Sectoral Distribution of Capital Formation and Output Growth: The Cases of China and India

Dr. Li Tan
Assistant Professor of Economics
Kean University, NJ, USA
Email: litan@kean.edu

Dr. Wei Ge
Associate Professor of Economics
Buckell University, PA, USA

Abstract

This paper provides a two-sector perspective for analyzing the effects of sectoral investment pattern on output growth. The two sectors are transformation and transaction. China and India are used as the empirical cases. We find that the rate differentials in real GDP growth between China and India tend to be positively correlated with the relative share of total investment that take place in the transformation sector, due to the effects of returns to scale and externalities. While emphasising the importance of sectoral distribution of capital formation at an early developmental stage, the study also highlights the role of the transaction sector in a longer term.

Keywords: GDP growth, Capital formation, Sectoral investment, Output shares, Chinese economy, Indian economy.

JEL classification: O41, O47, O57

1. Introduction

Capital accumulation has long been considered as a key contributor to the economic growth. The literature on the East Asian miracle in the 1990s (E.g.,Young 1995, Krugmen 1994, World Bank 1993), as well as more recent studies on the Chinese economy (E.g., Ding and Knight 2009, Kuijs and Wang 2006), all demonstrated that rapid capital formation played a major role in the output growth of these economies. Certainly, economy-wide accumulation of capital is conducive to the overall output growth. Yet, at a disaggregated or sector level, the relationship can be more complex. This paper explores the effects of the sectoral investment patterns on the real GDP growth, using China and India as empirical cases.

The Chinese and Indian economies provide a good pair for the investigation, as they are at comparable stage in economic development. The two economies have similar features in terms of population size, income levels, factor endowments, and growth performance. For example, both belong to the group of lower-middle-income countries, and are characterized by the abundance in low-skilled workforce and the scarcity of capital. Moreover, China and India both recorded a robust economic growth in recent decades, which has been driving the process of rapid transitions from rural, agricultural based societies to increasingly urbanized, industrial ones.

In terms of growth performance, however, there has been a gap between the two economies, with India's rate of real GDP growth falling persistently below that of China. Among all the variables potentially attributable to the rate differentials, we choose to focus on capital formation. Studies usually relate China's higher rate of growth to its high rate of capital investment. Yet the data shows that there had been a remarkable uplifting in the pace of total investment in the Indian economy in the past ten years or so as well. For example, between 2000 and 2008, India's total investment increased at an average rate of 15% per annum, which exceeded China's average rate of 12.1% per annum during the same period, according to the World Bank. In 2008, gross capital formation reached 40% of GDP in India, fairly close to the 43% of GDP registered in China. Nevertheless, the rate differentials in GDP growth between the two economies persisted despite the acceleration of investment growth in the Indian economy. China's real GDP increased at an annual rate of 10.4% per annum between 2000 and 2008, and the GDP growth rates was 7.9% for India during the period (World Bank 2010). The evidence suggests that in addition to the total capital formation, its sectoral composition may also play a role in driving the output growth, especially at earlier stages of economic take-off and development.

The sectoral distribution of investment is important, because it determines how effectively the limited capital resource are allocated across sectors to maximize the overall output growth. This paper intends to explain the differentials in GDP growth between the Chinese and Indian economies by comparing their sectoral investment patterns. We ask specifically: does the secotral distribution of capital formation matter for total output growth? If so, which sector or industries have larger or more immediate impacts on the overall output growth?

To proceed, we describe in Section 2 the analytical framework of the study, based on related literature on economic growth. Section 3 examines the patterns, in a comparative manner, of sectoral distribution of capital formation in China and India for the period under consideration. In Section 4, we contrast the patterns of sectoral output growth in the two economies. Section 5 proposes the findings on the relationship between the investment and output growth patterns. Section 6 concludes the paper with a comment on its policy implications.

2. Analytical Framework and Related Literature

To investigate the issues at hand, we classify all economic activities into two sectors, and call them 'transaction' and 'transformation' sector, respectively. The two-sector division was first introduced by Wallis and North in their study on transaction costs (Wallis and North 1986)[1], and has since been adopted in a number of country-specific studies (E.g., Dollery and Leong 1998, Dagnino-Pastore, Maria and Farina 1999, Hazledine 2001, Sulejewicz and Graca 2005). The two-sector framework in this paper is a modified version of the Wallis-North method[2]. In our framework, the transaction sector is made up by a subset of service activities under the conventional classification, including finance and insurance, real estate, wholesale and retail trade, and government services. All other types of economic activities are grouped into the transformation sector, ranging from agriculture and manufacturing, to such services as telecommunication and education.

The two-sector classification is desirable for our study, as it provides yet another perspective to view the functions of economic activities. In essence, transformation activities produce goods and services, and transaction activities facilitate the exchanges of the goods and services (North, 1990). The distinction between the 'production' and 'exchange' function is useful for analysing the relationship between the two sectors in longer terms. Meanwhile, the two-sector classification also allows us to differentiate industries that have different impacts on the overall output growth. That is, with this framework we can separate the industries that have direct and stronger impacts on GDP growth, such as those in the transformation sector, from the industries that tend to have indirect and weaker effects on GDP growth, such as those covered by the transaction sector.

