

## Growth of service sector in BRIIC economies

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### Abstract

In recent years, there has been growing attention to service sector in the world economies. This study analyses service sector in Brazil, Russia, India, Indonesia and China (BRIIC), which are five of the largest economies in today's developing world. We examine how the services links with overall economic activities and what drives its growth in the period 2000-2010. This research finds that in BRIIC economies, final demand in other sectors has not enhanced services output. Furthermore, using structural decomposition analysis, this study investigates various aspects which contribute to the growth of services output, which are final domestic demand, export, and changes in technology. The result suggests that in BRIIC economies, final domestic demand has been the main driver of the growth of services that exceeded more than 70% of overall effect in all economies. Domestic final demand for services contributed higher than the non-services one.

### Introduction

In the past, the service sector has been considered as the residual activities of the economy after classifying agriculture and manufacturing (Commission of the European Communities, 2003). In term of policy maker's perspective, the contrast between services and manufacturing could be found especially in developing economies where manufacturing is viewed as the leading edge of modernization and skilled job creation, as well as a fundamental source of various positive spillovers (Tybout, 2000).

Nevertheless, there is the ever-growing importance of services in the knowledge-based economy<sup>1</sup> (Tijaja, 2013, Damuri, 2012). While manufacturing sector still becomes the major contribution in many developing economies in the last decades, there has been a gradual increase in the importance of service sector for economic development. In response to this trend, policymakers in developing economies, which are previously preoccupied with tangible sectors, take consideration to the rise of intangibles (Goswami, Mattoo, & Saez, 2012).

The service sector should be considered not only as it is but also as a pivotal part to boost the national competitiveness through its strong (forward) linkages with the rest of economy. The concept of forwarding linkages measures the inter-relationship of a given industry with the rest of the economy through the demand side. It would show the impact to a given industry if the final demand of every other industry were to increase by one unit (OECD, 2007).

The strong linkage of the service sector is in line with two great unbundling's that marked globalization (Baldwin, 2006). The first unbundling is the breakdown of production and consumption, meaning that the locations of production and consumption are no longer required to be close to each other. This phase, which was driven by declining transportation cost, allowed spatial separation of factory and consumer. The second unbundling is the breakdown of various tasks of production. It was driven by the decline of communication and information cost. There became an opportunity to offshore some routine tasks which are easily codifiable and do not need face-to-face contact. This unbundling process has led to what known today as global value chains (GVC).

<sup>1</sup> Knowledge-based economies are economies which are directly based on the production, distribution and use of knowledge and information (OECD, 1996).

According to (Tijaja, 2013), the service sector plays two key roles in GVC: (1) by connecting each point along the global value chains; and (2) by constituting their global value chains. In a similar view, Damuri (2012) addresses the importance of services as production sector and input. As production sector, services generate value added, creates employment and acts as exports commodity 0. As inputs, services act as intermediate inputs to other sectors as well as provides basic socio-economic needs to the population such as education and health.

In general, services products cannot be separated from most of the products from other sectors as the services products are embodied in them. Transportation and logistics services, for example, play a crucial role in distributing manufacture products both for the domestic and international market. Poor quality of service sector leads to inefficiency and high-cost economy. Hence it means a higher price of goods sold to consumers (Damuri, 2012). Also, information and communication technology is also pivotal as it plays a critical role in information flexibility, product quality and fast response which are important in the overall business process (Roy, Das, & Chakraborty, 2002).

It becomes interesting to investigate the increasing role of the service sector in developing economies and how it links with other sectors. This study examines the service sector in Brazil, Russia, India, Indonesia and China (BRIC): how it links with the overall economic activities and what drives its growth. OECD (2008) classifies Brazil, Russia, India, Indonesia, China and South Africa (BRICS) as a significant group of emerging economies in today's world. For the past two decades, the countries' shares in world trade have been growing significantly. More specifically, the countries have been more integrated with the world in term of intermediate inputs, final goods, and services markets. However, due to data limitation of South Africa, this country is not included in this paper.

