienced primarily by high-income countries and not by developing ones. Most of the growth in services sector in India has been in sectors like Information Technology (IT), Business Process Outsourcing (BPO) and knowledge-based activities. Further, productivity growth in India, unlike other regions of the world, has been the strongest in services (IMFund 2006; Bosworth and Collins 2007).

At present, India ranks 15th in the services output in the world, and it provides employment to around 23% of the total workforce in the country. This sector has not only experienced a large-scale expansion of output and employment but also has attracted a chunk of global direct investment particularly during the post-reforms period<sup>3</sup>. The Reserve Bank of India's (RBI) balance of payments data shows that FDI inflows into India soared from US\$ 107 million in 1990–1991 to US\$ 32,944 million in 2010–2011 and the services sector accounts for more than half of it. One question arises here: Does this high volume of FDI inflows into India in general, and into services sector in particular, have the desired economic growth impact in the country? While some earlier studies argued that FDI inflows may still be too low to make a big impact (Bhat et al. 2004; Kamalakanthan and Laurenceson 2005), other studies (Agrawal and Shahani 2005; Chakraborty and Nunnenkamp 2008) have emphasised on the types of FDI and its structural compositions for its effect on economic growth.

In addition to attracting FDI, India's service sector has registered growth over the post-reform period. Banga (2005) and Dash and Parida (2011) find that high growth

<sup>1</sup> Growth in services is also recognised as an important source of economic development and is strongly associated with income growth and economic modernisation (Francois and Reinhart 1996).

<sup>2</sup> In the early 1970s, services sector accounted for only a quarter of the world FDI stock. In 1990s, this share was less than half of the total FDI stock and by 2008, it had risen to an astonishing 60% (UNCTAD 2009).

<sup>3</sup> Though the growth of services sector in India is in line with the global trend, there are two unique characteristics in the growth of India's service sector. First, the share of agricultural sector in total GDP has declined significantly, i.e. from 32% in 1990 to 17% in 2006–2007, and this decline has been picked up by the services sector, while manufacturing sector's share has remained more or less stagnant.

in service sector in 1990s in India relates to higher growth in services trade. India's services trade registered a remarkable growth of 19.7 % during 1990–2010, which is fairly higher than the growth rate of goods trade (13 %) during the same period.

Observation on FDI flows and services trade growth over the post-reform period inspires the following specific questions on this article:

1. To understand whether India's high growth during the post-reforms period led by the services sector has contributed to higher FDI flows and services trade or vice versa.
2. We evaluate whether the influence of FDI inflows and services trade (exports and imports) on economic output varies at the sectoral level. The reason is that the existing literature on developed countries suggests that the absorbing capacity of services sector is low as compared to manufacturing and, therefore, the spillover effect emanated from FDI and services trade is stronger in case of the latter sector than the former<sup>4</sup>.
3. Last but not the least, this article applies advance time series technique to explore the causality relationship between the variables.

The article is structured as follows. Section 2 outlines FDI policy and FDI inflows into India, the pattern of services sector growth and trade during the post-reforms period. Section 3 contains a brief overview of literature on services trade, growth and FDI. Section 4 presents data source and methodology of the article. Section 5 discusses the empirical results and Section 6 provides the conclusion and policy implications.

## 2 Economic reforms, services trade and services sector growth

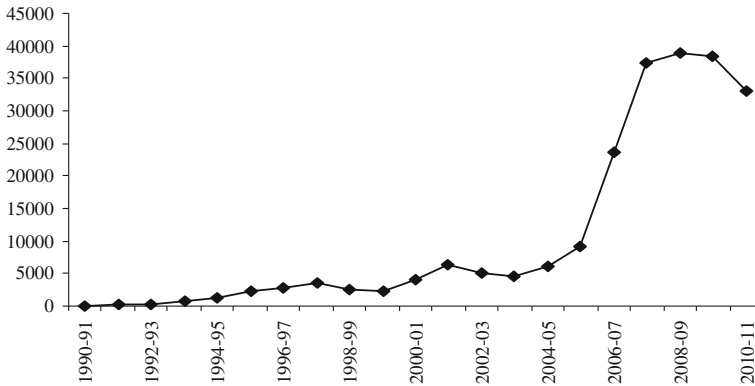
### 2.1 FDI policy and inflows

Although the Indian economy had witnessed a change in economic policies during the 1980s, a major shift in economic policies was observed only in the early 1990s. In order to accelerate the economic growth, many new policies were introduced. FDI liberalisation was one of them. Since then, FDI policy has been continuously revised and liberalised. As a result of this new policy, most of the sectors in the economy except a few are now open to FDI inflows through the automatic approval route.<sup>5</sup> Under the current policy, FDI can reach India through the automatic route as well as the government approval route. In some cases, where automatic route is not permitted, investment can be approved by the Foreign Investment Promotion Board (FIPB). Some other economic and industrial policies such as repatriation of investment capital and

---

<sup>4</sup> The analysis of this study is based on quarterly information which is available for all variables from 1996 onwards. Since we do not have quarterly FDI data at the sectoral level, we have taken total FDI inflow as a proxy for services FDI. In fact, the broad definition of services FDI shows that its share on an average is about 50 % of total FDI inflows between 1991 and 2010. Nevertheless, this data limitation remains a weak point for this study, which needs further research in the future depending upon the availability of information.

<sup>5</sup> In a few sectors, there are restrictions on FDI investment in the form of equity caps, divestment conditions and lock-in periods. Moreover, FDI is not allowed in gambling, betting retail, arms and ammunition, etc.



**Fig. 1** Year-wise FDI Inflow to India (million US\$). *Source* Handbook of Statistics, 2010, Reserve Bank of India

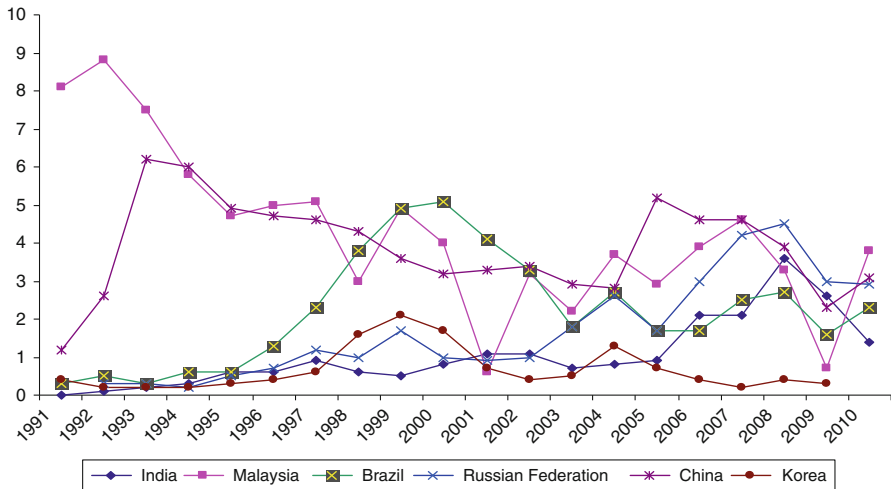
profits, change in labour laws, establishment of Special Economic Zones (SEZs) and taxation policy have helped India to become an attractive destination of FDI.