The transformation sector in this study covers the primary, secondary sector and part of the tertiary sector under the conventional classification. The secondary sector is known as a 'high growth' or 'high productivity growth' sector. The primary sector, for developing countries like India and China, is a 'low growth' one. The set of tertiary industries enclosed in the transformation sector are those that do not directly perform the 'exchange' functions (see Wallis and North 1986), which include transport, communication, education, medical care, entertainment and so on. Recent studies showed that services such as transportation, communication, and business services/software industry exhibited similar or even higher growth rate than the secondary industries (E.g., Rubalcaba and Marato 2007, Maclean 1997). Therefore, we postulate that transformation sector, on the whole, tends to exert stronger impacts on the GDP growth. And a subgroup of transformation industries could be further specified for their even stronger impacts on the overall output growth.

The explanations for why some industries can contribute more to GDP growth than other industries can be found in a broad set of propositions in the literature. These include, for instance, the notion of external economies by Rosenstein-Rodan (1943), the linkage effects among industries by A. Hirschman (1958), the designation of manufacturing as the 'engine of growth' by Nicolas Kaldor, known as Kaldor's growth law (Kaldor 1967, Thirlwall 1983), and the distinction between technologically progressive and non-technologically progressive sector was made by William Baumol (1967). Together, these propositions suggest that some industries can contribute more to the overall output growth, for given resources employed, basically because production in these industries can generate increasing return to scales and external economies.

The transaction sector in this study covers FIRE (finance, insurance, real estate), wholesale and retail trade, and government services, and bears the characteristics of 'low growth'. The low or lagging productivity growth of the service sector has been long recognized in economic studies (E.g., Baumol 1967, Kaldor 1967, Bhagwati 1984, Summers and Heston 1988). The conventional explanation is that the 'personal' or 'labour-intensive' nature of services made it harder to incorporate capital and new technology in the production process.

This thesis was later modified based on new empirical evidences. As mentioned above, recent studies showed that some services, mostly high-tech related services, registered as high productivity growth as goods-making industries. Nonetheless, recent studies also showed that the growth of other services, such as wholesale, retail, banking, insurance, and legal services, remained lagging behind that of secondary industries[3] (E.g., Triplett and Bosworth 2000, Maclean 1997). Under our two-sector classification, these low-growth services mostly belong to the transaction sector. Thus, we postulate that the transaction sector tend to have weaker impact on the GDP growth, compared with the transformation sector.

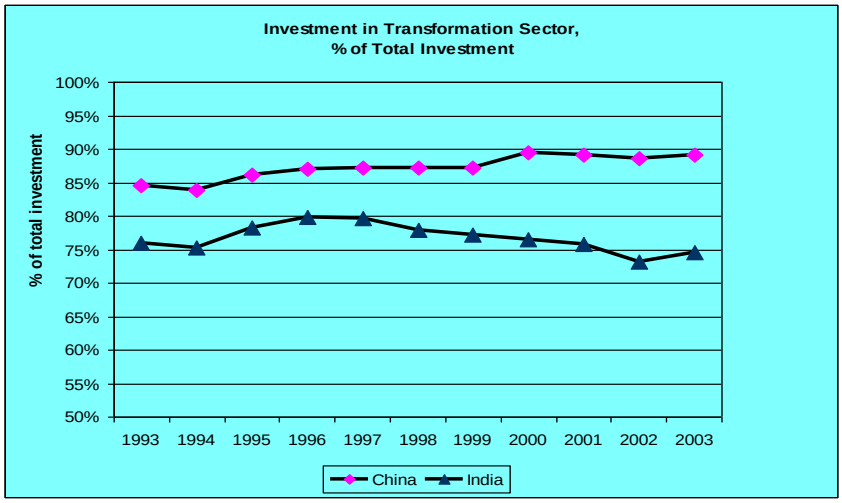
The differentiation of high-growth from low-growth sectors enables us to evaluate the impacts of capital formation at sector levels on a firmer ground. The functional perspective provided by the two-sector framework is useful for examining the dynamic interplay between the transformation and transaction sector in longer terms. From the Wallis-North paper and other related empirical studies, at lower developmental stage economies tend to devote relatively larger proportion of resources to the transformation sector that carries the production function. As the levels of specialization and division of labour expand in the economy, more and more resources would shift to the transaction sector, to meet the rising demands for the exchange function that becomes increasingly complex[4]. Therefore, from the functional perspective, the transaction sector is equally import as the transformation sector in sustaining economic growth in long term, despite its low-growth nature. Moreover, the size of the transaction sector as measured by its output share in GDP, to some extent, can serve as an indicator for the depth of the domestic market in an economy.

Finally, the two-sector framework has another convenient feature, in terms of data collection. Since the framework alters the activity grouping only at the aggregated level, it still allows for the use of by-industry statistics based on the conventional Standard Industry Classification (SIC) in carrying out our assessments. The annual time series data used in this study are drawn from the official sources of China and India[5]. All variables are expressed in real terms, to eliminate the effects of price fluctuation. The time period covered in this study runs from 1993 to 2003, due to the constraints of data consistency and availability[6]. For our purpose, the ten-year period data should be adequately representative.

