

Service-led Catch-Up in the Indian Economy: Alternative Hypotheses on Tertiarization and the Leapfrogging Thesis

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The experience of India in economic catch-up is unique when compared to other countries. First, the catch-up process of India was not only service-led, but also accompanied by a decoupling between manufacturing and services. Second, productivity performance in the service sector was higher than in the manufacturing sector in terms of the level as well as growth rate. Finally, exports in IT services led the tertiarization of the Indian economy. From this perspective, the trajectory of the Indian catch-up can be characterized as "path-creating." Existing hypotheses on tertiarization do not fully account for such aspects of the uniqueness of the Indian experience.

The leapfrogging argument in Neo-Schumpeterian economics provides a more plausible explanation of the Indian experience. The ICT revolution and the shift from hardware systems to client-server systems have created new markets for the global services trade. This paradigm shift lowered the costs of entry, including fixed investments, for Indian IT service firms and helped close the experience and skill gaps quickly. The industry-specific characteristics of the IT services industry and the country-specific advantages of India further lowered the costs of entry. With steady strategic and organizational innovations, Indian IT service firms succeeded in securing competi-

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tive advantages in the global market.

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JEL Classification: O11, O14, O53, O19, O25

I. Introduction

The most remarkable aspect of economic growth in India since the 1990s is its strong performance in the service sector. This fact suggests that India is creating a new trajectory of economic growth and catch-up that is different from that of other East Asian countries, which are led by manufacturing sectors. Conventional hypotheses on “de-industrialization” or “tertiarization,” such as the demand-bias hypothesis (Fisher 1939; Clark 1940; Fuchs 1968; Schettkat and Yocarini 2006), the productivity-bias hypothesis (Baumol 1967; Summers 1985), and the demand-for-services-as-intermediate-goods hypothesis (Francois and Reinert, 1996; Pilat and Wölfl 2005; ten RAA and Wolff 2006) might not be satisfactory explanations for the Indian experience. These hypotheses were based on the experiences of advanced industrialized countries that shared a common pattern in which manufacturing growth preceded that of the service sector. By contrast, in the Indian economy, the service sector became quite large without undergoing a historical stage where the manufacturing sector was dominant.

Several researchers attribute the service-led success of India to the comparative advantage of the economy. In this approach, the economic liberalization during the 1990s is considered having played a crucial role (Arora *et al.* 2001; Sridharan 2002). Nevertheless, this approach cannot explain why other developing countries with cheap labor failed to achieve similar accomplishments in their service sectors and why other sectors in India that could benefit from cheap labor failed to succeed.

Unlike existing studies, this paper attempts to explain the service-led economic growth of India using the leapfrogging argument proposed by Neo-Schumpeterians. At the core of this argument is the possibility of lower entry barriers faced by latecomer countries at the very early stage of a particular technological paradigm (Perez and Soete 1988). A latecomer country that adopts a new technological paradigm during the transition period has a possibility of shortening the time necessary for

catch-up or even to create a new path for catch-up, instead of simply following the paths that were taken by the firms in leader countries (Lee and Lim 2001). This leapfrogging argument has been applied more to explain firm- or industry-level technological catch-up happening in India and might provide a useful explanation to the country-level catch-up.

This paper is organized as followings. Section II revisits the existing hypotheses on de-industrialization or tertiarization. Section III discusses the major characteristics of the Indian experience of tertiarization from an international perspective. From those comparisons, the existing hypotheses on tertiarization will be shown to be unable to explain the Indian experience and that the Indian catch-up model exhibits a quite idiosyncratic particularity compared to other successful catch-up countries. Section IV sheds light on the development of the Indian IT service industry from the perspective of the technological leapfrogging argument. Section V is the conclusion.

II. Conventional Hypotheses on Tertiarization

The conventional hypotheses on tertiarization, a process in which the industrial structure moves from manufacturing to service industries, fall broadly into three categories. The first hypothesis is often referred to as the demand-bias hypothesis (hereafter, DB). According to this hypothesis, the income elasticity of demands for services is relatively higher than manufactured goods, such that the share of services in the total demand increases as per capita income increases (Fisher 1939; Clark 1940; Fuchs 1968; Schettkat and Yocarini 2006). The second hypothesis is the productivity-push hypothesis (hereafter, PP), in which tertiarization is driven by the relatively higher productivity growth in manufacturing compared to the service sector. That is to say, as the service industries are in general more labor intensive than manufacturing, productivity grows more slowly compared to manufacturing due to the strong diminishing returns of the former sector. From this perspective, tertiarization occurs because workers, who become redundant due to the strong productivity growth in the manufacturing sector, move progressively towards service industries with stronger labor demands (Baumol 1967; Summers 1985). The third hypothesis, namely the services-as-intermediary-goods hypothesis (hereafter, SI), privileges the intermediate, rather than the final, demands for services when explaining the

relatively stronger demand growth for services. As the manufacturing firms pursue stronger production specialization for higher profitability and risk diversion, these firms tend to rely increasingly on intermediary service inputs, in particular, through outsourcing (Francois and Reinert 1996, Pilat and Wölfl 2005; ten RAA and Wolff 2006).

Although these three hypotheses are the most widely accepted in the tertiarization literature, they only have limited justification when applied to the interpretation of the Indian experience.

First, the basic premise of these hypotheses is that a certain period of manufacturing development always precedes service sector development. In particular, both PP and SI assume that the dynamics of manufacturing principally drives the expansion of the service sector. The role of the manufacturing sector is relatively equivocal in DB. However, this hypothesis is also based on the strong assumption that demand growth for manufacturing goods is relatively stronger at lower income levels and at higher income levels for services, as implied by the Engel Curve.

Second, PP assumes that manufacturing tends to have higher productivity growth and to be more scale-intensive than services. However, the assumption that the productivity growth of services is always slower than in manufacturing is strong. The observed relatively weak productivity growth in most OECD countries is in a great part due to the well-known difficulties in measuring service productivity. According to Griliches (1992), "because of this lack of data, a number of service industries series are deflated by makeshift deflators, and real output is assumed to grow proportionally to some measure of input and to lead to no observed productivity growth by assumption." Furthermore, studies conclude that in a number of US service industries, such as distributional and IT services, productivity performance was higher than in manufacturing (Stiroh 2002; Bailey and Solow 2001; F.Buera and J.P. Kaboski 2012). The later part of this paper will show that productivity growth in services was stronger than that in manufacturing during the post-takeoff period in the case of India.

Finally, DB is mostly appropriate for closed economies. Even though the demand for services grows more quickly in the domestic market, it can be compensated by the strong demand growth for manufactured goods abroad. In this case, no tertiarization could take place either in terms of value-added or in terms of employment. In the tertiarization process, SI tends to be limited to the one-country perspective in most cases. Traditionally, services are often considered as non-tradable in the economic literature because of the very high transaction costs, include-

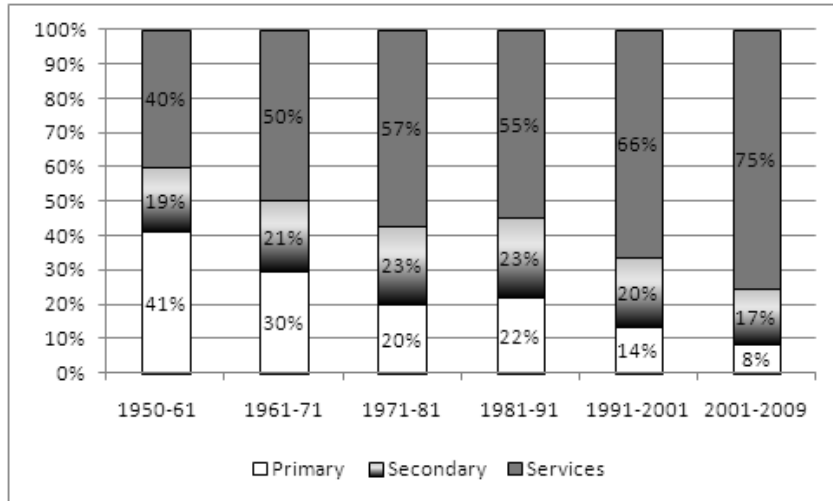
ing transportation expenses that are associated with services traded across borders. However, the recent development of IT technology, which has reduced the transaction cost of traded services, has increased the portion of such services in the world trade. Under such circumstances, the increased demand for services resulting from deeper specialization in manufacturing production may not necessarily lead to the development of the domestic service industry. This change created an opportunity for a low-income developing country with abundant labor to develop service industries without any precedent manufacturing-led industrialization.