Since 1991, inflows of FDI into India have gone up considerably. Figure 1 shows that the total FDI inflows, which were US\$ 107 million in 1990–1991, increased unprecedentedly to US\$ 38,940 million in 2008–2009. However, it declined to US\$ 32,944 million in 2010–2011 due to global slowdown in the previous two fiscal years.<sup>6</sup>

Although FDI inflows into India from source countries have increased since 2004, it still remains a less attractive destination for FDI as compared to other countries in the world. Country-wise comparison of net FDI flows as percentage of GDP shows that FDI, as percentage of GDP in India, is relatively low compared to countries like China, Malaysia and Brazil (Fig. 2).

The post-reform period has not only witnessed higher growth of aggregate FDI but also the sector- and industry-wise composition of FDI has also changed considerably. For comparison, we divided the period from 1991 to 2011 into two: first, the period from 1991 to 1999 and second, the period from 2000 to 2011. During the first period, services sector absorbed very little portion of FDI. Only 7% of total FDI came into this sector as per the Department of Industrial Policy and Promotion (DIPP), which uses a narrow definition of services sector. If we use the broad definition of services by including services like telecommunications, housing and real estate, construction, computer software, trading, transports, hotel and tourism, information and broadcasting, consultancy services, hospital and diagnostic centres, and education, then the share of FDI in services sector to total FDI inflows goes up to 44% during this period. This share increases even further to 60% in the second period of economic reforms. Within the services sector, financial, communications, power, real estate, computer software and trade services have attracted large FDI inflows as compared to other services (Table 1).

<sup>6</sup> Fiscal year covers from April 1 of an year to March 31 of the next year. For example, 2010–2011 covers the period from 1 April 2010 to 31 March 2011.



**Fig. 2** Year-wise net FDI inflow across countries (ratio of GDP). *Source* World Development Indicator, CD-ROM 2011

## 2.2 Growth of services trade

Along with increased FDI flows in the services sector, trade in services has also been outstanding over the post-reform period. Trade in services in India has been growing rapidly since the early 1990s due to various reform measures.<sup>7</sup> The share of India's services trade to that of world has gone up from 1.5% during the 1990s to over 4% during the 2000s. Similarly, India's services exports share to that of the world has increased from 0.66% in the 1980s to 0.74% in the 1990s and further to 2.1% in the 2000s. More importantly, the services exports has registered higher growth than services imports during the 1990s and 2000s, implying the comparative advantages that India is enjoying in services exports in the international market. Interestingly, not only has India's services export grown faster than merchandise exports, but also has increased faster than the world services exports during the 1990s and 2000s (Table 2).

Not only has India's share in world services trade increased but also has changed over the years. It is clear from Table 3 that services like computer, communications and other services, insurance and financial service, and travel services have been fast-growing services exports during the 2000s compared to 1990s. As has been discussed earlier, these services sectors have also received higher FDI during the 2000s as compared to other services sectors. Table 3 also shows that while the share of travel and transportation services in total services exports has declined during the 2000s as compared to 1990s, the share of software services has increased considerably between the two periods.

<sup>7</sup> In recent years, India brought out policy changes in a number of key 'backbone' services. Barriers to entry by new private firms have been eliminated in telecommunications and freight transport, and are being phased out in insurance and banking—even though restrictions on foreign ownership remain.

**Table 1** FDI in India in the Service Sector (million US\$)

Category	1991–1999	1999–2000	2000–2001	2003–2004	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011
Financial and non-financial	4885	1049	224	850	2585	5113	6457	4874	3675
Transport	1682	328	284	442	480	937	573	430	467
Telecommunication	1690	478	587	380	535	1246	3459	3414	2095
Computer software	1592	1241	3636	162	2672	1081	1666	1012	794
Power	14848	169	1977	32	165	745	998	1607	1269
Real estate	0	0	0	148	482	1683	2868	3160	1144
Consultancy	84	77	121	32	120	260	333	381	272
Hotel and tourism	1595	104	171	65	200	326	461	824	414
Trading	660	164	156	228	118	478	653	817	573
Others	406	6	10	51	133	192	468	213	316
Services total	27442 (44)	3615 (46)	7167 (47)	2388 (40)	7492 (59)	12062 (64)	17935 (64)	16731 (58)	11019 (56)

Source SIA Newsletters (various issues), Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, Government of India

Note Figures in parentheses are share of services sector in total FDI

**Table 2** A Comparison between India and World Service Trade

Period	% Change in world service export	% Change in world service import	% Change in India's service export	% Change in India's service import	% Change in India's merchandise export	% Change in India's merchandise Import	India's share in world exports of services	India's share in world imports of services
1980–1990	7.9	6.7	4.2	7.9	7.2	4.2	0.66	0.77
1991–2000	6.1	5.7	15.7	14.6	9.7	11.2	0.74	0.84
2001–2010	9.7	9.1	24.1	21.8	18.3	21.5	2.1	2.0

Source World Development Indicator, CD-ROM, 2011

**Table 3** Average growth rate of various services exports

Period	Services export		Services import	
	1990–2000 (average % change)	2001–2010 (average % change)	1990–2000 (average % change)	2001–2010 (average % change)
Computer, communications and other services	24.9 (41.7)	27.1 (69.5)	18.1 (29.8)	25.1 (36.2)
Insurance and financial services	14.1 (2.6)	36.7 (4.6)	14.07 (5.9)	21.2 (9.1)
Transport services	7.9 (20.9)	21.2 (11.5)	10.8 (53.6)	20.0 (41.9)
Travel services	6.2 (34.0)	16.1 (14.1)	23.3 (9.3)	15.1 (12.5)

Source World Development Indicator, CD-ROM, 2011

Note Figures in parenthesis are average share in total services exports and total services imports, respectively

The improved performance of India's services trade relative to merchandise trade could be noticed from the world ranking compiled by WTO. In 2010, India ranked 10th in terms of global export and 17th in terms of global import of commercial services. Contrary to this, India's world ranking in terms of merchandise exports and imports was 20th and 13th, respectively (WTO 2010). According to World Bank (2004), India exhibits a strong revealed comparative advantage (RCA) in services as compared to goods.<sup>8</sup> Between 1996 and 2000, the RCA index for services increased by 74% while that for goods declined by 15%. A study by De and Raychaudhuri (2008) finds India's strong RCA in services trade. RCA index, which was 1.14 in 1991 increased to 1.97 by the end of 2005–2006.<sup>9</sup> This increase in RCA of services was mainly on account of 'other business services', which include services such as software exports (IT and BPO), finance, communication, management, consultancy and telecommunication.