3. *Sectoral Pattern of Capital Formation*

To compare the sectoral investment patterns in China and India, we compiled the investment data from the two economies under the two-sector classification as described above. In order to gain further insight, we specified two subgroups within the transformation sector for each economy, and call them, respectively, the subgroup of 'five-major transformation industries' and the subgroup of 'other transformation services'. The former consists of manufacturing, mining, utility, construction, and transportation & communication. The latter includes services in transformation sector, such as education, medical care and science research, but excludes transportation and communication services. The results of cross-country comparison of sectoral patterns of capital formation are summarized in Figure 1 and Table 1.

Figure 1. Capital Formation in Transformation Sector, China and India, 1993-2003



Sources: Authors' computation, with data from China Statistical Yearbook; and Central Statistical Office, Government of India.

Figure 1 compares the shares of the transformation sector in total investment in the two economies. As can be readily seen, both economies had a large share of capital formation in the transformation sector, a feature common to developing economies. But China's share was significantly higher than that of India, about 10 percentage point during the period considered. In addition, the investment share of the transformation sector in China increased from 85% in 1993 to 89% in 2003, yet stayed roughly at the 75-76% range in the Indian case during the period.Within the transformation sector, the largest difference in investment shares between the two economies is found for the subgroup of 'other transformation services'. According to the data collected, China's investment in 'other transformation services' rose markedly from 13% of total investment in 1993 to 24% in 2003, while for India, the share increased only marginally, from 3% to 4% during the period. The Indian share, however, might be underestimated, as 'business service' was categorized under group of finance and insurance in the Indian official data, and thus, was not counted as part of 'other transformation services' in our calculation. Yet, despite the discrepancy, the data still suggests that China invested a much higher proportion in such services as education, medical care, and science and research, in comparison to India.

To further explore the sector patterns of investment in the two economies, we calculated three ratios in Table 1, to show the proportion of the transformation sector (and the two subgroups) to the transaction sector in investment. Ratio-I is the ratio of capital formation in transformation to that in transaction sector. Ratio-II is the ratio of investment in the five major transformation industries to that in transaction sector. Ratio-III is the ratio of investment in other transformation services to that in transaction sector. All three ratios are higher in China than in India. During the period, India had Ratio-I of 4.3, Ratio-II of 2.8 and Ratio-III of 0.2, on average. It means that in India, investment in transformation sector was four times that in transaction sector; Investment in the major five transformation industries was about three times that in transaction sector, and investment in other transformation services was only one fifth that in transaction sector, averagely over the years. In comparison, the corresponding ratios for China were 7.0, 4.9 and 1.5, respectively, pointing to a much larger gap in investment between the transformation and transaction sector in general. In particular, China's investment in the major transformation industries was five times that in transaction sector.

Table 1. Sectoral Investment Ratios, China and India, 1993-2003

	Ratio-I	Ratio-II	Ratio-III
China			
1993	5.5	4.2	0.9
1994	5.2	4.1	0.8
1995	6.2	4.8	1.0
1996	6.7	5.2	1.1
1997	6.8	5.1	1.2
1998	6.9	5.0	1.3
1999	6.8	4.7	1.5
2000	8.5	5.7	2.0
2001	8.2	5.4	2.1
2002	7.8	4.9	2.1
2003	8.1	5.1	2.2
Ave. 1993-03	7.0	4.9	1.5
India			
1993	4.2	2.7	0.1
1994	4.0	2.6	0.1
1995	4.6	3.1	0.1
1996	5.0	3.5	0.1
1997	4.9	3.4	0.1
1998	4.5	3.0	0.2
1999	4.4	2.8	0.2
2000	4.2	2.7	0.2
2001	4.1	2.4	0.4
2002	3.7	2.1	0.2
2003	3.9	2.4	0.2
Ave. 1993-03	4.3	2.8	0.2

Sources: Authors' computation, based on data from China Statistical Yearbook; and Central Statistical Office, Government of India.

Moreover, Table 1 shows that over time, all three ratios increased in China. Whereas, in India, Ratio-I and Ratio-II declined over the years, and Ratio III increased slightly, due mostly to its lower base. Combining Table 1 with Figure 1, a picture of sectoral patterns of capital formation in the two economies can now be painted. Two features are worth noting. First, China consistently allocated a much larger share of investment in the transformation sector than India did during the period. Second, in the Chinese economy the transformation-sector investment increased in proportion to that in the transaction sector over time, while the opposite is the case for the Indian economy.

4. Sectoral Pattern of Output Growth

We now turn to the sectoral patterns of output growth. Again, all industries are grouped into transformation and transaction sectors. GDP is the sum of value-added output of all industries. Within the transformation sector, special attention is paid to the subgroup of 'five major transformation industries', which include manufacturing, mining & quarrying, and utility, construction and transportation & communication. In the Chinese case, the value added of manufacturing, utility, and mining and quarrying is combined under the label of 'Industry', as no breakdown data is available from the Chinese official source.