While the hypotheses mentioned above focused on the case of developed countries with advanced industrial structure, several studies have explained cases of tertiarization without manufacturing development in some developing countries. In particular, Dasgupta and Singh (2005; 2006) attributed this phenomenon to jobless growth in the manufacturing sector. According to this study, in some countries, tertiarization without manufacturing development occurs because redundant workers in rural areas are absorbed by the informal urban service sector. This effect is the result of the inability of the formal manufacturing sector to create job opportunities that are sufficiently strong. Although this interpretation can be applied to some low-income countries, this finding does not fit with the Indian case, where productivity growth in the service sector has been moving faster than in manufacturing. Particularly, this view cannot account for the rapid growth of relatively high value-added service industries, including computer services, telecommunications, and other business services, in India.

III. Characteristics of Tertiarization in India

A. Service-led growth

In the Indian economy, the contribution of services to economic growth was very strong throughout all the periods under consideration (Figure 1). This reflects partly the fact that the share of the service sector in India has been always large since the early period. In particular, the service sector accounted for 75 percent of total growth during the period from 2001 to 2009, during which the average GDP growth rate was exceptionally high at 7.56 percent. The contribution of the service sector to economic growth became increasingly strong since the 1990's. The contribution of secondary sectors increased slowly until the 1980s and then declined in the 1990s. Due to the rapid growth of the service sector, the



Note: a) The secondary sector includes industries, such as mining, manufacturing, electricity, gas, and water. The service sector includes the construction as well as the typical service industries.

b) The contribution of sector A is calculated as $\left(\frac{\text{Real value-added for sector A in the compared year} - \text{Real value-added for sector A in the reference year}}{\text{Real GDP for the entire economy in the compared year} - \text{Real GDP for the entire economy in the reference year}} \right) \times 100$ (%)

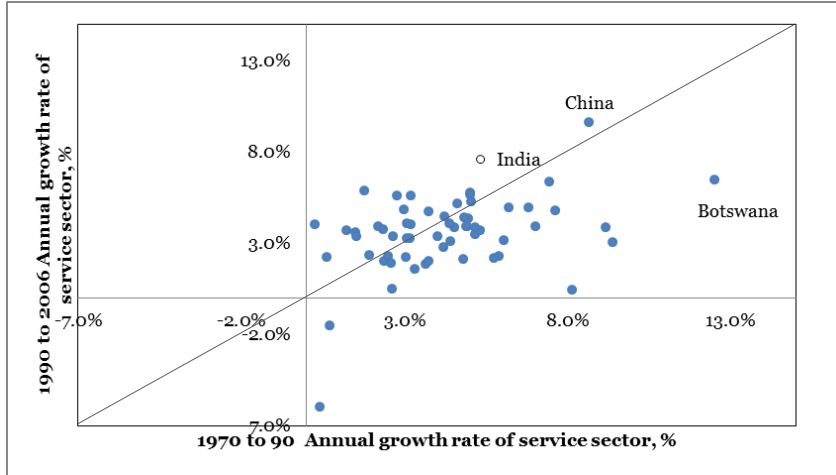
Source: Reserve Bank of India, *Handbook of Statistics on Indian Economy*, www.rbi.org.in

FIGURE 1

SECTORAL CONTRIBUTION TO THE GDP OF INDIA, 1950 TO 2009

contribution of primary sectors declined from 41 percent in the 1950s to a mere 8 percent during the 2000s.

India is one of the economies that have experienced a rapid economic growth since the 1990s. Although the annual rate of growth of the Indian economy was only about 4.2 percent during the period from 1970 to 1990, it reached about 6.0 percent during the period from 1990 to 2006. Thus, the annual rate of per capita GDP growth more than doubled during the same period from 1.9 percent to 4.3 percent. The accelerated growth of the Indian economy since the 1990s is largely attributable to the rapid growth of the service sector. A cross-country comparison reveals that the Indian service sector has grown very rapidly on average and the growth has accelerated after 1990 (Figure 2).



Note: World Bank data do not classify construction under services, such that the growth rates presented in this figure is slightly different from the statistics provided by the Reserve Bank of India.

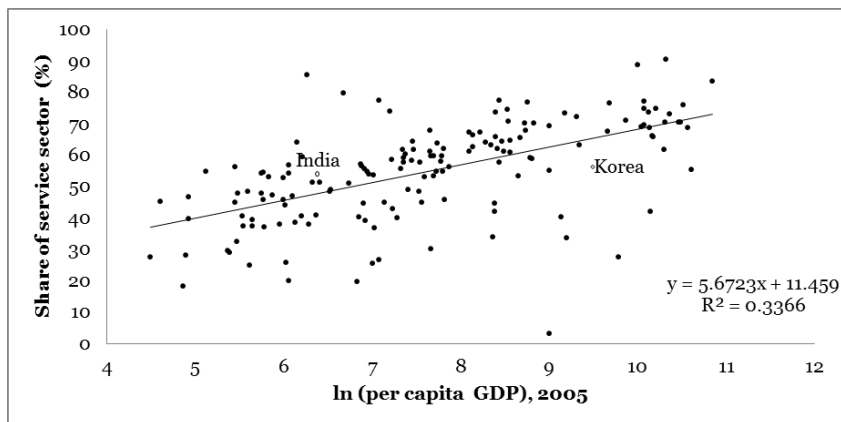
Source: World Bank, *World Development Indicators 2008*.

FIGURE 2

CHANGES IN ANNUAL RATE OF GROWTH OF SERVICE SECTOR: A CROSS-COUNTRY COMPARISON

However, unlike the widely held belief, the share of the service sector in the Indian economy is not exceptionally high relative to its income level (Figure 3). Some studies have already pointed out that it is not unusual that a developing country has a large service sector in its early stage of industrialization and that this sector grows relatively quickly as well (Cho 2008; Dasgupta and Singh 2005; 2006). In other words, the large share of service sector is a phenomenon that is frequently found even among the developing countries with slow economic growth.

The contribution of the service sector to economic growth is the highest in the sub-sector of trade, hotel, transportation and communications, which added up to 36.5 percent from 2001 to 2009 (Table 1). Finance, insurance, real estate, and business services made the second strongest contribution, and the lowest contribution was construction at 9.1 percent. The contribution of the first two sub-sectors is not only high, but also has increased rapidly throughout the period under consideration, which is a natural consequence of rapid growth. By contrast, in the case of community, social and personal services, despite its signi-



Note: World Bank data do not classify construction as services. Thus, the growth rates presented in this figure are slightly different from the statistics provided by the Reserve Bank of India. \ln (per capita GDP) is a natural logarithm of per capita GDP and is measured in 2000 US dollars.

Source: World Bank, *World Development Indicators 2008*.

FIGURE 3

INCOME LEVEL AND SHARE OF SERVICE SECTOR: A CROSS-COUNTRY COMPARISON (2005)

ficant contribution to growth, the annual growth rate is remarkably lower than the former two sub-sectors.

If we examine a more detailed industrial classification, the growth accelerated in the 2000s for communications, construction, real estate, business services, railroad, storage, and transportation, compared to 1993 to 2000. However, finance, hotels, and restaurants experienced a slowdown in the 2000s (Figure 4).