Using structural decomposition analysis, this study investigates various aspects which contribute to the growth of services output, which are final domestic demand, export, and changes in technology. In term of export in services, it is known that developing economies still need to struggle to compete with more developed ones. Besides the fact that barriers to trade in services are more complex than barriers to trade in goods (i.e., domestic restriction and regulation), recent studies confirm that service sector performance critically depends on human capital, the quality of the telecommunication network and the quality of institutions, which are likely to be better in developed economies (Amin & Mattoo, 2006; Goswami et al., 2012; and Eichengreen & Gupta, 2009). Thus, this study will provide new findings on services through developing economies' perspective which has different institutional settings with the developed ones.

Some existing studies have discussed the linkage of services with other economic activities. Jean emphasize that the quality and competence of core logistics service providers is one of the important aspects of overall country performance. The study shows that better logistic services strongly correlate with trade outcomes in goods sectors. Also, Arnold, Javorcik, Lipscomb, & Mattoo (2012) discuss the role of the service sector in a broader scope. The authors find that improvements in regulation on services in India have been a crucial source of productivity gains in manufacturing. The services covered in the study include banking, telecommunications, insurance, and transport.

Duggan, Rahardja, & Varela (2013) examine the extent to which policy restrictions on FDI in the Indonesian service sector affected the performance of manufacturers over the period 1997–2009. This study finds that relaxing policies toward FDI in the service sector was not only associated with improvements in the perceived performance of the service sector itself but also of the manufacturing industry. It is shown by 8 percent increase in manufacturers' total factor productivity over the period.

Some studies that emphasize the linkage of the service sector to overall economy have led some researchers to investigate whether or not the contribution of the service sector has really increased in an economy. Roy and Toh & Thangavelu (2013) focus on information and communication technology (ICT), which is part of growing service sector. ICT sector is considered as one of the key drivers of the 'knowledge economy'. According to Powell & Snellman (2004), in the knowledge economy, production and services are based on knowledge-intensive activities. These activities lead to the more advanced pace of technical and scientific development. The main characteristic that distinguishes knowledge economy to the conventional one is its greater reliance on intellectual capabilities than on physical and natural resources.

Roy et al. (2002) study the extent of *informatization* in the Indian economy during the period 1983- 84 to 1989- 90 and identify the information-intensive sectors. During the period, there was increased linkage between the information sector and other non-information sectors in India. This growth has been mainly driven by domestic demand expansion. Although export expansion and technological coefficient changes also have a role, the effects are not too significant. Later on, the same investigation was done by Toh & Thangavelu (2013)

on Singapore ICT sector. The results indicate that the ICT sector provided the key linkages for the expansion of high-value-added manufacturing activities and electronics export for the Singapore economy.

The existing literature has shown the growing importance of service sector in the economic development. There is the multiplicative positive effect of supporting policies on services towards other sectors due to the pivotal role of services in the economy.

### Research Methods

Input-output framework allows us to understand the impact of one particular sector in an integrated framework regarding its linkages to the overall economy, including its sector and other sectors (Toh & Thangavelu, 2013). For that purpose, this study uses National Input-Output Table (NIOT) of each of BRIIC countries for the year 2000, 2005 and 2010, obtained from the World Input-Output Database (WIOD)<sup>2</sup>. The observation in this study will be divided into two sub-periods, which are 2000-2005 and 2005-2010. It will allow us to observe and compare the change of output between the two sub-periods.

The WIOD provides data of 40 countries (all 27 EU countries and 13 major other countries) and estimates for the rest of the world. All data in WIOD are obtained from official national statistics and are consistent with the National Accounts. Because it is presented in current prices, the data is converted to constant 2005 prices using CPI deflators.

The NIOT consists of 59 products which are produced and used by each of 35 sectors. Along with the aim to observe the contribution of the service sector to the economy, it is necessary to classify which sectors from the NIOT are categorised as services. Services discussed in this study are based on services classification of Statistical Classification of Economic Activities (NACE) revision one but limited to education and commercial services 4F<sup>3</sup>. Hence it does not include public and other community, social and personal services 5F<sup>4</sup>. It results in 15 out of 35 industries in NIOT to be classified as service sector as presented in Table 1.1 of Appendix 1. These sectors will then be merged as one sector in the NIOT.