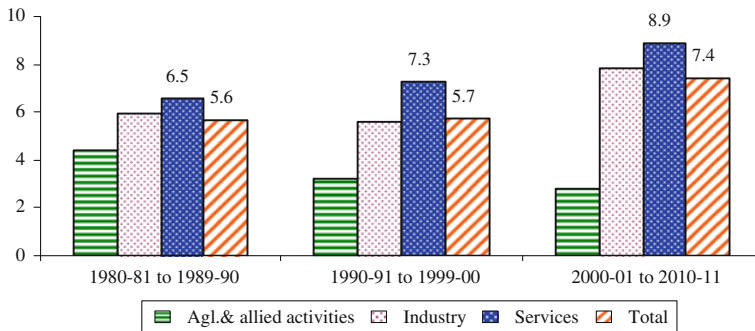
### 2.3 Growth of service sector GDP

India's economic reforms in trade and services and FDI have facilitated the economy to register higher growth in general and in services sector in particular. India's emergence as one of the fastest growing economies in the world in the 1990s can be attributed, to a large extent, to the rapid growth of its services sector. The growth of output in the services sector in the 1990s has been much higher than the growth of output

<sup>8</sup> An RCA index for a sector is calculated by taking the share of the particular sector's export in that country's total export of goods and services, and dividing this by the ratio of global exports in this sector by the total exports of goods and services. An RCA index with value greater than unity indicates comparative advantage in the concerned sector.

<sup>9</sup> According to Rakshit (2007), India's RCA in services exports in fact was higher than industry, agriculture, and merchandise exports during the period 1991 to 2005.





**Fig. 3** Average sectoral growth rates (%). *Source* Authors' calculation using National Accounts Statistics data published by CSO, Government of India

in agriculture or industry.<sup>10,11</sup> The contribution of services output to GDP during the period 2001–2009 has been more than 60% per annum. Services sector output growth, which was 6.5% per annum in the 1980s, increased to 7.3% per annum in the 1990s, and further to 8.9% in the 2000s (Fig. 3).

Agricultural growth, however, declined from 4.4% per annum in the 1980s to 3.2% in the 1990s and further to 2.8% in the 2000s. Industrial output registered an average growth of 5.6% in the 1980s which increased marginally to 5.7% in the 1990s before scaling up to a higher growth rate of 7.8% in the 2000s due to considerable increase in manufacturing output growth during the same period. This indicates that there may be some positive spillover effect from manufacturing to services sector and vice versa.

The aggregate growth of services sector, however, has not been uniformly distributed across its sub-sectors. Services like trade, communication, transport, real estate and banking and insurance have posted strong output growth during the second decade of economic reforms as compared to the first (Table 4). More importantly, these sectors have also attracted higher FDI and registered higher trade growth during the same period.

The above discussion suggests that both FDI inflows and services trade have played important roles in the success of economic growth in general and higher services growth in particular during the post-reforms period. Sectors like banking and insurance, communication, trade, real estate and business have registered higher output growth during the post-reforms period and they are well supported by both FDI inflows and services trade. Some services like storage, public administration, defence and railways are growing because of domestic demand. These sectors are least open to FDI inflows. It suggests that both FDI and services trade either partly or wholly are

<sup>10</sup> Among the reasons cited for relatively better performances of the services sector as compared to the industry are (a) labour restrictions and small-scale reservations resulted in more disadvantages for industries than services and (b) services sector has received more generous tax incentives.

<sup>11</sup> Growth in the services sector has also been less cyclical than the growth of industry and agriculture, as it has the smallest coefficient of variation.

**Table 4** Annual average growth rate of services sector GDP

Services categories	Annual average growth rate		% Share in total services in 2004–2005 prices
	1991–1992 to 1999–2000	2000–2001 to 2009–2010	2004–2005 to 2009–2010
Trade	7.5	8.5	27.3
Hotels and restaurants	10.0	8.5	2.8
Railways	3.3	7.5	1.8
Transport by other means	7.4	8.5	10.3
Storage	15.8	4.3	0.1
Communication	15.8	25.9	4.5
Banking and insurance	10.7	10.8	12.5
Real estate, ownership of dwellings and business services	−0.1	5.6	16.6
Public administration and defence	6.7	6.2	10.2
Other services	6.8	7.0	13.9
Total services	7.5	8.9	100.0

*Source* Authors' calculation using National Accounts Statistics data published by CSO, Government of India

accountable for the success or failure of services sector performance in India.<sup>12</sup> This analytical finding is empirically verified in this study.

### 3 Existing evidence on FDI impact of services trade and growth

In this section, we discuss the theoretical and empirical literature on the inter-linkages between services trade, FDI and services sector growth.

#### 3.1 FDI versus services sector growth

As discussed earlier, the theoretical literature emphasized the role of FDI in economic growth (De Mello 1999; Balasubramanyam et al. 1996; Borensztein et al. 1998). In the past, several studies have examined the impact of total FDI inflows on the host country's output growth (Balasubramanyam et al. 1999; Bende-Nabendem et al. 2003; Basu et al. 2003). Recently, the focus has shifted from overall FDI analysis to sectoral composition of FDI inflows and its impact on sectoral output growth. A few studies find that the impact of FDI inflow to manufacturing sector

<sup>12</sup> A preliminary data analysis suggests that the correlation between FDI and output growth in services sector is 0.64 during 2005 and 2008. In case of manufacturing, we find even a higher correlation of 0.84 between growth and FDI during 2000 and 2007. Nevertheless, the correlation number of services sector suggests that the sector's output growth is influenced by FDI inflows.

produces bigger impact on growth than FDI inflows to services sector due to the latter's low absorbing capacity (Alfaro 2003; Aykut and Sayek 2007; Chakraborty and Nunnenkamp 2008). However, theoretically it is argued that like manufacturing FDI, services FDI can provide various benefits to the host country in price changes, quality improvements, increased variety of services available, employment and knowledge spillovers (Lipsey 2001; UNCTAD 2004; Mirodout 2006; Fernandes and Paunov 2008). Services like financial, communications, transport and power are especially as key intermediate inputs into the production process of all sectors and FDI inflows into these sectors reduces cost, improves productivity and promotes economic growth in the long-run (Francois 1990; Markusen 1989; Lipsey 2001; Fernandes and Paunov 2008).