Telecommunications showed the most rapid growth among the Indian service industries. This industry is important for its growth and role in the infrastructure of the Indian economy. Moreover, this industry maintained the status of the economy as a global IT supplier. The drastic growth is triggered not only by exports, but also by increasing domestic demand. In particular, mobile telecommunication services have expanded rapidly since the liberalization of the telecommunication industry in 1992. During the early 2000s, the number of mobile subscribers increased at an average annual rate of 85 percent, and the number of subscribers to privately-owned mobile providers increased at an average

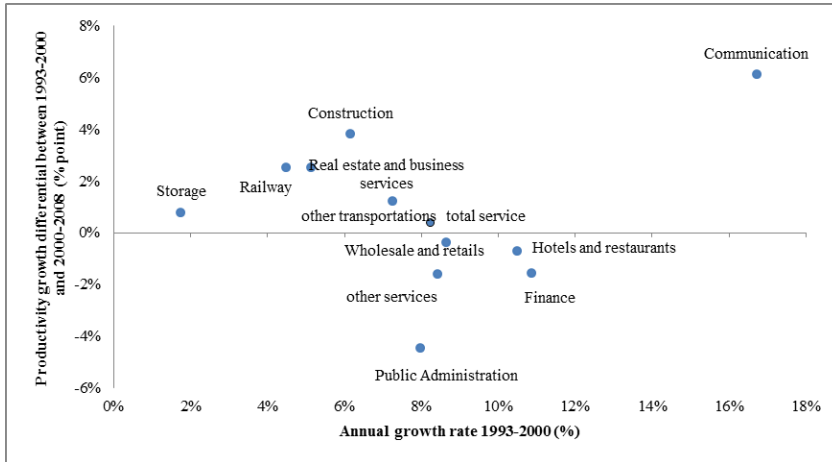
TABLE 1
CONTRIBUTION OF SERVICE SUB-SECTORS TO GDP GROWTH
(1950 TO 2009)

	Construc- tion	Trade, Hotel, Transport and Communications	Finance, Insurance, Real Estate, and Business Services	Community, Social, and Personal Services
Contribution to economic growth (%)				
1950–1961	8.0%	16.7%	5.6%	9.8%
1961–1971	9.0%	18.6%	6.4%	15.8%
1971–1981	6.5%	25.1%	9.4%	16.1%
1981–1991	5.4%	19.6%	15.1%	14.8%
1991–2001	5.4%	27.8%	16.4%	16.6%
2001–2009	9.1%	36.5%	17.0%	12.6%
Annual growth rate (%)				
1950–1961	6.1%	5.2%	2.9%	3.6%
1961–1971	5.4%	4.9%	3.4%	5.2%
1971–1981	3.0%	4.7%	4.0%	3.9%
1981–1991	4.5%	5.7%	8.7%	5.7%
1991–2001	4.9%	7.4%	7.5%	6.3%
2001–2009	10.1%	10.4%	8.8%	6.4%

Source: Reserve Bank of India, *Handbook of Statistics on Indian Economy*,
www.rbi.org.in

annual rate of 200 percent (Walter *et al.* 2007). As a result, the share of private service providers relative to the total number of providers increased sharply from 5 percent in 1999 to 79 percent in 2009 (Indian Ministry of Finance 2009). In addition, the Indian mobile telecommunication market has become the second largest market after China. The number of internet users increased by approximately 10 times between 2000 and 2005, and reached almost 56 million in 2005, whereas the number of broadband subscribers was only 0.75 million (Walter *et al.* 2007). However, the number of broadband subscribers has steeply increased since then, reaching almost 5.69 million in 2009.¹

¹ Behind the astonishing growth of Indian telecommunication industry are two sets of policy reforms that played very important roles. On the one hand, during the late 1980s, the establishment of a public laboratory, C-DOT, made the creation of state-of-the-art telecom technologies that were suited to Indian conditions possible, and domestic private sector enterprises were allowed to participate in manufacturing telecom equipment. On the other hand, the New Economic Policy



Note: The 1993-1994 and 1999-2000 constant prices were applied for 1993-2000 and 2000-2008, respectively.

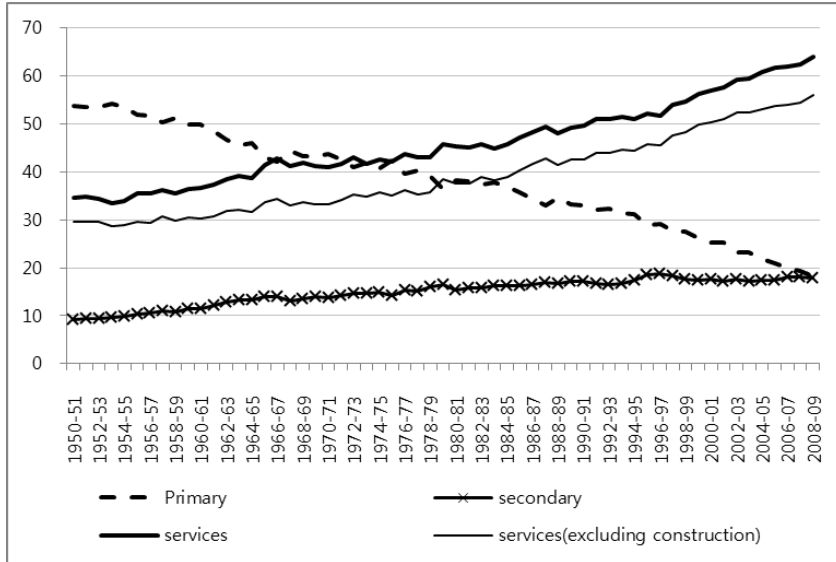
Source: Ministry of Statistics and Programme Implementation, National Account Statistics, 2004 and 2009.

FIGURE 4

CHANGES IN ANNUAL GROWTH RATE OF THE DETAILED SERVICE INDUSTRIES

Although Figure 4 is unclear about the fact, IT services became the driving industry in the economy. The average annual rate of growth of business services was 19.05 percent from 1991 to 2001, and 15.98 percent from 2001 to 2008. Computer-related services grew at an average annual rate of 25.0 percent from 2000 to 2008 (Joseph *et al.* 2009). The growth of Indian IT services was supported by the strong growth of global demand for IT services and software as well as by the rapid diffusion of global business process outsourcing among the large companies in advanced economies. As advanced economies faced a severe shortage of IT service providers, which was triggered by the exponent-

announced in 1991 and the National Telecom Policy in 1994 prompted wider participation of private providers in both fixed and mobile wireless services. The policy reforms in the early 1990s paved a way to improving the penetration of telephone services and the accelerated introduction of new telecommunication services. However, the reforms had drastic effects on trade balance as the private sector nudged into the market for fixed lines and for wireless technologies, and thus, the manufacturing of telecom equipments became, by consequence, increasingly dependent on imports and FDI (Lee *et al.* 2012; Noll and Wallsten 2013).



Note: The secondary sector includes industries, such as mining, manufacturing, electricity, gas, and water. The service sector includes construction as well as typical service industries.

Source: Reserve Bank of India, *Handbook of Statistics on Indian Economy*, www.rbi.org.in

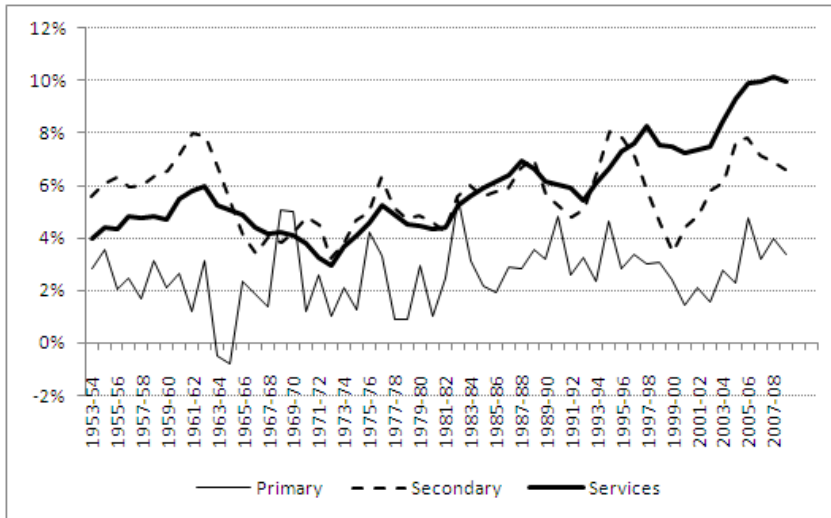
FIGURE 5

SECTOR SHARES OF THE INDIAN ECONOMY, 1950 TO 2009 (%)

ially growing demand for IT services to cope with the Y2K issue in the late 1990s, Indian providers grew rapidly by taking full advantage of the reduction in the costs related to digitalization, transmission, and processing (Friedman 2005).