The results are summarized in Table 2. As shown, from 1993 to 2003, real GDP grew at an average annual rate of 9% and 6.2%, respectively, in China and India. The growth differential was 2.8 percentage points for the period. We compare the output growth pattern in the two economies from three aspects: sectoral output growth, sector shares in total output, and sectoral contribution to GDP growth.

Sectoral output growth

Column 1 presents the growth rates of sectoral outputs in the two economies. As shown, the output of China's transformation sector increased at an average rate of 9.3% per annum, exceeding its GDP growth rate, while India's transformation output increased at a lower rate than its GDP growth, 5.6% per annum on average. That is, the output growth differential between the two economies' transformation sectors is much larger than their GDP growth differential for the period.

Within the transformation section, the combined output of China's five major transformation industries grew at an average annual rate of 10.1%, much higher than India's 7.4%. In particular, China's 'Industry' output (manufacturing, mining & quarrying, and utility) grew at an average annual rate of 11.5%, almost doubling India's 6.5% during the period. Among the major industries, India delivered slightly faster output growth than China only in one: transport and communication, which was mainly due to the rapid expansion of telecommunication in India.

From Column 1, we could also compare the output growth of the two sectors within an economy. In the Chinese economy, the transformation sector expanded faster than the transaction sector, 9.3% versus 7.7%, per annum. Whereas in the Indian economy the opposite holds: the transformation sector expanded at a slower rate than the transaction sector, 5.6% versus 7.6%, per annum.

Sector shares in total output

Sector shares in GDP are presented in column 2. In general, China's transformation sector took a much large share in total output than India's: 81.2% versus 69% of GDP. The difference is particularly noticeable for the major transformation industries. The output of the five major transformation industries in China accounted for 56% of its GDP, more than doubling India's 21.6% of GDP. Among the five industries, 'Industry' (manufacturing, mining & quarrying, and utility) alone accounted for 43% of China's GDP, doubling India's 21.6%. On the other side of the coin, China's transaction-sector output accounted for 18.8% of its GDP on average, much lower than India's 31%, for the period. Briefly, column 2 shows that India's GDP is distributed relatively more evenly between the two sectors, in comparison to the Chinese case.

Sectoral contribution to total output

Based on sectoral output growth and sector shares in GDP, we calculated sectoral contribution rates[7] to GDP growth as presented in column 3. Contribution rate tells a sector's contribution to GDP growth, percentage wise.

From column 3, India exhibited a relatively balanced output growth pattern, with 62.2% of its GDP growth coming from the transformation sector and 37.8%, from the transaction sector. The five major transformation industries contributed 42% of India's GDP growth during the period. By contrast, China's GDP growth pattern is much more skewed, with 84.3% of its GDP growth coming from the transformation sector and 15.7%, from its transaction sector. The subgroup of the five major transformation industries alone contributed 68% of its GDP growth during the period.

Table 2. Sectoral Patterns of Output Growth: China and India, 1993-2003, %

	Average annual growth rate	Share in GDP, average	Contribution rate
India			
GDP	6.2	100.0	100.0
Transformation sector	**5.6**	**69.0**	**62.2**
Manufacturing	6.8	16.5	18.2
Mining and quarrying	5.1	2.4	2.0
Elect. gas & water supply	5.6	2.4	2.1
Construction	6.3	5.2	5.3
Transport, storage & comm.	10.7	8.2	14.1
Five industries' subtotal/average	*7.4*	*34.0*	*41.7*
Transaction sector	**7.6**	**31.0**	**37.8**
Trade (wholesale and retail)	8.4	13.2	17.8
Banking & insurance	8.9	6.1	8.7
Real estate & business service	5.9	6.1	5.8
Public administration & defence	6.2	5.6	5.5
China			
GDP	9.0	100.0	100.0
Transformation sector	**9.3**	**81.2**	**84.3**
Industry	11.5	43.0	55.2
Construction	8.3	6.8	6.3
Transport, post & telecom services	10.1	5.9	6.6
Five industries' subtotal/average	*10.1*	*55.7*	*68.1*
Transaction sector	**7.7**	**18.8**	**15.7**
Wholesales & retail trade	7.5	8.4	7.1
Finance & insurance	7.0	5.7	4.5
Real estate	8.4	2.0	1.8
Government agencies & parties	7.6	2.8	2.3

Sources: Authors' computation, based data from China Statistical Yearbook, and Central Statistical Office, Government of India. For China, 'industry' includes manufacturing, mining & quarrying, and utility.

We can convert the sectoral contribution rates into sectoral pulling rates[8]. In the Chinese case, the subgroup of the five major transformation industries and the transaction sector had a pulling rate of 6.1% and 1.4%, respectively. That is, if we decompose China's GDP growth of 9%, 6.1 percentage points was from the output growth of its five major transformation industries, and 1.4 percentage points, from the output growth of its transaction sector. Comparatively, India's five major transformation industries and transaction sector had a pulling rate of 2.6% and 2.4%, respectively. The difference in the pulling rates of the five major transformation industries between the two economies was as large as 3.5 percentage points (6.1% versus 2.6%), which more than covered the GDP growth differentials of 2.8 percentage points between the two economies. That is to say, even though China's transaction sector had a lower pulling rate than India's, China's GDP growth is still faster thanks to the much higher pulling rate of its major transformation industries.