On the other hand, it is argued that the buying power of the domestic market as well as growth potential of the market proxied by GDP or GDP growth rate attracts large amounts of FDI into services sector. A study by Ramasamy and Yeung (2010) argued that a larger market size, an increased purchasing power and a high growth potential attract greater amounts of FDI.

### 3.2 Services trade versus services sector growth

Classical economists argue that services are used as inputs in the production process of agriculture and industry, and they did not focus on the role of services trade in economic growth. However, with the development of information and communication technology (ICT) and globalization, services activities have not only become tradable but also unbundled (Ghani and Kharas 2010; Bhagwati 1984; Baumol 1985). Subsequently, services trade was recognised as an item of exchange by WTO in 1995, and international trade became formally acknowledged to include both goods and services in the international trade basket. Prior to the development of specific theory on services trade, several studies applied the goods exports-led growth theory to analyse the services trade.<sup>13</sup> Services trade, like goods trade, possess growth-generating characteristics, particularly in sectors like telecommunications, software, financial services and transport. In these sectors, there is considerable scope for learning by doing, knowledge generation, expanding product variety, and upgrading product quality. Therefore, trade in these services may increase the scale of domestic activity, resources allocation, employment opportunities and productivity growth, through technology spillover effect (Francois 1990; Levine 1997; Mattoo et al. 2006; Francois and Hoekman 2010).

---

<sup>13</sup> For example, studies such as those of Hindley and Smith (1984), Deardorff (1985) and Sapir and Winter (1994) argue that under the assumption of 'perfect competition', the theory of comparative advantage can be applied to services trade. Further, Bhagwati (1984) and Melvin (1989) have shown that the factor endowment theory is also compatible with service trade. More recently, 'endogenous growth' theories emphasize the benefits stemming from a dynamic export sector to other sectors through technological and managerial spillover effects (Grossman and Helpman 1991; Romer 1990; Rebelo 1991).

### 3.3 FDI versus services trade

Unlike the voluminous literature on FDI versus growth and services trade versus growth, a few past studies have explored the link between FDI and services trade<sup>14</sup>. In the literature, the following two aspects of possible linkages between FDI and international trade are discussed: (i) whether FDI is a substitute for, or a complement to, international trade and (ii) whether FDI causes international trade or if it is the other way round. The General Agreement on Trade in Services (GATS) specifies four modes of trade in services. These are first, cross-border supply, when a service crosses a national border; second, consumption abroad, when a consumer travels abroad to consume from the service supplier; third, commercial presence, when a foreign owned company sells services, and fourth, temporary movement of natural persons. Out of these, the third mode of services is arguably the most critical in facilitating FDI flow and also underpins much of the activity associated with other 'modes' (see, for example, [Fillat-Castejón et al. 2008](#); [Francois and Hoekman 2010](#)). Empirical evidence also suggests that these four modes are complementary in nature ([WTO 2004](#); [Lennon 2008](#)). Therefore, we expect that FDI and services trade are likely to be complementary to each other<sup>15</sup>.

### 3.4 Indian context

In the Indian context, a few empirical studies have examined the link between services trade and services sector GDP growth. [Banga \(2005\)](#) finds that high growth in services sector in the 1990s in India is related to higher growth in services trade. A recent study by [Dash and Parida \(2011\)](#) supports the services export-led growth in India during the post-reforms period. Unlike the lack of literature in case of services trade and economic growth, we find vast literature on FDI and economic growth in India, and the results are mixed. Studies such as [Agrawal \(2005\)](#) and [Pradhan \(2002\)](#) fail to find significant positive growth effects of FDI. A few studies find that higher growth attracts more FDI, rather than vice versa ([Chakraborty and Basu 2002](#); [Sahoo and Mathiyazhagan 2003](#)). It is also important to note here that most of the existing studies have looked into impact of FDI on aggregate growth of the economy. In contrast, a study by [Chakraborty and Nunnenkamp \(2008\)](#) analyses the sector-specific hypothesis and find only transitory effects of FDI on output in the services sector. The study, however, emphasizes that FDI in services sector may have promoted growth in the manufacturing sector through cross-sector spillovers.

<sup>14</sup> In fact, a recent study by [Welsum \(2003\)](#) stresses that given the peculiarities of the nature of services trade, the impact of FDI on it could be different as compared to its impact on trade in merchandise goods.

<sup>15</sup> It has been argued that if investment is undertaken by investing/source countries to bypass high trade barriers in the host country, such FDI tends to substitute trade and is commonly known as tariff-jumping FDI. Further, if foreign investors seek to gain greater market access by investing in large market economies overseas to reap the benefits of scale economies, such FDI tends to displace trade and is known as market-seeking or horizontal FDI. On the other hand, if FDI is motivated by strategic considerations such as seeking low-cost locations overseas so as to gain from host country's comparative advantage, such FDI tends to generate complementarities and hence is trade generating and is known as export-oriented or vertical FDI.

In contrast to the above two issues, the empirical literature on FDI and services trade is very limited in general and India in particular. In case of Korea, [Kim and Kim \(2000\)](#) find that improvement in productivity in certain sectors, such as distribution of services, is due to large FDI inflows. [Gholami et al. \(2006\)](#) find that higher level of ICT investment leads to an increase in FDI inflows in case of developed countries. A study by [Srivastava \(2006\)](#) confirms the presence of short-run unidirectional granger causality from FDI to services exports for India. On the other hand, [Feng \(2009\)](#) finds FDI inflow has no significant impact on services exports and output performances in India.

The above discussions suggest that the theoretical literature does not underline clear-cut conclusions on the relationship between FDI and international trade in services. In the context of above background, this study makes an attempt to examine the hypothesis of cause and effect relationship between FDI, services trade, and economic growth of service sector in India. Broadly, we address three specific hypotheses:

1. Does the causality runs from services FDI and services trade to economic growth and vice versa?
2. Is there any complementary relationship between services trade and FDI inflows?
3. Are there cross-sectoral spillover effects from services FDI and services trade to manufacturing output?