B. Decoupling of growth between Manufacturing and Services

As discussed above, the service sector led the economic growth of India. However, a feature of the Indian economic growth is the occurrence of tertiarization without a historical stage where the manufacturing sector dominated. Since its early days, the value-added share of the service sector is growing rapidly in India (Figure 5). From 1950 to 1951, just before the first five-year plan was launched, primary, secondary, and service sectors accounted for 55.3 percent, 10.6 percent, and 34.1 percent, respectively, of the GDP. In fact, the share of the service sector



Note: The secondary sector includes industries, such as mining, manufacturing, electricity, gas, and water. The service sector includes construction as well as typical service industries.

Source: Reserve Bank of India, *Handbook of Statistics on Indian Economy*, www.rbi.org.in

FIGURE 6

TREND OF GROWTH RATES BY SECTOR IN INDIA: FIVE-YEAR MOVING AVERAGE, 1951 TO 2009 (%)

was already substantial during the liberation of the country because the role of India as a British colony had been focused on trade, transportation, and personal services. By 2008 to 2009, the share of primary sectors has declined to 17.0 percent, whereas that of the service sector has increased to 64.5 percent. On the contrary, the share of the secondary sector was only 18.5 percent in this year, rising only by 8 percentage points compared to 1950 to 1951.²

The share of the service sector grew faster in the 1990s than in prior decades. While the share increased only by 14.7 percentage points during the four decades from 1950 to 1990, it increased by 15.7 percentage points after only 18 years from 1990 to 2008. By contrast, secondary sectors grew slowly and steadily in the first period, but became stagnant

² This share of secondary sector may have been under estimated. A referee observed that construction is not considered part of services but of secondary sector.

TABLE 2
CORRELATION COEFFICIENT OF GROWTH RATES FOR SECONDARY AND
SERVICE SECTORS

	1951– 1970	1970– 1990	1990– 2009
Average annual growth rate of secondary sector (A)	5.8%	5.2%	5.9%
Average annual growth rate of service sector (B)	4.6%	5.0%	7.7%
Correlation coefficient between A and B	0.587	0.553	0.386

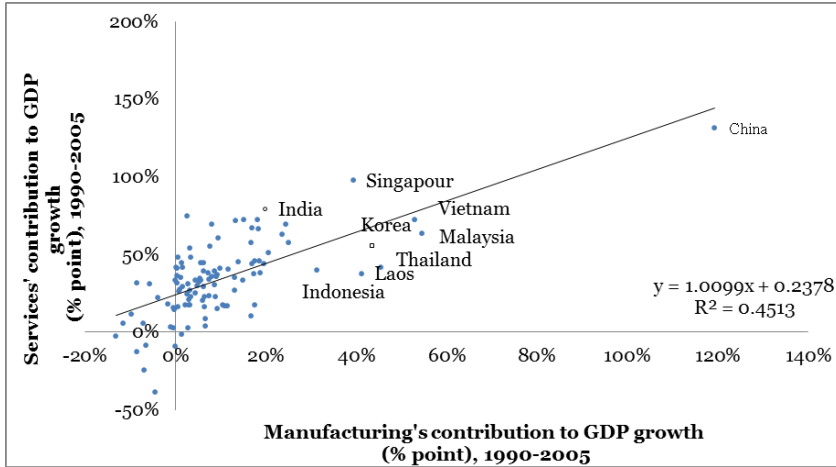
Note: The primary industry includes agriculture and related industries. The secondary industry includes mining, manufacturing, electricity, gas, and water. The tertiary industry includes other industries including construction.

Source: Reserve Bank of India, *Handbook of Statistics on Indian Economy*, www.rbi.org

in the second period. Therefore, in the second period, the reduction in the share of primary sectors was completely compensated by the expansion of the service sector. In this respect, we can safely state that the “tertiarization” without manufacturing development began from the early 1990s.

The decoupling of growth between secondary and service sectors becomes clearer when their growth rates are compared. Figure 6 shows that the fluctuations in the productivity growth of the two sectors went hand in hand until the early-1990s. However, since the mid-1990s, their trends became completely different from each other. During 1951 to 1970 and 1970 to 1990, the average annual growth rates of secondary sectors were 5.8 percent and 5.2 percent, respectively, and were higher than those for the service sector (4.6 percent and 5.0 percent, respectively). However, the trend was completely reversed during 1990 to 2009. The service sector grew by 7.7 percent in the annual average, whereas the corresponding figure for the secondary sector was only 5.9 percent. Furthermore, the correlation coefficient between the growth for secondary sectors and for the service sector from 1990 to 2009 is noticeably lower than those for the two prior periods (Table 2).

Figure 7 shows the contribution of the manufacturing and service sectors to economic growth for different countries from 1990 to 2005. India exhibited a distinct growth pattern compared to those of East Asian NIEs. For East Asian NIEs, manufacturing was the leading sector of economic growth. In the case of Singapore and China, the contribution of the service sector was very strong, and manufacturing grew rapidly



Note: The contribution of sector A is calculated as ((Real value-added for sector A in the compared year-Real value-added for sector A in the reference year)/(Real GDP for the entire economy in the compared year-Real GDP for the entire economy in the reference year)) \times 100 (%)

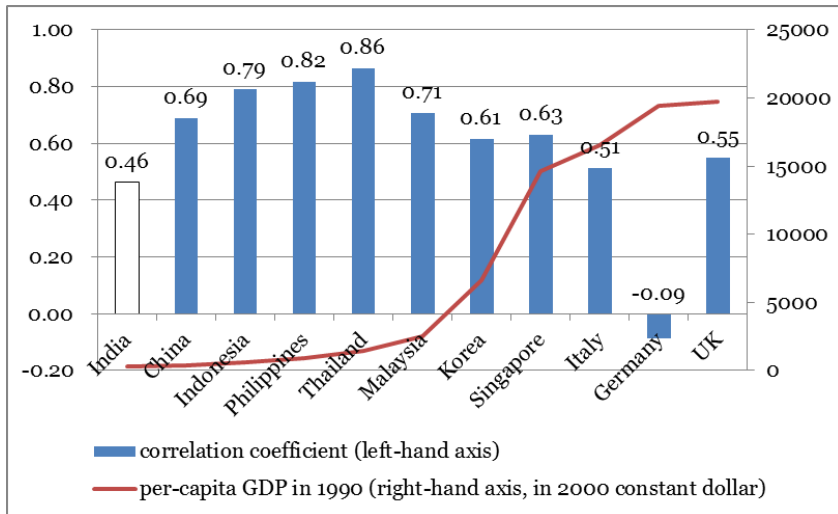
Source: World Bank, *World Development Indicators 2008*.

FIGURE 7

CONTRIBUTION TO GROWTH OF MANUFACTURING AND SERVICE SECTORS,
1990 TO 2005

as well. By contrast, in India, the contribution of manufacturing to growth was very small, whereas that of service sector was substantial. Except for Singapore and China, the contribution of the service sector to economic growth in India was the biggest in the world.