### Input coefficient of service sector

This section attempts to measure the services intensity of various sectors and their changes over two sub-periods. Thus, it will confirm whether the diffusion of the service sector has occurred and continued to expand in other sectors of BRIIC economies.

Referring to Roy et al. (2002) and Toh & Thangavelu (2013), the intensity measure used in this study is the ratio of services intermediates used per unit of output or also known as input coefficient of the service sector. Denoting this ratio for sector  $i$  by  $h_i$ , we can proceed to obtain a second measure ( $h^*$ ), that accounts for both direct and indirect services required to produce one unit of goods by each sector, as follows.

$$\mathbf{h}^* = \mathbf{h}'(\mathbf{I} - \mathbf{A})^{-1} \quad (1)$$

Where  $h^*$  is the row vector with element  $h^*$ ;  $\mathbf{h}'$  is the row vector with element  $h_i$ , and  $(\mathbf{I} - \mathbf{A})^{-1}$  is the standard Leontief inverse matrix.<sup>F</sup>

### Structural decomposition analysis

To calculate the changes or growth of services output, this study uses structural decomposition analysis (SDA). It is a well-known methodology to assess the relative importance of effects that together constitute the actual change in a certain variable of interest. In other words, the SDA quantifies the contributions of determinants of change to total change in a variable over time. For example, the total change in gross outputs between two periods could be broken down into: (1) the part associated with changes in technology (as reflected, initially, in the changes in the Leontief inverse for the economy over the period); and (2) the part related to changes in final

<sup>2</sup> WIOD consist of World Input-Output Table (WIOT). The construction of WIOD and WIOT is described in detail in Timmer (2012) and Dietzenbacher, et al (2013).WIOD can be accessed on <http://www.wiod.org/>. All data are available for free.

<sup>3</sup> Based on NACE rev. 1, services comprise economic activities covered by wholesale and retail trade (sector G) to real estate, renting and business activities (sector K) and education (sector M) to other community, social and personal service activities (sector O) (OECD, 2013). The classification of commercial services refers to Goswami et al. (2012). The exclusion of personal services from the classification is also because this study tries to focus on the second wave of service sector growth and the so-called 'modern economy' as discussed in Eichengreen & Gupta (2009).

<sup>4</sup> However in the NIOT, health sector is presented in the same section with social work under 'Health and Social Work' industry. This of course becomes a data limitation.

demand over the period (both domestic final demand and export). At the next level, both Leontief inverse and final demand can be disaggregated into parts of interest (Miller & Blair, 2009).

The basic equation is as follows:

$$\begin{aligned} \mathbf{x}_1 - \mathbf{x}_0 &= (\mathbf{I} - \mathbf{A}_1)^{-1} \mathbf{f}_1 - (\mathbf{I} - \mathbf{A}_0)^{-1} \mathbf{f}_0 \\ &= \mathbf{M}_1 \mathbf{f}_1 - \mathbf{M}_0 \mathbf{f}_0 \end{aligned} \quad (2)$$

$$= (\mathbf{M}_1 - \mathbf{M}_0) \mathbf{f}_1 + \mathbf{M}_0 (\mathbf{f}_1 - \mathbf{f}_0) \quad (3)$$

$$= (\mathbf{M}_1 - \mathbf{M}_0) \mathbf{f}_0 + \mathbf{M}_1 (\mathbf{f}_1 - \mathbf{f}_0) \quad (4)$$

$\mathbf{x}$  =  $n$ -element (column) vector of gross output (or production value) in each sector, in which each element  $x_i$  in  $\mathbf{x}$  matrix indicates gross output in sector  $i$

$\mathbf{A}$  =  $n \times n$  matrix of intermediates, in which each element  $a_{ij}$  in  $\mathbf{A}$  matrix indicates the deliveries of good  $i$  (which is produced in sector  $i$ ) that are sold to sector  $j$  (as an intermediate input in the production of sector  $j$ )

$\mathbf{M}$  =  $(\mathbf{I} - \mathbf{A}_1)^{-1}$  = multiplier matrix or also known as the Leontief inverse

$\mathbf{f}$  =  $n \times k$  matrix of final demand categories, in which each element  $f_{ij}$  in  $\mathbf{f}$  matrix indicates the goods and services produced by sector  $i$  that are bought by category  $j$  (e.g. private consumption by the households).