#### 4 Data sources and methodology

Quarterly data on FDI, real Gross Domestic Product (GDP), Export of Services (SEXP) and Import of Services (SIMP) are collected from Handbook of Statistics on Indian Economy, Reserve Bank of India (RBI). The study covers the period from Q1 of 1996–1997 to Q4 of 2010–2011, comprising 60 observations. The year 1996–1997 was selected because quarterly data on GDP is available for India from this year onwards. All the variables are seasonally adjusted and transformed into logarithms. Services exports, imports and FDI are converted into real terms deflating by WPI series (base 2004–2005), as quarterly data on unit value of services exports and imports prices are not available.

In this analysis, we use the Augmented Dickey Fuller (ADF) test ([Dickey and Fuller 1981](#)) for examining the stationarity of variables, and [Johansen and Juselius \(1990\)](#) (JJ hereafter) multivariate co-integration methodology to determine the number of co-integrating variables. Further, Granger causality test is done using vector error correction method (VECM).

##### 4.1 Granger causality test

After testing for co-integration, we follow VECM procedure for the direction of causality between output, FDI, service export, and import. Here, the multivariate model is extended to allow for the simultaneity of all included variables. The VECM procedure suggested by [Granger \(1986\)](#) and [Engle and Granger \(1987\)](#) can be written as follows:

$$\begin{aligned} \Delta \ln \text{GDP}_t = & \alpha_1 + \sum_{j=1}^{p-1} \delta_{1i} \Delta \ln \text{GDP}_{t-j} + \sum_{j=1}^{p-1} \varphi_{1i} \Delta \ln \text{SEX}_{t-j} + \sum_{j=1}^{p-1} \theta_{1i} \Delta \text{SIMP}_{t-j} \\ & + \sum_{j=1}^{p-1} \lambda_{1i} \Delta \ln \text{FDI}_{t-j} + \beta_1 \text{ECM}_{t-1} + u_{1t} \end{aligned} \quad (1)$$

$$\begin{aligned} \Delta \ln \text{SEXP}_t = & \alpha_2 + \sum_{j=1}^{p-1} \delta_{2i} \Delta \ln \text{SEXP}_{t-j} + \sum_{j=1}^{p-1} \varphi_{2i} \Delta \ln \text{GDP}_{t-j} + \sum_{j=1}^{p-1} \theta_{2i} \Delta \text{SIMP}_{t-j} \\ & + \sum_{j=1}^{p-1} \lambda_{2i} \Delta \ln \text{FDI}_{t-j} + \beta_2 \text{ECM}_{t-1} + u_{2t} \end{aligned} \quad (2)$$

$$\begin{aligned} \Delta \ln \text{SIMP}_t = & \alpha_3 + \sum_{j=1}^{p-1} \delta_{3i} \Delta \ln \text{SIMP}_{t-j} + \sum_{j=1}^{p-1} \varphi_{3i} \Delta \ln \text{SEX}_{t-j} + \sum_{j=1}^{p-1} \theta_{3i} \Delta \text{GDP}_{t-j} \\ & + \sum_{j=1}^{p-1} \lambda_{3i} \Delta \ln \text{FDI}_{t-j} + \beta_3 \text{ECM}_{t-1} + u_{3t} \end{aligned} \quad (3)$$

$$\begin{aligned} \Delta \ln \text{FDI}_t = & \alpha_4 + \sum_{j=1}^{p-1} \delta_{4i} \Delta \ln \text{SIMP}_{t-j} + \sum_{j=1}^{p-1} \varphi_{4i} \Delta \ln \text{SEX}_{t-j} + \sum_{j=1}^{p-1} \theta_{4i} \Delta \text{GDP}_{t-j} \\ & + \sum_{j=1}^{p-1} \lambda_{4i} \Delta \ln \text{FDI}_{t-j} + \beta_4 \text{ECM}_{t-1} + u_{4t}, \end{aligned} \quad (4)$$

where  $\text{ECM}_{t-1}$  is the error correction term generated from the co-integrated regression from the Johansen multivariable process,  $u_{it}$  are disturbance terms,  $\Delta$  denote first differences required to induce stationarity for corresponding variables,  $p$  is the order of the VAR, which translates into a lag of  $p - 1$  in the VECM. For example, when the order of the VAR is one, we have no lagged difference terms in VECM. In this case, the only right-hand side variable is the error correction term. As [Engle and Granger \(1987\)](#) argued, failure to include the ECM term will lead to mis-specified models which can lead to erroneous conclusions about the direction of causality. The Granger causality test may be applied to Eqs. (1)–(4) as follows: first, by checking statistical significance of the lagged differences of the variables for each vector; this is so called short-run causality; and second, by testing the statistical significance of the error-correction term for the vector which explains the existence of a long-run relationship. Thus, this procedure has the dynamics or disequilibrium adjustment. It is important to note here that we also estimate a similar set of VECM in the case of manufacturing and services GDP separately.

## 5 Results analysis

The econometric results are presented in three steps. First, we establish the order of integration of all the variables using unit root tests. Second, we conduct a Johansen–

**Table 5** Augmented Dickey–Fuller (ADF) unit root test

Variables	Test statistics (levels) (intercept only)	Optimal Lags (AIC)	Test statistics (levels) (intercept and trend)	Optimal lags (AIC)	Test statistics (1st difference) (intercept only)	Optimal lags (AIC)
LFDI	−0.72	1	−2.18	1	−7.58*	0
LGDP <sub>SER</sub>	2.71	2	−2.13	3	−6.87*	1
LGDP <sub>MAN</sub>	0.90	5	−2.12	4	−4.77*	1
LGDP	0.67	2	−2.17	3	−7.97*	2
LSEXP	0.16	2	−2.56	1	−6.86*	1
LSIMP	−0.79	1	−1.86	2	−8.71*	0

\*The null hypothesis that the variable concerned is non-stationary can be rejected at 1 % significance level  $L$  logarithms

Juselius (JJ) co-integration test to find out whether there exists long-run relationship among all the variables, and third, we conduct the VECM Granger causality test.

### 5.1 Stationary test results

As shown in Table 5, the null hypothesis of the series being non-stationary is not rejected at levels. But the same null hypothesis is rejected in favour of the alternative at least at 1 % significance level when first differences of the variables are taken. These ADF test results indicate that all the variables are integrated of order one, i.e. 1 (1).