The weak correlation between the growth rate of manufacturing and services distinguishes the pattern of Indian economic growth from that of other East Asian NIEs. Figure 8 shows that although China, Indonesia, Philippines, and Thailand started industrialization relatively later, the correlation remained high throughout their industrialization. In the cases of South Korea and Singapore, where the tertiarization process already began during industrial maturation, the correlation was weaker and was similar to that of developed countries. For India, of which the per capita income was the lowest among the other countries, the correlation was only 0.46, which is similar to the figures of Italy and the UK.



Source: World Bank, *World Development Indicators 2008*.

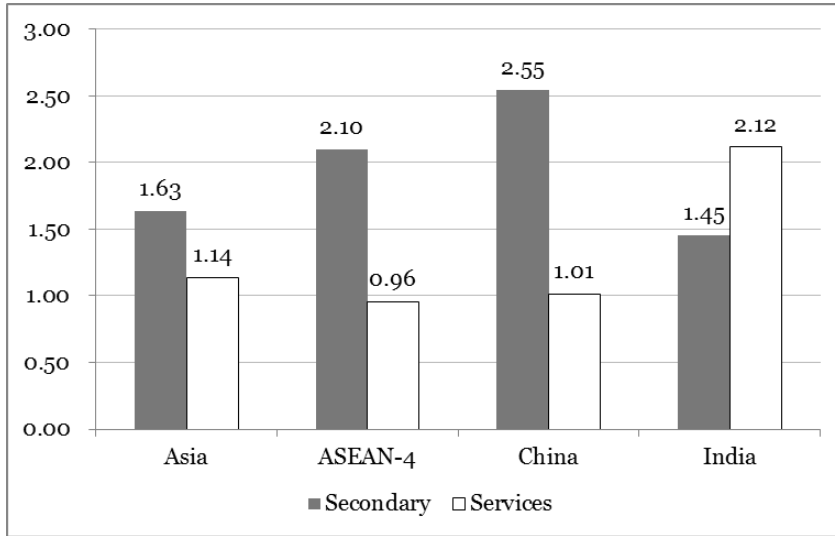
FIGURE 8

CORRELATIONS BETWEEN GROWTH RATES OF MANUFACTURING AND SERVICES: SELECTED COUNTRIES

C. Higher Productivity growth in the Service Sector than in Manufacturing

The rapid growth of the service sector in India is driven by its strong productivity performance, which in turn prompted a massive inflow of workers into the sector because of higher wages. This pattern differs from other developing countries, where the expansion of the service sector did not accompany significant improvements in productivity.

One of the remarkable particularities of Indian tertiarization lies not only in the level of labor productivity, but also in its higher rate of growth in the service sector than in the other sectors. Figure 9 shows that the labor productivity level of the service sector is more than twice as high as that of the entire economy. In particular, when compared to the ASEAN-4 (Indonesia, Malaysia, Philippines, and Thailand) or China, of which the level of economic development is similar to India, the difference is more apparent. In the case of China and ASEAN-4 countries, the labor productivity level of the service sector remains as high as the average of the entire economy, but that of the secondary sectors is exceptionally high. In the case of India, the labor productivity level is

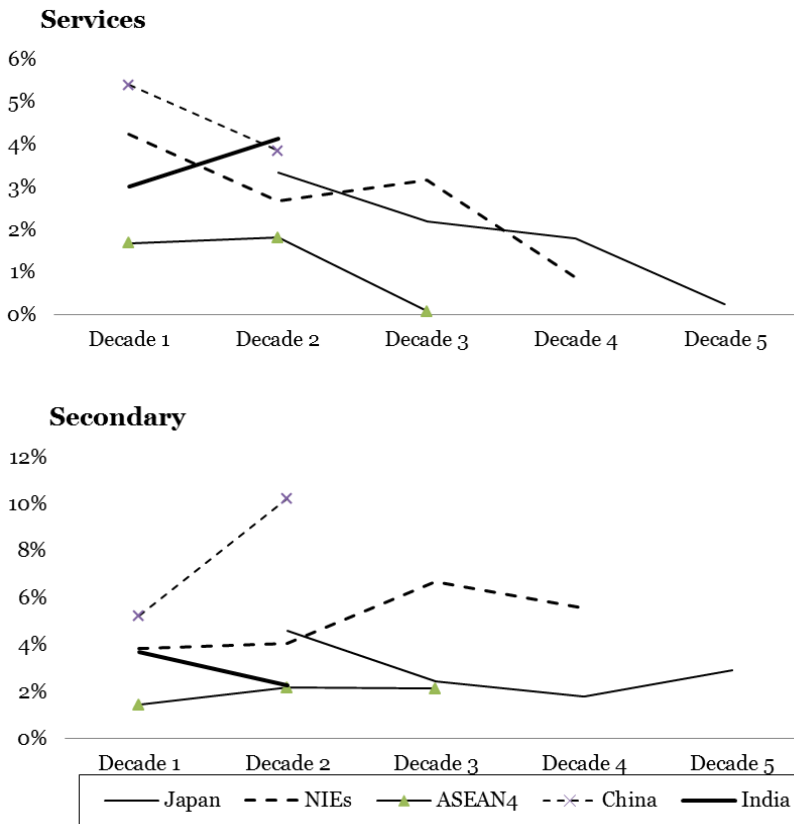


Note: ASEAN-4 refers to Indonesia, Malaysia, Philippines, and Thailand. IMF (2006) used the most recent data available at the time of the publication. Source: Calculated by author from IMF (2006).

FIGURE 9
RELATIVE LEVEL OF LABOR PRODUCTIVITY BY SECTOR
(WHOLE ECONOMY = 1)

higher in the service sector than in manufacturing. In addition, the relative productivity level of the service sector (as measured in putting that of the whole economy as 1) is higher than that of other countries. On the contrary, the relative productivity of manufacturing is relatively low in India.

In India, the labor productivity of the service sector grew more quickly than that of other sectors. Jeong and Park (2009) reported that the average annual rates of labor productivity growth for primary and secondary sectors were only 1.7 percent and 2 percent, respectively, from 1972 to 2002, whereas that of the service sector was as high as 2.9 percent. The IMF (2006) compared the growth of sectoral labor productivity for a number of Asian economies from their take-off to recent years (to 1996 if the country experienced the Asian financial crisis in 1997). The report showed that, in India, unlike the general trend, the service sector experienced the most rapid productivity growth. The annual rate of productivity growth in the service sector was 3.71



Note: a) ASEAN4 refers to Indonesia, Malaysia, Philippines, and Thailand. NIEs include South Korea and Singapore, for which relevant data are available.

b) It is assumed that Japan took off in 1955, NIEs countries in 1967, ASEAN-4 countries in 1973, China in 1979, and India in 1982.

Source: IMF (2006).

FIGURE 10

PATTERNS OF PRODUCTIVITY GROWTH BY SECTOR FOR SELECTED ASIAN NIEs

percent during 1980 to 2004, whereas those in the primary and secondary sectors were only 2.05 percent and 2.98 percent, respectively.³

³ Notably, the estimates of labor productivity in the Indian service sector reported here might overstate its real level and growth rate because the wages and salaries are indexed to CPI in the Indian organized service sector. This limit is

A more interesting feature of the Indian service sector is that its productivity growth accelerated after the economy took off. Figure 10 shows that in cases of first-generation East Asian NIEs and China, labor productivity growth in the secondary sector accelerated just after the take-off period, whereas, the growth in the service sectors slowed down. Thus, the secondary sector was the engine of productivity catch-up, and the role of the service sector was relatively insignificant in most Asian countries. India shows the exact opposite pattern in which the average annual rate of productivity growth in the service sector increased and reached over 4 percent, whereas that of the secondary sector slowed down to only 2.3 percent.