In sum, Table 2 shows that similar to the investment patterns presented in section 3, China's output growth pattern is also much more skewed towards the transformation sector, in comparison to Inida's. China's higher GDP growth (than India) is based on the high output growth of its transformation sector, particularly, the exceptionally high rate of output growth of its major transformation industries.

5. Connecting the Investment and Output Patterns

Connecting the results in Section 3 and 4, we find a consistent relationship between the sectoral investment and output growth patterns for each economy. India's ' less skewed' investment pattern led to a relatively balanced output growth between the two sectors, while China's proportionately higher investment in the transformation sector generated much faster output growth from that sector, and consequently, higher GDP growth than India.

GDP Growth Differentials

Per literature review in Section 2, investment in certain industries can generate more GDP growth, due to increasing return to scales and external economies. By our two-sector framework, these 'high-growth' industries mostly fall into the subgroup of major industries in the transformation sector. From section 3, China consistently allocated a much larger share of investment in these transformation industries than India did during the period under investigation. Consequently, as shown in section 4, the combined output of China's five major transformation industries grew at an average annual rate of 10.1%, contributing 68% of the GDP growth during the period. Comparatively, India's five major transformation industries expanded at 7.4%, contributing 42% of its GDP growth during the same period. Generally speaking, investment in major transformation industries lead to higher GDP growth through several channels.

First, large scale of investment in manufacturing can yield increasing return to scales. The Chinese empirical case largely supports Kaldor's proposition that the faster the growth rate of manufacturing, the faster will be the growth rate of GDP (Kaldor 1967). From our investment data, China's investment in manufacturing increased at an average rate of 18% per annum, compared with India's 4% per annum during the period between 1993 and 2003. Note that China invested heavily not only in consumer-good manufacturing, which is better known, but also in 'heavy industries' such as steel, ship-building, automobile, petrochemical and so on. These heavy industries initially require substantial capital to establish optimal scale of plants. Once economies of scales are achieved through adequate investment, more outputs would be turned out for given costs, with enhanced productivity. We do not have separate data on the value added of manufacturing for China. However, as shown in section 4, China's 'Industry' output (manufacturing, mining & quarrying, and utility) grew at an average rate of 11.5% per annum during the period. Comparatively, India's manufacturing output increased at an average annual rate of 6.8% during the same period.

Moreover, known as the world's manufacturing centre, China's manufacturing industries benefit even more from the scale effects by selling larger quantities in the overseas markets. The production of larger amount of outputs enabled the Chinese firms or joint-ventures to take better advantage of economies of scale, which would lead to further increases in total output. Meanwhile, the growth of export manufacturing had the effects of inducing the expansion of other industries through the backward and forward linkages over time (Hirschman 1958). The linkage effects of export industries are similar to that in the East Asian economies, which have been covered extensively in the literature (E.g., World Bank 1993). Secondly, compared with the Indian case, China is also known for its much faster expansion of infrastructure, thanks to the investment incentives schemes in the economy (Bai and Qian 2010). Infrastructure industries include power generation, gas supply, railways, seaports, highways, airports and so on.

From our existing investment data, China's investment in power generation, gas supply, transport and communication accounted for an average of 41% of its total investment, while India's investment in the same set of industries accounted for 21% of its total investment on average, during the period from 1993 to 2003. On the output side, as shown in Section 4, the industry of 'Electricity, gas and water supply' expanded at an average rate of 5.6% per annum in India. In the Chinese case, again, the 'Industry' output (manufacturing, mining & quarrying, and utility) grew at a much faster rate of 11.5%, during the period under consideration.

China's large scale of investment in infrastructure not only contributed to the overall output directly but also generated external economies or positive externalities to other industries over the years. In general, infrastructure bears the characteristic of 'basic industries' as described by Rosenstein-Rodan in early development economics. Investment in 'basic industries' tend to generate external economies, which refer to the benefits of an investment project enjoyed by other firms or industries not involved in project. The classical example is the building of a road, which can bring benefits to all businesses along the line, in terms of new investment opportunities and demands for outputs (Rosenstein-Rodan 1943). The importance of infrastructure in spurting the overall growth has also been studied at length in the contemporary literature (E.g., Morrison and Schwartz 1996, Lynde and Richmond 1992). Of course, further empirical works are required for evaluating the 'external economies' from the infrastructure in the Chinese case.