In addition to equation (3) and (4), there are some other alternatives of decomposition (Miller & Blair, 2009). However, among many researchers, Dietzenbacher & Los (1998) examine a wide variety of possible decompositions and conclude that using an average of results from (3) and (4) is often an acceptable approach.

As this study aims to see the role of services, the overall sector will be classified as a service sector (S) and non-service sector (N). Furthermore, to see the different role of change in domestic final demand and export to the total output, final demand  $\mathbf{f}$  will be decomposed into domestic final demand  $\mathbf{d}$  and export which is represented by  $\mathbf{e}$ . Thus, the equation (3) is decomposed as follows:

$$\begin{aligned} \lambda(\mathbf{x}_1 - \mathbf{x}_0) &= \lambda(\mathbf{M}_1^S - \mathbf{M}_1^N) \mathbf{f}_1 && \text{(changes in services input)} \\ &+ \lambda(\mathbf{M}_1^N - \mathbf{M}_0) \mathbf{f}_1 && \text{(changes in non-services input)} \\ &+ \lambda \mathbf{M}_0 (\mathbf{d}_1^S - \mathbf{d}_0) && \text{(changes in domestic final demand for services sectors)} \\ &+ \lambda \mathbf{M}_0 (\mathbf{d}_1^N - \mathbf{d}_0) && \text{(changes in domestic final demand for non-services sectors)} \\ &+ \lambda \mathbf{M}_0 (\mathbf{e}_1^S - \mathbf{e}_0) && \text{(changes in export of services sectors)} \\ &+ \lambda \mathbf{M}_0 (\mathbf{e}_1^N - \mathbf{e}_0) && \text{(changes in export of non- services sectors)} \end{aligned} \quad (5)$$

Similarly, equation (4) is decomposed as follows:

$$\begin{aligned} \lambda(\mathbf{x}_1 - \mathbf{x}_0) &= \lambda(\mathbf{M}_1^S - \mathbf{M}_1^N) \mathbf{f}_0 && \text{(changes in services input)} \\ &+ \lambda(\mathbf{M}_1^N - \mathbf{M}_0) \mathbf{f}_0 && \text{(changes in non-services input)} \\ &+ \lambda \mathbf{M}_1 (\mathbf{d}_1^S - \mathbf{d}_0) && \text{(changes in domestic final demand for services sectors)} \\ &+ \lambda \mathbf{M}_1 (\mathbf{d}_1^N - \mathbf{d}_0) && \text{(changes in domestic final demand for non-services sectors)} \\ &+ \lambda \mathbf{M}_1 (\mathbf{e}_1^S - \mathbf{e}_0) && \text{(changes in export of services sectors)} \\ &+ \lambda \mathbf{M}_1 (\mathbf{e}_1^N - \mathbf{e}_0) && \text{(changes in export of non- services sectors)} \end{aligned} \quad (6)$$

Where  $\lambda$  is a diagonal matrix composed of one and zeros. The one appears in the location that corresponds to service sectors and all the other elements of the matrix are zero. In other words,  $\lambda$  in the equation will generate only element of service sector.

## Results and Discussion

### Services intensity of BRIIC economies

As discussed in the theoretical framework section, services coefficient or input coefficient of the service sector is the ratio of services intermediates used per unit of output in all sectors. The services coefficients of various sectors in each of BRIIC economies are presented in Table 2.1 to 2.5 in Appendix 2 with a highlight on the top five services intensive sector in each year. The tables present more detailed information of services intensity for each sector. During 2000-2010, it varied from 16.5% (agriculture) to 41.5% (mining and quarrying) in Brazil, from 18.5% (agriculture) to 45.3% (electricity, gas and water supply) in Russia, from 10.5% (agriculture) to 48% (rubber and plastic) in India, from 1.5% (coke, refined petroleum and nuclear fuel) to 35.2% (electrical

and optical equipment) in Indonesia, and 14.2 (agriculture) to 47.4% (public admin and defense; compulsory social security) in China.