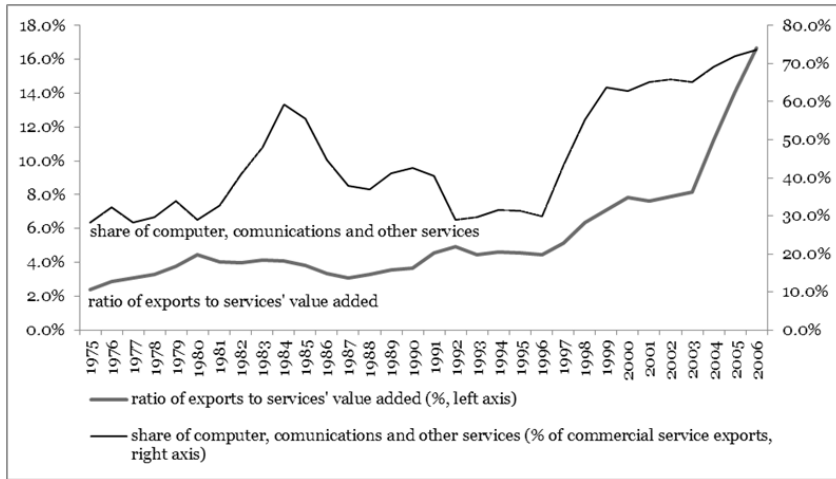
D. Export-led tertiarization

Exports played the most important role in the growth of the Indian service sector. In particular, the role of global outsourcing was outstanding. Figure 11 shows that the share of exports in services' value-added in India increased by more than four times, from 4.5 percent in the mid-1990s to 16.6 percent in 2006. In particular, the exports of ICT-related services grew rapidly than that of other types of commercial services in recent years. According to statistics from the World Bank, the share of "computer, communications, and other services" in commercial service exports increased from 30 percent in the mid-1990s to 74 percent in 2006.

A series of liberalization policies adopted during the 1990s provided crucial momentum in making service exports the engine of Indian economic growth. In many aspects, 1991 can be considered as the turning point in the Indian economy. Based on critical assessments of unstable fiscal policies in the 1980s, which led to the 1990 trade-balance crisis, the dominant view among Indian policy makers shifted in favor of privatization, liberalization, and globalization. They moved away from control-and-order-based protectionism. This shift in economic policies was combined with strong global demand for IT services, and the Indian economy started to be more closely integrated to the global market.⁴

related to the more generally cited difficulties in measuring the productivity of services, as indicated by Griliches (1992). However, a common finding in recent studies using more rigorous methods shows that the productivity performance of the service sector is higher than that of manufacturing in India (Bosworth *et al.* 2007; Bosworth and Maertens 2010; Eichengreen and Gupta 2010; Dougherty *et al.* 2009).

⁴Note that, due to the service-led economic catching-up and the export-led



Source: World Bank, *World Development Indicators* 2008.

FIGURE 11

ROLE OF EXPORTS IN THE GROWTH OF THE SERVICE SECTOR IN INDIA

Therefore, India emerged as one of the major destination countries for global service outsourcing (Table 3).⁵ In 2006, India was the 11th largest destination country for service outsourcing and exported about 510 billion dollars. Its ranking has rapidly climbed from 17th place in 2001. When business services were excluded and only telecommunications and computer services were considered, India was the 4th largest destination country.

Table 3 shows that, except for China and India, the largest destination countries for service outsourcing are the ones with relatively high-income levels. In particular, among the East Asian NIEs, only Hong Kong, Singapore, and South Korea have high rankings. South Korea was ranked 16th in 2001 but declined to 21st in 2006. When taking only

tertiarization, the growth of the service sector may have had no significant contribution to the rest of the Indian economy. Furthermore, due to the high capital-intensity of the telecommunication and IT services, the rising value-added share of the service sector did not translate into a similar change in its employment share. By consequence, some studies characterized Indian service-led growth as “jobless growth” (Banga 2005; Bothworth and Maertens 2010).

⁵ Here, in following the definitions proposed by Amiti and Wei (2004), we used export and import data of communications, computer, and information services as well as other business services as proxies for service outsourcing.

TABLE 3

RANKING OF THE LARGEST DESTINATION COUNTRIES OF GLOBAL SERVICES
OUTSOURCING, 2001 TO 2006 (IN MILLION US DOLLARS)

Ranking	2001		2006			
	Country	Total outsourcing	Country	Total outsourcing	Country	ICT services
1	Germany	97,580	Germany	276,436	Ireland	82,226
2	UK*	74,297	Netherlands	161,369	Germany	53,535
3	USA	62,309	Ireland	141,114	Netherlands	32,751
4	Netherlands	58,177	Italy	133,711	India	31,150
5	France	56,475	France	125,115	France	21,836
6	Italy	56,390	Japan	102,297	Belgium	19,137
7	Japan	47,610	Belgium	86,758	Sweden	18,724
8	Sweden	34,773	USA	86,252	USA	17,953
9	Hong Kong	26,448	Sweden	85,182	Italy	15,840
10	Austria	24,114	Singapore	60,918	Luxembourg	13,919
11	Canada	23,387	India	51,066	Canada	11,950
12	Singapore	20,333	Austria	44,527	Denmark	7,375
13	Ireland	16,033	Norway	42,305	Norway	7,036
14	Denmark	12,621	Hong Kong	41,240	Finland	6,467
15	Spain	12,383	Canada	39,432	Romania	6,214
16	Korea	11,936	Denmark	35,467	Spain	5,412
17	India	10,855	China	32,669	Czech Rep.	4,600
18	China	9,180	Luxemburg	28,848	Japan	4,255
19	Norway	7,313	Spain	27,261	Singapore	3,848
20	Israel*	7,164	Finland	26,871	China	3,696
21	Australia	5,742	Korea	19,723	Kuwait	3,397

Note: Data for UK and Israel in 2006 were not available.

Source: UN, United Nations Service Trade Statistics Database.

communication and computer services into account, South Korea ranked 30th in 2006.

In summary, the growth of the service sector in India reveals its unique characteristics compared to other economies including the East Asian NIEs. First, its contribution to GDP has been substantial due to its large share and high growth rate. Second, in terms of sectoral growth, the sector expanded without any significant manufacturing development. Third, its performance in labor productivity was higher than in manufacturing, in terms of its level and growth rate. Finally, exports have principally led its growth.

Considering these various characteristics together, existing hypotheses

on tertiarization can hardly explain the Indian experience. As discussed in Section II, DB and PP presumed that the manufacturing sector developed prior to the service sector, and that the productivity growth of the former is faster than that of the latter. At least within a closed-economy context, SI was not a relevant explanation for the Indian experience either because the development of the service sector was driven by strong foreign demand. However, from an open-economy perspective, SI provides a plausible explanation. With new developments in ICT, services became increasingly tradable, and huge demand was created for intermediary service inputs in the global market. This newly-emerged international link allowed the Indian economy to expand its service sector without manufacturing development.

The next section explains why India, unlike other developing countries, was capable of successfully reacting to such increases in demand and why its growth was concentrated in telecommunications and computer-related services.

IV. Leapfrogging in the IT Service Industry of India

The Indian economy directly and successfully entered the service sector without manufacturing development. In this section, the case of IT services, which is one of the most dynamic industries in the Indian service sector, will be highlighted to develop an alternative explanation of the Indian tertiarization process. This explanation will be principally based on the technological leapfrogging argument from Neo-Schumpeterian economics.

A. Technological leapfrogging and IT service industry of India

Gerschenkron (1962) pointed out that the firms in developing countries benefitted from various latecomer advantages over those firms in developed countries. This condition is particularly true for firms with mature technologies, in which mass production based on large-scale capital investments is proven efficient. Although this argument provided a very useful framework to understand how latecomer countries succeeded in keeping abreast with leading countries in particular technologies, the argument could not explain sufficiently the catch-up process in newly emerging technologies or industries (Lee 2013). Alternatively, Perez and Soete (1988) proposed a model in which latecomer advantages can appear even in emerging technologies. According to this model, a newly emerging

industry or technology can provide “Windows of Opportunity” to catching-up firms because the costs of entry are possibly lower than that in mature ones. The costs of entry can be categorized into four groups, namely, fixed investments, closing the knowledge gap, closing the experience and skill gaps, and compensation for lack of externalities.