Thirdly, investment in new technologies or high-tech industries could also yield stronger impacts on GDP growth, as the introduction of new technologies can raise productivity both within and outside of the industries through technological dispersion -- another source for positive externalities. New technologies tend to cluster in industries such as communication (telecom, Internet, computer, wireless device), business services (computer, Internet and software) and medical research (biotechnology), of which 'communication' is the largest segment in terms of output shares by our existing data. From our data set, the two economies have performed equally well in the communication segment. India's 'communication' segment expanded at an average rate of 20.6% per annum, and China's 'post and communication' grew at an average rate of 22% per annum during the period under investigation. However, India is well known for the rapid advance of its telecom networks. From related studies, India's telecommunication delivered much far growth than other infrastructure industries. (E. g., Patel and Bhattacharya 2010)

Due to the limitation of our data, it is hard to evaluate the output growth of other high-tech segments under various broad industries. However, the investment data in Section 3 showed that China invested a much higher proportion in such services as education, medical care, and scientific research, in comparison to India. Investment in these services should be considered favourable for the development of high-tech industries, as it provides the 'soft' infrastructure necessary for faster adoption of new technologies. From our existing data, the segment of 'scientific research' expanded at an annual rate of 11% per year and the growth rate of the 'education' segment (including culture and arts) was 10.5% per annum in the Chinese case. For India, these services were wrapped the broader category of 'other services', which expanded at annual rate of 6.8% per annum.

From the above, China's much higher investment in manufacturing and infrastructure (than India), and at least equally adequate investment in high-tech related industries, stands as an important source for the GDP growth differentials between the two economies.

Economic Growth in Long Term

The Chinese investment pattern has yielded higher GDP growth so far. However, a question remains: is the resultant output growth pattern viable in longer terms? The major concern here is that the growth of the transformation and transaction sector was highly unbalanced in the Chinese case. As shown in Section 4, China's transaction-sector output not only had a much lower share in GDP than India's, but also saw a declining trend. Between 1993 and 2003, the transaction sector's share in GDP increased from 29% to 32.9% in India, but fell from 20.4% to 18.1% in China.

To verify the trends in the transaction-sector output shares for the two economies, we extended the period of investigation, as consistent output data is readily available a longer period. We collected the data on the value added of two major transaction industries, wholesale & retail trade and banking & insurance, for the period between 1990 and 2007, and computed their output shares in GDP, for the Chinese and Indian economies. From the results in Table 3, again, China's two major transaction industries had not only smaller but also declining shares in GDP.

In the Indian case, the combined output of the two transaction industries increased from 15.1% in GDP in 1990 to 18.3% in 2007. Whereas, in the Chinese case, the GDP share of the two industries fell from 13.5% to 11.6% during the same period. The numbers suggest that the development of the transaction sector lagged much behind that of transformation sector in the Chinese case, compared with Indian case.

Table 3. Shares of two major transaction industries in GDP, 1990-2007

	Wholesales & Retail Trade, % of GDP	Banking & Insurance, % of GDP	Two industries combined, % of GDP
India			
1990-91	11.2	3.9	15.1
1995-96	12.5	4.8	17.3
2001-02	13.6	5.7	19.3
2005-06	14.2	6.1	20.3
2007-08	14.3	7.1	21.4
Ave. 1990-2007	12.9	5.4	18.3
China			
1990	6.8	6.7	13.5
1995	5.7	5.4	11.1
2000	8.2	4.1	12.3
2005	7.8	3.8	11.6
2007	7.6	4.6	12.2
Ave. 1990-2007	6.8	4.8	11.6

Sources: China Statistical Yearbook; and Ministry of Statistics and Program Implementation, Government of India.

From the functional perspective, the transaction sector that performs the exchange function was essential to the expansion of the transformation sector that carries the production function, especially at higher developmental stage. As discussed in Section 2, the transaction sector would take an increasingly larger share in GDP as an economy moves onto higher income levels[9], based on the empirical studies on the developed economies. Such a trend was observed in the Indian case but not in the Chinese case, even though the two economies are at similar developmental stage. The transaction services, particularly, consumer-related transaction services, plays a critical role in fostering domestic demands. For instance, services such as wholesale and retail distribution, consumer finance services, consumer legal service and small courts, consumer protection agencies & programs, consumer credit rating and consumer product research directly determine the quality and quantity of goods and services exchanged in the domestic markets. Thus, to great extent, the output share of transaction services can serve as an indicator for the depth of the domestic market.

Lagged development of transaction sector would constrain the growth of the transformation sector in a closed economy. Yet, the expanding global markets have greatly alleviated this constraint for the export-oriented economies. With the overseas markets, a national economy could expand its production or supply capacity underlined by the transformation sector beyond the constraints of domestic consumption. As well known, the Chinese economy is a successful case of export-oriented growth. In other words, rapid export growth has served as an important conduit for the remarkable growth of the overall output in the Chinese case. This can be readily shown by a comparison of the demand structures for the Chinese and Indian economies. From the latest World Bank data, in 2008, China's consumption accounted for 34% of GDP and its net export, 9% of GDP. By contrast, India's consumption and net export was 54% and -5% of GDP, respectively (World Bank 2010). The difference in the demand structure between the two economies is consistent with our finding on the trends in the development of the transaction sector in the respected economies. A lower share of domestic consumption in GDP is associated with a relatively smaller transaction sector, and vice versa.

Given the importance of transaction services at higher developmental levels, a shift towards the transaction sector in the growth pattern is inevitable for sustaining long-term growth in the Chinese case.