### 5.2 Co-integration results

Given that all relevant variables are integrated of order one, in the next step we check if there exists a stable long-run relation among the variables. We applied the JJ test of co-integration, which is generally considered to be among the most reliable to examine whether the variables for each equation are co-integrated. We test co-integration relationship separately for total GDP, service GDP and manufacturing GDP. We also test the co-integration relationship between services GDP, manufacturing GDP, FDI and services exports in order to explore the sector specific spillover effects. Using the maximum eigenvalue test as well as the trace test, the null hypothesis of at the most zero co-integration can be rejected for each equation, indicating that there exists at least one co-integrating vector (Table 6). Therefore, the result supports the hypothesis of co-integration between GDP, service export, import and FDI.

### 5.3 Causality results

According to Granger's representation theorem, if there is co-integration there must be Granger causality in at least one direction and, therefore, one can reformulate the

**Table 6** JJ co-integration test

Null hypothesis	Test statistics (max-Eigenvalue)	5% CV	Test statistics (trace statistics)	5% CV
Equation: LGDP LFDI LSEXP and LSIMP				
$r = 0$	29.60*	27.58	49.05*	47.85
$r \leq 1$	13.71	21.13	23.44	29.79
$r \leq 2$	9.71	14.26	9.73	15.49
$r \leq 3$	0.01	3.84	0.01	3.84
Equation: LGDP <sub>SER</sub> LFDI LSEXP and LSIMP				
$r = 0$	31.56*	27.58	58.69*	47.85
$r \leq 1$	20.76	21.13	28.43	29.79
$r \leq 2$	11.19	14.26	11.44	15.49
$r \leq 3$	3.68	3.84	0.019	3.84
Equation: LGDP <sub>MAN</sub> LFDI LSEXP and LSIMP				
$r = 0$	47.07*	27.58	73.49*	47.85
$r \leq 1$	17.69	21.13	26.42	29.79
$r \leq 2$	7.52	14.26	8.41	15.49
$r \leq 3$	0.87	3.84	0.76	3.84
Equation: LGDP <sub>SER</sub> LGDP <sub>MAN</sub> LFDI and LSEXP				
$r = 0$	3114*	27.58	60.20*	47.85
$r \leq 1$	18.34	21.13	31.02*	29.79
$r \leq 2$	11.31	14.26	12.76	15.49
$r \leq 3$	1.04	3.84	1.04	3.84

Notes  $r$  is the number of co-integration vectors under null hypothesis of no co-integration. We assume a linear deterministic trend. Both trace test and Max-Eigenvalue test indicate one co-integration vector at 5% level. The lag order in the VAR process is selected on the basis of AIC criteria. CV critical value

VAR into VECM, in which error correction terms are included. Having established evidence supporting the existence of a co-integrating long-run relationship among variables under consideration, a VECM is estimated and the results of the causality analysis are shown in Table 7. We have used the Akaike Information Criterion (AIC) to select the optimum lag length of the VECM.

The significance of the  $F$  statistics for the lagged values of independent variables in Eqs. (1)–(4) show that there exists a unidirectional short-run causality running from LGDP to LSEXP. In all other cases, we do not find any short-run causality between the variables. Most importantly, the error correction term, which represents the long-run relationship among the variables, is statistically significant in all equations except services imports. In other words, this suggests that there exists bi-directional long-run causality between total GDP, services export and FDI. Thus, we conclude that services export and FDI influenced the overall output in India and vice versa. This supports our hypothesis that both FDI and services export in India are growth enhancing in the long-run. Our results also support the hypothesis that there exists complementary relationship between services exports and FDI as the error correction term in Eqs. (2) and (4) is statistically significant.



**Table 7** Test for Granger-Causality using VECM approach

Dependent variable	F stat ( <i>p</i> value)			t stat ( <i>p</i> value)		
	$\sum_{j=1}^p \ln \Delta GDP_{t-j}$	$\sum_{j=1}^p \ln \Delta SEXP_{t-j}$	$\sum_{j=1}^p \ln \Delta SIMP_{t-j}$	$\sum_{j=1}^p \ln \Delta FDI_{t-j}$	Lagged ECM term	
<b>Causality between GDP and service export, import, and FDI</b>						
$\Delta \ln GDP$		1.56 (0.30)		0.66 (0.71)	2.11 (0.24)	-2.89* (0.01)
$\Delta \ln SEXP$	4.84* (0.02)			2.66 (0.16)	0.67 (0.69)	-2.02* (0.04)
$\Delta \ln SIMP$	0.87 (0.66)	1.24 (0.44)			0.91 (0.59)	-1.51 (0.13)
$\Delta \ln FDI$	1.37 (0.38)	1.76 (0.27)		0.77 (0.66)		-2.82* (0.01)
<b>Causality between Manufacturing GDP, service export, import, and FDI</b>						
$\Delta \ln GDP_{MAN}$		3.46 (0.11)		2.58 (0.18)	1.45 (0.34)	-6.25* (0.00)
$\Delta \ln SEXP$	1.07 (0.48)			2.05 (0.27)	1.65 (0.29)	-1.12 (0.38)
$\Delta \ln SIMP$	0.65 (0.71)	0.63 (0.74)			1.12 (0.46)	-0.33 (0.77)
$\Delta \ln FDI$	1.32 (0.39)	2.83 (0.13)		0.66 (0.71)		-1.88# (0.06)
<b>Causality between Service GDP and service export, import, and FDI</b>						
$\Delta \ln GDP_{SER}$		4.21* (0.03)		2.75 (0.14)	1.59 (0.31)	-3.12** (0.00)
$\Delta \ln SEXP$	5.16* (0.01)			0.44 (0.84)	3.43# (0.07)	-2.56* (0.02)
$\Delta \ln SIMP$	0.73 (0.72)	0.97 (0.53)			2.16 (0.23)	-1.21 (0.28)
$\Delta \ln FDI$	1.47 (0.33)	0.47 (0.79)		0.78 (0.70)		-2.34* (0.03)

**Table 7** continued

Dependent variable	F stat ( <i>p</i> value)			Lagged ECM term
	$\sum_{j=1}^p \ln \Delta GDP_{t-j}$	$\sum_{j=1}^p \ln \Delta SEXP_{t-j}$	$\sum_{j=1}^p \ln \Delta FDI_{t-j}$	
Causality between Service GDP and service export, Manufacturing GDP, and FDI				
$\Delta \ln GDP_{SER}$		1.40 (0.34)	1.34 (0.39)	2.78 (0.14)
$\Delta \ln SEXP$	4.12* (0.3)		1.49 (0.32)	0.73 (0.71)
$\Delta \ln GDP_{MAN}$	4.23* (0.03)	1.45 (0.34)		0.62 (0.74)
$\Delta \ln FDI$	2.03 (0.28)	1.25 (0.42)	2.06 (0.26)	