The amount of these four groups of costs of entry depends on the particular stage of technological paradigms. In Phase I of technological paradigms (which is the Introduction Phase), fixed investment costs and costs of closing the experience and skill gaps tend to be lower because markets are still fragmented due to insufficient standardization, while leading firms encounter very new tasks as followers. Consequently, catching-up firms easily cope with those costs. On the contrary, costs of closing the knowledge gaps and of compensating for lack of externalities are relatively greater in Phase I, and constitute major entry barriers for catching-up firms.

Our explanation of Indian success in IT services starts from the idea that the various costs of entry presented above are affected by the particular conditions in specific industries and countries. More precisely, we will show that a number of industry- and country-specific factors contributed to strengthening latecomer advantages of India and to reducing latecomer disadvantages in IT services.

B. Windows of Opportunity for IT Services in India

Indian IT service companies first took advantage of low production costs to enter into the emerging market. Thereafter, the IT companies expanded their business by progressively accumulating more refined organizational capabilities to take advantage of given opportunities (Athreya 2005; Ethiraj *et al.* 2005). Indian IT service firms can hardly be characterized as high technology producers. The reasons of their success lie in their capabilities in absorbing quickly new technologies, in enhancing their internal competence to respond quickly to client demands, and in supplying services with good quality. Based on these capabilities, some Indian service firms were able to be included among the “Fortune 1000 companies.”

Tata Consultancy Service (TCS), an affiliate of the Tata conglomerate, is a pioneer in the Indian IT services industry. The company entered the software industry in 1970. Until the early 1980s, government policies were focused on achieving self-reliance in hardware capability. However, the hardware manufacturers, either domestic or foreign, relied heavily on

programmers in India to convert programs to their particular computer systems. In the late 1970s and early 1980, new software companies, such as Pentamedia Graphics, Tata Bourroughs Ltd. (later renamed as Tata Unisys Ltd, and now known as Tata Infotech Ltd.), Wipro Technologies, and Infosys Technologies Ltd., were established. The major achievement of the early Indian IT service firms consisted of mobilizing talented young graduates and delivering highly customized projects to large foreign firms. In this way, they progressively developed their reputation and project experiences (Athreye 2005). At that time, most development activities took place at the client sites because of the lack of appropriate communication facilities and capabilities to manage complex software projects. This widespread model was known as the “body-shopping model.”

Meanwhile, the experiences of Indian subsidiaries of some multinational companies, such as Citibank and Texas Instruments, revealed some elements of a successful offshore model. Thereafter, Indian IT service firms succeeded to develop their own organizational capabilities and accumulate project execution capabilities. The ICT revolution in the early 1990s, the Y2K problem, and the Internet boom in the late 1990s had crucial roles in this process (Lee *et al.* 2014; Lee 2013).

The paradigm shift of IT technologies in the early 1990s created new markets for Indian IT service firms and served as an important momentum for their growth. In particular, the shift from hardware technology to client-server systems created new markets for migration and re-engineering of application software and system integration (Krishnan and Vallabhane 2010). As large US companies confronted increasing shortage of consultants with sufficient qualification, Indian firms, such as TCS, became increasingly important suppliers of qualified IT service workers. In this way, a particular type of global division of labor in IT services progressively occurred. In this division of labor, global consulting firms took charge of consulting and system design, whereas Indian service firms specialized in coding, testing, and maintenance of software. In the mid-1990s, the reputation of Indian firms as high quality IT service providers was widely acknowledged. Soon, leading multinational firms established their development centers in India.⁶ Meanwhile, the domestic firms began to expand their offshore models and contracted with large multinationals to provide IT services exclusively. The develop-

⁶ Today, most multinational heavy IT investors, including Hewlett-Packard, Oracle, Sony, Sharp, and LG, are running their own development centers in India.

ment centers created by those contracts are called Offshore Development Centers (ODCs).

In the late 1990s, the Y2K problem and the Internet boom resulted in a sharp increase in the demand for IT technicians and created once again huge opportunities for the Indian IT service industry (Lee *et al.* 2014). The “dot-com boom” created a new market for web sites, e-commerce, and IT applications for business. Another positive effect of the Internet boom on Indian IT services industry was the contributions of expatriated IT workers. During the boom, a large number of IT technicians from India became successful entrepreneurs in Silicon Valley. Others occupied senior positions in foreign customer firms. They produced positive externalities to Indian IT service firms by creating solid reputations and by transferring knowledge. They also contributed by connecting Indian IT service firms to their foreign clients. During this period, several large Indian software companies, including Wipro and Infosys, were listed on the US Stock markets, such as Nasdaq and the New York Stock Exchange. One of the important aims of the overseas listing of Indian IT service firms was to strengthen their visibility and reliability in the global market (Athreya 2005).

In this process, Indian IT service firms succeeded in preempting new markets through steady innovative efforts. First of all, Indian IT service firms preempted quality certifications, which were increasingly important given the distance between developers and clients. Indian firms were leaders in acquiring SEI-CMM Levels 3, 4, and 5 certifications, and 60 percent of the firms that acquired SEI-CMM Level 5 certification were located in India (Nasscom 2002). On the other hand, Indian IT service firms went through strategic and organizational innovations to strengthen their competitive advantages. Strategic innovations consist of the shift towards business process outsourcing to secure tighter integration into the global customer value chain. Organizational innovations include the creation of ODCs, and, more recently, that of Proximity Development Centers (the development centers are located close to customers to enhance responsiveness to their needs). In this way, the IT firms succeeded to “lock-in” customers within their existing ties (Krishnan and Vallabhane 2010).

C. What made Indian firms capable to take advantage of the windows of opportunity

According to Perez and Soete (1988), in the Phase I of technological

paradigms, although latecomers have disadvantages in terms of high costs of closing the knowledge gaps and of compensating for lack of externalities, these latecomers may have advantages in terms of weak economies of scale and low costs of closing the experience and skill gaps. On one hand, the successful entry of Indian firms into new IT service markets can be partly attributed to the intrinsic characteristics of the industry that allowed the strengthening of latecomer advantages while reducing the disadvantages. On the other hand, country-specific advantages of India had important roles in diminishing entry barriers. From this point of view, understanding is possible as to why the catch-up process occurred precisely in India, rather than in other developing countries and precisely in the IT services industry rather than in other industries.

The IT service firms of India are the pioneers of software development and engineering processes, and can be best described as process capability specialists according to the classification proposed by Wong (1999).

First, in Phase I of technological paradigms, the production scale is usually small because the firms have to know what or what not to produce. Price competitiveness and productivity are relatively less important at this stage. Therefore, entry barriers related to fixed investments are lower than in other stages (Perez and Soete 1988). Those entry barriers are low in relative terms, but not in absolute terms. From this perspective, latecomer advantages related to fixed investments are more pronounced in the IT service industry than in manufacturing because of weak scale intensity. The semiconductor industry, for example, is capital intensive and requires huge initial physical investments to secure a minimum efficiency scale. By contrast, such investments are not necessary in the IT service industry, and the gradual improvement of production capacity is possible. Although the principal clients are businesses for both semiconductors and IT services, markets for IT services are more differentiated and fragmented than that of the semiconductor markets (Krishnan and Vallabhane 2010). As a result, pressures for price cuts are generally weaker in IT services than in semiconductor firms.

Second, developers, engineers, administrators, and consumers encounter completely new experiences and skills. Hence, the difference in the cost of closing the experience and skill gaps in Phase 1 tends to be small between leaders and followers (Perez and Soete 1988). Different from manufacturing industries in which firms have to deal with a very high level of technical complexities in innovation and production process,

the most important task in the IT service industry is human resources management. The required qualifications and skills in the IT service industry are completely different from that of the requirements in manufacturing. For instance, the major barrier against catch-up in the semiconductor industry is usually lack of technological knowledge, whereas the major barriers for IT services industry are organizational processes and domain knowledge (Krishnan and Vallabhane 2010). Management of client relationship is more important in IT services. Indian IT service firms were able to outperform their rivals from other NIEs because of client relationship management despite of their weak experiences in manufacturing.