Indeed, under the government's recent policy initiatives, China is making the move towards the 'consumption-oriented' and 'innovation-propelled' growth. In this regard, our study suggests that the deepening of domestic consumption markets may require an adjustment in the sectoral distribution of capital formation in the economy. That is, higher proportion of investment need to be devoted to the transaction sector, particularly, to the consumer-related transaction services.

6. Concluding Remarks and Policy Implications

While economy-wide capital accumulation is considered a key factor for output growth, our study suggests that the sectoral composition of investment also matters. In this paper, we investigated the effects of secortal distribution of capital formation on the overall output growth. Using a two-sector framework, the empirical cases of China and India are considered and compared. We find that China consistently allocated larger proportion of investment in transformation sector than India did, which produced much faster output growth of major transformation industries, and consequently, higher GDP growth in the Chinese case. Thus, the difference in the sectoral investment pattern between the two economies stands as an important source for their GDP growth differentials. From the policy perspective, our study highlights the importance of sectoral distributions of investment. Sectoral structure of capital formation is important, as investment in certain industries could be far more effective in generate overall output growth than others. This is particularly meaningful for capital-scarce economies, at earlier stage of industrialization. Intensive investment in major transformation industries can lead to rapid build-up of infrastructure, establishment of production scales and introduction of new technology, all of which can contribute to rapid GDP growth. The impact of such externalities should not be underestimated for developing economies. The government policies can play an important role in sectoral allocation of capital by providing incentives for both private and public investment in relevant industries.

On the other hand, our study also suggests that a gradual adjustment of the sectoral investment pattern may be required in the Chinese case as the economy moves onto higher stages of development. Although it has 'lesser' direct impacts on GDP growth in early periods of modernization, the transaction sector plays an increasingly vital role for sustaining economic growth in long term. Consumer-related transaction services are particularly needed in fostering strong internal demands and innovation capabilities. Finally, as an initial attempt to provide a two-sector perspective for investigating the effects of sectoral investment, this study is certainly limited in the scope and technical details. Better testing methods, with larger sets of data, are needed to gain further insights on the issues at hand.

Notes

[1] The primary application of the transaction-transformation classification, by Wallis and North, has been centered on the estimation of transaction cost in an economy.

[2] By Wallis and North, transaction sector also covers the transaction services within firms of transformation industries.

[3] Triplett and Bosworth (2000), for instance, found that in the U.S economy labor productivity increased at an annual average rate of 0.5% in finance, insurance and real estate (FIRE) from 1973 to 1997, compared with the 2.7% in the manufacturing sectors. Within the manufacturing sectors, labor productivity in electronics industry grew an average 5.8% a year. In contrast, among the FIRE services, depository and non-depository institutions, insurance carriers, agents, holding and investment offices all had negative growth (-0.3%, -0.1%, -0.8% and -0.3%, respectively), and labor productivity in legal services fell at an annual average rate of 2.5%

[4] By Wallis and North's study, the size of the transaction sector in the American GNP had increased from about 26% in 1870 to 54.7% in 1970. Dollery and Leong found that the size of the transaction sector grew from 32 % of GNP in 1911 to 59.5% in 1991 in Australia. In the their study for Argentina, less developed economy, Dagnino-Pastore and Farina showed that the transaction sector's share of GDP increased rather slowly, from 25% in 1930 to 35% in 1990.

[5] There is a discrepancy between the data provided by the country governments and that from the World Bank.

[6] In the Chinese case, the methods of industry grouping applied to data from 2004 onwards differ from those employed in earlier years. The Indian government also rebased and modified some data on capital formation for later years.

[7] Contribution rate is computed by dividing the change in sectoral output by the change in GDP. Contribution rates of all sectors should add up to 100%.

[8] Pulling rate is computed by multiplying a sector's contribution rate by GDP growth rate. Pulling rates of all sectors should add up to GDP growth rate.

[9] By Wallis and North's study, the share of transaction costs in the American GNP had increased from about 26% in 1870 to 54.7% in 1970. Dollery and Leong found that the size of the transaction sector grew from 32 % of GNP in 1911 to 59.5% in 1991 in Australia. In the their study for Argentina, less developed economy, Dagnino-Pastore and Farina showed that the transaction sector's share of GDP increased rather slowly, from 25% in 1930 to 35% in 1990.

References

Bai, C. and Qian, Y., 2010. Infrastructure Development in China: The Cases of Electricity, Highways and Railways. *Journal of Comparative Economic,* 38 (1), 34-51.

Baumol, W. J., 1967. Macroeconomics of Unbalanced Growth: the Anatomy of Urban Crisis. *American Economic Review*, 57(3), 415-426.

Bhagwati, J. N., 1984. Splintering and Disembodiment of Services and Developing Nations. World Economy, 7 (2), 133-143.

Bosworth, B. and Collins, S., 2008. Accounting for Growth: Comparing China and India. *Journal of Economic Perspectives,* 22 (1), 45-66.