The lag length is selected on the basis of AIC criterion

Figures in parentheses are *p* values

\*\* Significance at 1% level, \* significance at 5% level and # significance at 10% level

Now, turning to the sector-specific growth impact of services trade and services FDI, first we have run the causality relationship in case of manufacturing GDP and the results are given in Table 7. In the case of manufacturing GDP, we do not find short-run causality. The long-run causality measured through error correction term is statistically significant in the case of manufacturing GDP. This implies that the long-run causality runs from FDI and services exports to manufacturing GDP. This result corroborates the findings of previous studies which argue in favor of positive impact of services FDI on manufacturing output. We also find the long-run causality from services trade and manufacturing GDP to FDI inflows. But we do not find the long-run causality from FDI and manufacturing GDP to services exports. This suggests that the spillover impact from the performance of manufacturing output on services exports is limited in the case of India.

Similarly, we also carried out causality between services trade and FDI with services GDP. The results indicate that there exists bi-directional causality among services GDP, service export and FDI as the error correction term is significant in each case at 5% level. This suggests that there is presence of feedback relationship between FDI, services exports and services output in India in the long-run. Furthermore, the causality result suggests that there exists complementary relationship between FDI and services export, as the error correction term is statistically significant in both the cases. It is important to note here that we find the same results in the case of total GDP also.

Now, turning to the hypothesis of cross-sector spillover effects, we run causality test between services GDP, manufacturing GDP, FDI and services trade. The results given in Table 7 suggest that there exists spillover effects from manufacturing GDP to services GDP and vice versa due to greater FDI inflows and services exports, reconfirming the findings of earlier studies. Nevertheless, we also find direct impact of FDI on services output, which nullifies the argument that services output is not affected by FDI due to its low absorbing capacity.

Overall, we find clear evidence of a feedback relationship among FDI, services exports, and services GDP (or total GDP) in India. Our results also indicate the presence of both short- and long-run bi-directional causality between services sector GDP and services exports. We also find complementary relationship between services exports and services FDI and the presence of spillover effects from manufacturing GDP to services GDP although services FDI has strong direct impact on both services and manufacturing GDP.

## 6 Conclusion and policy implications

This article has examined the causal relationships among inward FDI, GDP and services trade for India both at the aggregate and at the sectoral (manufacturing and services) levels. We applied co-integration and VECM time series techniques to test different hypotheses. Our co-integration test results suggest the presence of a long-run relationship among these variables at the aggregate and sectoral levels as well.

The presence of bi-directional causal relationship between FDI and economic output as well as between services exports and economic output is evident from VECM

causality. The feedback relationship is also evident between services export and FDI and no causal relationship between services imports and FDI. At the sectoral level, we find at least a unidirectional causality from FDI and services exports to both manufacturing and services outputs. We also find the presence of feedback relationship from services and manufacturing GDP to services FDI. Interestingly, we do not find any causality from GDP (total, manufacturing or services) and FDI to services imports.

To sum up, our results suggest three important findings. They are (i) services export and FDI influenced the overall and services output in India and vice versa, (ii) there exists complementary relationship between services exports and FDI in case of India and (iii) cross-sectoral spillover effects from manufacturing output to services output and vice versa are present in India which partially supports the findings of earlier studies.

The above findings have important policy implications for developing countries like India. Services exports have been one of the main sources of revenue for India to partially offset the huge trade deficit. Therefore, it is of utmost importance for the government to create conducive business climate to improve the existing production capacity and thus higher services exports. The government has recently outlined policies to improve the share of manufacturing output to total output up to 25% within the next 10 years. Our results show that promoting services exports and attracting FDI to services generate strong spillover effects on manufacturing output. Therefore, we suggest that along with other policy measures, the policy-maker should also focus on promoting the growth and export performance of the services sector.

**Acknowledgments** We are grateful to two referees of this paper for their valuable comments and suggestions.

## References

- Agrawal P (2005) Foreign direct investment in South Asia: Impact on economic growth and local investment. In: Graham EM (ed) *Multinationals and foreign investment in economic development*. Palgrave Macmillan, Basingstoke, pp 94–118
- Agrawal R, Shahani R (2005) Foreign investment in India: issues and implications for globalisation. In: Tisdell C (ed) *Globalisation and world economic policies: effects and policy responses of nations and their groupings*. Serials Publication, New Delhi, pp 644–658
- Alfaro L (2003). *Foreign Direct Investment and Growth: Does the Sector Matter?* Harvard Business School Working Paper, Harvard, USA
- Aykut D., Sayek S. (2007) The role of the sectoral composition of foreign direct investment on growth. In: Piscitello L, Santangelo GD (eds) *Do multinationals feed local development and growth?* Elsevier, Oxford, pp 35–62
- Balasubramanyam VN, Salisu M, Sapsford D (1996) Foreign direct investment and growth in EP and IS countries. *Econ J* 106:92–105
- Balasubramanyam VN, Salisu M, Sapsford D (1999) Foreign direct investment as an engine of growth. *J Int Trade Econ Dev* 8:27–40
- Banga R (2005) Critical issues in India's service led growth, Indian Council for Research on International Economic Relations, Working Paper No. 171
- Basu P, Chakraborty C, Reagle D (2003) Liberalization, FDI, and growth in developing countries: a panel cointegration approach. *Econ Inq* 41:510–516
- Baumol W (1985) Productivity Policy and the Service Sector. In: Inman R (ed) *Managing the service economy: Prospects and problems*. Cambridge University Press, Cambridge