Along with these industry-specific characteristics, the country-specific advantages of India have a crucial role in reducing the costs of closing the experience and skill gaps. Those country-specific advantages consist of traditional emphasis on engineering and mathematics, English skills, and initial accumulation of experiences through the early market entry by TCS and graduates from Indian Institutes of Technology (IITs). Particularly, academic hardware and software development had already begun at the Tata Institute of Fundamental Research as early as the 1950s (Krishnan and Vallabhane 2010). Fresh graduate technicians from those institutions formed a massive labor pool for qualified technicians and programmers. In addition, demands for programmers were relatively strong from hardware manufacturers in the 1980s although the Indian IT service industry was still at its very early stage of development (Athreya 2005).

Third, the costs of closing the knowledge gap tend to be large in Phase I, which resulted in higher entry barriers (Perez and Soete 1988). Although a large part of IT services industry is new, this part can be hardly classified as a science-intensive industry. For example, the development of a new generation semiconductor requires significant changes in both product and process, and the maintenance of a close connection among these changes. By contrast, new technologies in IT services rarely involve development, but are more closely related to adoptions and applications. Moreover, technologies in software development, such as software engineering and project management for coding large-scale software programs, evolve more slowly than semiconductors (Krishnan and Vallabhane 2010).

Fourth, costs of compensation for lack of externalities, such as those aspects related to limited accessibility to equipment suppliers, sources of knowledge, and customers, tend to be greater in the case of catching-

up countries due to poor market conditions and small number of related producers (Perez and Soete 1988). However, the services industry of India reaped considerable benefits from market conditions and changes in technological conditions. First, firms in advanced countries started to focus on their core capabilities and to replace their marginal tasks with outsourcing or offshoring to reduce production costs and to secure flexibility. In this process, trade in services expanded quickly in the global market. Furthermore, the progress achieved in information and telecommunication technologies facilitated the fragmentation of production processes by lowering the costs of information digitalization, transmission, and processing. Thus, geographically distanced specialized suppliers were able to provide intermediary service inputs. Finally, as leading Indian IT service firms took leading positions in the global market, they acquired a greater access to global decision-making networks. Competence in English, communication skills, and capacities to adapt to different cultures further facilitated this process.

The massive immigration of IT technicians, mostly to the United States, in 1970 to 1980 once raised concerns about “brain-drain.” However, with development of IT service industries, the same phenomenon turned into a strong advantage especially in providing valuable human networks and creating positive spillovers to domestic IT service firms. Unlike the case of Taiwan, the significance of “returning immigrants” was small in India. However, immigrant workers assumed the role of brokers, who helped to establish connections between large foreign firms and Indian IT service suppliers (Rosenberg 2013).

Finally, government intervention was significant in the reduction of the costs of compensation for lack of externalities for Indian IT service firms. From the 1960s, the Indian government had an important role in the development of the computer industry by sponsoring research in astrophysics, space, artificial intelligence, basic sciences, computer simulation, and mathematical modeling, without mentioning the establishment of IITs for higher engineering education and heavy subsidization of other local engineering colleges. The Indian government provided various incentives for software exporters, such as tariff reduction for hardware imports, easier access to foreign exchange, and income tax exemption on export earnings, through a series of policy schemes. Some of these schemes included the 1972 Software Export Scheme, the 1984 New Computer Policy, the 1986 Software Policy, the 1991 New Economic Policy, and so on. Software Technology Parks (STPs) were established to support small software exporters (Athreye 2005; Aggarwal 2013).⁷

TABLE 4
 INDIAN SERVICES-LED CATCH-UP FROM THE PERSPECTIVE OF
 TECHNOLOGICAL LEAPFROGGING

Technological changes in IT, spread of outsourcing, Y2K problems ⇒ Creation of new markets			
Costs of entry	Relative costs of latecomers (Ph.I)	Industry-specific advantages	Country-specific advantages
Fixed invest-ments	Low	No need for initial large-scale investments • Industry fragmentation	
Experience and skill gap	Low	(Compared to manufacturing) completely different skill requirements • Greater importance of human resource management over technological complexity (organizational process and domain knowledge)	Abundant human resources • Initial experiences accumulation • Traditional emphasis on engineering and mathematics
Knowledge gap	High	Weak science intensity • Adoption and application rather than product development	
Externali-ties	High	• Relatively easy access to the sources of knowledge • Technological progress in ICT	• Immigrant technicians and entrepreneurs • English and communication skills • Software Technology Parks

+ Strategic/Organizational Innovations

⇒ Leapfrogging or path-creating catch-up(Lee and Lim 2001)

Source: Authors' work based on the leapfrogging idea of Perez and Soete (1988).

Table 4 summarizes the industry- and country-specific advantages with regard to each type of costs of entry.

⁷The first STP was created by the Indian state of Karnataka in 1976, and the model was followed by the federal government in the late 1980s (Basant 2006).

Catch-up paths differ from country to country, within a country, and from industry to industry. Recent literature on technological catch-up points out that catch-up process should not be understood as a matter of speed under the assumption that catching-up countries follow one fixed path. Latecomer firms often skip some stages or even create their own paths instead of simply following the same technological development paths taken by forerunners (Lee and Lim 2001). Lee and Lim (2001) classified catch-up patterns into three categories, namely, path-following, stage-skipping, and path-creating catch-up processes. This type of classification would be more relevant in firm- or industry-level analyses. However, to expand this typology to country-level analysis, Indian growth path, unlike that of other successful developing, can be characterized as an example of stage-skipping or path-creating catch-up. The catch-up process first occurred in the service sector without the precedent of manufacturing development. Industry-specific characteristics and country-specific advantages had important roles in this process.

V. Conclusion

The service sector accounted for approximately two thirds of the economic growth of India from 2001 to 2009, whereas the contribution of the manufacturing sector was limited to 17%. However, the economic growth of India since the 1990s cannot be simply characterized as a tertiarization. Existing hypotheses on tertiarization, which are based on the experiences from advanced economies, cannot provide satisfactorily explain the exceptional experience of India. The Indian economy features a very distinctive pattern of decoupling between secondary and service sectors, and the tertiarization process of Indian economy did not occur only because of weak job creation capability of manufacturing sector as experience by several developing countries. Labor productivity in the Indian service sector was higher than that in the manufacturing sector in level and in growth rate. Productivity growth in the service sector has accelerated since the take-off of Indian economy in 1980, but has decelerated in the manufacturing sector.

In the second half of this paper, we explained the tertiarization of the Indian economy from the technological leapfrogging perspective. The Indian IT service industry was able to reap benefits from low costs of entry, as new markets were created with the shift of business models in computer industry from hardware technology to client-server systems.

In addition, industry-specific advantages including fragmented markets, new skill requirements on organizational process and domain knowledge, low science-intensity and weak location constraints, as well as country-specific advantages including fluency in English, traditional emphasis on mathematics and engineering, initial experiences in IT services, and presence of immigrant technicians and entrepreneurs, contributed to the successful entry of the Indian IT service firms. In addition, Indian IT service firms benefitted from exceptionally favorable demand conditions at the time of their entry, which would be difficult to replicate in the future.

After successfully entering the global IT services market, Indian service firms have had a leading role in quality certifications. To strengthen their competitive advantages, these firms need to pursue further strategic and organizational innovations, including ODCs and Proximity Development Centers. As the industry matured, these firms succeeded in consolidating their competitive position in the global market by accumulating their own experiences and skills within the global value chain.

This paper provided a new explanation on the unique rise of the Indian economy by using the concept of leapfrogging. However, direct and generalized evidence for technological leapfrogging at country level was not provided. Studies on productivity advances at firm- or industry- levels, such as Jeong (2009), may be read as complementary works to this study. We leave more formalized works to develop new typology of the catching-up process at country level as future research agenda.

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