Dagnino-Pastore, D., Maria, J. and Farina, P. E., 1999. Transaction costs in Argentina. Presented at the Conference of ISNIE 1999.

Dollery, B. and Leong, W. H., 1998. Measuring the transaction sector in the Australian economy, 1911-1991. *Australian Economic History Review,* 38(3), 207-231.

Ding, S. and Knight, J., 2009. Can the Augmented Solow Model explain China's Remarkable Economic Growth? A cross-country Panel Dada Analysis. *Journal of Comparative Economic,* 37(3), 432-452.

Government of India, Ministry of Statistics and Programme Implementation, http://mospi.gov.in/mospi_nad_main.htm

Government of India, Central Statistical Office, various years. http://www.mospi.nic.in/cso_test1.htm (accessed August, 2007).

Government of India, Ministry of Finance, Economic Survey, 2005-2006. http://www.finmin.nic.in/the_ministry/dept_eco_affairs/dea.html

Hazledine, T., 2001. Measuring the New Zealand Transaction Sector, 1956-98, with an Australian Comparison. *New Zealand Economic Papers,* 35(1),77-100.

Hirschman, A.O., 1958. *The Strategy of Economic Development*. New Haven, CT: Yale University Press.

Jeanneney, S. G., Hua P., and Liang, Z. C. 2006. Financial Development, Economic Efficiency, and Productivity Growth: Evidence from China. *Developing Economies,* 44 (1), 27-52.

Kaldor, N., 1967. Strategic Factors in Economic Development, New York State School of Industrial and Labor, New York, Ithaca

Krugman, P., 1994. The Myth of Asia's Miracle. *Foreign Affairs* 73 (6), 62-78.

Kuijs, L. and Wang, T. 2006. China's Pattern of Growth: Moving to Sustainability and Reducing Inequality. *China and World Economy*, 14 (1), 1-14.

Liu, M., Tao. R., Yuan, F. and Cao, G., 2008. Instrumental Land Use Investment-driven Growth in China. *Journal of The Asia pacific Economy,* 13 (3), 313-331.

Lynde, C. and Richmond, J., 1992. The Role of Public Capital in Production. *The Review of Economics and Statistics*, 74 (1), 37-44.

Maclean D., 1997. Lagging productivie Growth in the Service Sector: Mismeasurement, Mismanagement or Misinformation? *Working paper* 97-6, Bank of Canada.

Morrison, C. and Schwartz, A. E., 1996. State Infrastructure and Productive Performance, *American Economic Review*, 86 (5), 1095-1111.

North, D. C., 1990. *Institutions, institutional Change and Economic Performance* Cambridge: Cambridge University Press.

National Bureau of Statistics of China. China Statistical Yearbook, various years. Beijing: China Statistical Publishing House. http://www.stats.gov.cn/tjsj/ndsj/

Patel, U. R. and Bhattacharya, S., 2010. Infrastructure in India: The Economics of Transition from Public to Private Provision. *Journal of Comparative Economic*, 38 (1), 52-70.

Rodrik, D., 2006. What's So Special about China's Export? *China & World Economy*, 14 (5), 1-19.

Rosenstein-Rodan, P. N., 1943. Problems of Industrialization of Eastern and South Eastern Europe, *Economic Journal*, 53 (210/211), 202-211.

Rubalaba, L. and Maroto, A., 2007. Productivity in Service. In: L. Rubalaba, ed. *Services in European Economy: Challenges and implications for Economic Policy*. Cheltenham, UK: Edward Elgar, 80-95.

Sulejewicz, A. and Graca, P., 2005. Measuring Transaction Costs in the Polish Economy, 1996-2002. Presented at the Conference of ISNIE 2005.

Summers, R. and Heston, A., 1988. A new Set of International Comparisons of Real product and product levels: Estimates for 130 Countries, 1950-1985. *Review of Income and Wealth*, 34, June.

Thirlwall, A. P., 1983. A Plain Man's Guide to Kaldor's Laws. *Journal of Post Keynsian Economics*, Spring, V(3), 345-58.

Triplett, J. E. and Bosworth, B. P., 2000. Productivity in the Services Sector, Brookings Institution. Prepared for American Economic Association 2000.

Wallis, J. J. and North, D. D., 1986. Measuring the Transaction Sector in the American Economy, 1870-1970. In: S. L. Engerman and R. E. Gallman, ed. *Long-Term Factors in American Economic Growth*. Chicago and London: The University of Chicago Press, 95-148.

Wang, N., 2007. Measuring Transaction Costs. *Division of Labor and Transaction Costs*, 2(2): 111-146.

Woo, W. T. and Zhang, W., 2010. Time for China to Move from Macro-stability to Macro-Sustainability: Making Macro-stimulus Work and Maintaining Its Effects. *Journal of the Asia pacific Economy*, 15 (4), 349-368.

World Bank. 1993. *The East Asian Miracle Economic Growth and Public Policy*. Washington, D.C.: The World Bank.

World Bank. 2010. World Development Indicator, 2010. Washington, D.C.: The World Bank.

Young, A., 1995. The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience. *Quarterly Journal of Economic*, 110 (3), 641-680.