- Bende-Nabendem A, Ford JL, Santoso B, Sen S (2003) The interaction between FDI, output and the spillover variables: Co-integration and VAR analysis for APEC, 1965–1999. *Appl Econ Lett* 10:165–172
- Bhagwati Jagdish N (1984) Splintering and disembodiment of services and developing nations. *World Econ* 7(2):133–143
- Bhat KS, Sundari TCU, Raj KD (2004) Causal nexus between foreign direct investment and economic growth in India. *Indian J Econ* 85:171–185
- Borenstein E, De Gregorio J, Lee J-W (1998) How does foreign direct investment affect economic growth? *J Int Econ* 45:115–135
- Bosworth B, Collins S (2007) Accounting for growth: comparing China and India. NBER Working Paper No. 12943
- Chakraborty C, Basu P (2002) Foreign direct investment and growth in India: A cointegration approach. *Appl Econ* 34(9):1061–1073
- Chakraborty C, Nunnenkamp P (2008) Economic reforms, FDI, and economic growth in India: A sector level analysis. *World Development* 36(7):1121–1192
- Dash RK, Parida PC (2011) Services trade and economic growth in India: an analysis in the post-reform period. *Int J Econ Bus Res* 4(3):326–345
- Deardorff AV (1985) Comparative advantage and international trade in investment services. In: Robert S (ed) *Trade and investment in services: Canada/US perspectives*. University of Toronto Press, Toronto, pp 39–71
- De Mello Jr (1999) Foreign direct investment-led growth: evidence from time series and panel data. *Oxford Econ Pap* 51:133–151
- De P, Raychaudhuri A (2008) Is India's services trade pro-poor? A simultaneous approach. Macao Regional Knowledge Hub, Working Paper No. 16
- Dickey D, Fuller W (1981) Likelihood ratio statistics for autoregressive time series with unit root. *Econometrica* 30:167–182
- Engle R, Granger C (1987) Co-integration and error correction: representation, estimation and testing. *Econometrica* 55:251–276
- Feng Y (2009) FDI in India and its economic effects on service industry. *Int J Trade Glob Mark* 2:179–193
- Fernandes M, Paunov C (2008) Foreign direct investment in services and manufacturing productivity growth: evidence from Chile. The World Bank, Policy Research Working Paper No. 4730
- Fillat-Castejón C, Francois J, Woerz J (2008) Cross-border trade and FDI in services. CEPR Discussion Paper No. 7074
- Francois J (1990) Producer services, scale and the division of labor. *Oxford Econ Pap* 42:715–729
- Francois J, Reinhart K (1996) The role of services in the structure of production and trade: stylized facts from cross-country analysis. *Asia Pac Econ Rev* 2:35–43
- Francois J, Hoekman B (2010) Services trade and policy. *J Econ Lit* 48(3):642–692
- Ghani E, Kharas H (2010) The service revolution in South Asia: an overview. In: Ghani E (ed) *The service revolution in South Asia*. Oxford University Press, New Delhi, pp 1–25
- Gholami R, Sang-Yong Tom L, Decimate A (2006) The causal relation between ICT and FDI. *World Econ* 29:43–62
- Gordon J, Gupta P (2004) Understanding India's services Revolution. IMF Working Paper No. 171
- Granger CWJ (1986) Developments in the study of co-integrated economic variables. *Oxf Bull Econ Stat* 48:213–228
- Grossman GM, Helpman E (1991) *Innovation and growth in the global economy*. MIT Press, Cambridge
- Hindley B, Smith A (1984) Comparative advantage and trade in services. *World Econ* 7(4):369–389
- Hoekman B, Mattoo A (2008) *Services trade and growth*. The World Bank, Policy Research Working Paper No. 4461
- International Monetary Fund (2006) *Asia rising: patterns of economic development and growth*. World Economic Outlook, Washington, DC
- Johansen S, Juselius K (1990) Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxf Bull Econ Stat* 52(2):169–210
- Kamalakanthan A, Laurenceson J (2005) How important is foreign capital to income growth in China and India? ABERU Discussion Paper No. 14. Asian Business and Economic Research Unit, Monash University, Melbourne. (<http://www.buseco.monash.edu.au/units/aberu/papers/1405Abby.pdf>)
- Kim JI, Kim JD (2000) Liberalization of trade in services and productivity growth in Korea. KIEP Working Paper No. 00-10

- Lennon C (2008) Trade in services: cross-border trade vs. commercial presence. Evidence of complementarity. Paris School of Economics working Paper No.2008-53
- Levine R (1997) Financial development and economic growth: views and agenda. *J Econ Lit* 35:688–726
- Lipsey RE (2001) Foreign direct investment and the operations of multinational firms: concepts, history, and data. NBER, Working Paper No. 8665
- Mattoo A, Rathindran R, Subramanian A (2006) Measuring services trade liberalization and its impact on economic growth: an illustration. *J Econ Integr* 21:64–98
- Markusen JR. (1989) Trade in producer services and in other specialized intermediate inputs. *Am Econ Rev* 79:85–95
- Melvin JR (1989) Trade in producer services: a Heckscher-Ohlin approach. *J Political Econ* 97(5):1180–1196
- Mirodout S (2006) The linkages between open services markets and technology transfer. OECD Trade Policy Working Paper No. 29
- Pradhan JP (2002) Foreign direct investment and economic growth in India: a production function analysis. *Indian J Econ* 82(327):582–586
- Rakshit M (2007) Services-led growth: the Indian experience. *Money Financ* 3:91–126
- Ramasamy B, Yeung M (2010) The determinants of foreign direct investment in services. *World Econ* 33(4):573–596
- Rebelo S (1991) Long-run policy analysis and long-run growth. *J Political Econ* 99:500–521
- Romer PM (1990) Endogenous technological change. *J Political Econ* 98:71–102
- Sahoo D, Mathiyazhagan MK (2003) Economic growth in India: does foreign direct investment inflow matter? *Singap Econ Rev* 48(2):151–171
- Sapir A, Winter C (1994) Services trade. In: Greenaway D, Winters L (eds) *Surveys in international trade*, Blackwell economic theory and the role of government in East Asian industrialization. Princeton University Press, Princeton
- Srivastava S (2006) The role of foreign direct investment in India's services exports: an empirical investigation. *Singap Econ Rev* 51:175–194
- UNCTAD (2004) *World investment report: the shift towards services*. United Nations, Geneva
- UNCTAD (2009) *World investment report*. United Nations, Geneva
- Welsum D (2003) Foreign direct investment and exports of services. Brikbeck College, London
- World Bank (2004) Measuring trade in services liberalisation and its impact on economic growth: an illustration. World Bank Group Working Paper. [http://econ.worldbank.org/files/2373\\_wps2655.pdf](http://econ.worldbank.org/files/2373_wps2655.pdf)
- World Development Indicators (2011) CD-Rom, The World Bank
- World Trade Organization (2004) The impact of Mode 4 on trade in goods and services, Staff Working Paper, ERSD-2004-07
- World Trade Organization (2010) *International trade statistics*, Geneva