**Table 1:** Average of service intensity between 2000-2005 and 2005-2010

Country	Average of Change		Trend
	2000-2005	2005-2010	
Brazil	-0.0010	0.0131	Increasing
Russia	0.0301	0.0608	Increasing
India	0.0143	0.0230	Increasing
Indonesia	0.0175	0.0198	Increasing
China	-0.0497	0.0394	Increasing

Table 1 shows the trend of average value of services intensity in BRIIC between two sub-periods. Although there is heterogeneity across economies and sectors, the results suggest that in all BRIIC economies, the average of the change of services coefficient increased in the second sub-period. It means that on average there is increasing use of services input per unit of output in the second period compared to the first sub-period. Therefore, there has been an increase in services intensity in BRIIC economies in the period 2005 – 2010 compared to that in 2000 – 2005.

#### Sources of growth of service sector in BRIIC economies

Structural decomposition analysis (SDA) model is used to identify the sources of growth of service sector in each of BRIIC economies. Referring to Dietzenbacher & Los (1998), the result of the analysis is derived from the average of (2.3) and (2.4). Table 3.1 until Table 3.5 in Appendix 3 provide information on the contributors to the services growth, which are divided into domestic final demand effect, export effect and technical coefficient effect (effect of the change in services input). Furthermore, each of them is similarly decomposed into the effect of services and non-services.

All BRIIC economies, except Brazil, show positive growth of services output in both sub-period 2000-2005 and 2005-2010. Moreover, when compared between two sub-periods, all economies experience an increase in growth of services except India which has modest decline from US\$ 265,356.68 million to US\$ 245,482.11 million. As for Brazil, although the growth of output is negative over first sub-period, it catches up over second sub-period with the increase from US\$ -114,368.95 to US\$ 660,774.08.

In all of the economies, domestic final demand effect has been the main factor in the growth of services output. All things being equal, the contribution of this effect exceeded more than 70% of overall effect in all economies, where final domestic demand for services contributed higher than the non-services one. The result implies that domestic services activities have mainly driven the growth of services output in BRIIC. Nevertheless, Brazil, India, and Indonesia show an increasing contribution of non-services domestic final demand in the second sub-period.

Another contributor to the growth of services output is export, includes both services and non-services. Its contribution varied across economies. The most striking feature can be seen in the case of Indonesia wherein output growth was dampened by the negative export effect in the first sub-period. Nevertheless, the export effect increased from -10.41% to 2.69% in the second sub-period. On the contrary, India and China show deteriorating effect of export between two sub-periods. In the case of India, the effect declined from 19.03% in the first sub-periods to 10.29% in the second sub-period. The decline was even dramatic in China which dropped from 25.10% in the first sub-periods to 9.10% in the second sub-period.

The decline of export contribution in the growth of services output in both economies during second sub-period might be affected by the re-shoring phenomenon which recently arises. Financial crises in 2008 have led to economic recession in developed economies including US and EU countries. This simultaneously occurred in the period when the real wage in developing economies strikingly increased. In China, for instance, the aggregate of the salaries and benefits of an average worker increased between 2000 and 2005 by 10% per year and have accelerated between 2005 and 2010 to 19% a year. Moreover, the Chinese government has set the target to increase the minimum wage by 13% per year until 2015. In India, wage rate has also grown by 10-20 % annually in the last decade (Margulescu & Margulescu, 2014).

Even though most of there-shored activities are manufacturing, it affects both services and non-services output because services activities are embedded in manufacturing as well, such as transportation, finance and renting and other business activities. Moreover, Heinemann Jr. (2013) addresses that nowadays closely

interrelating, even co-locating, research and development, design and marketing, manufacturing and assembly close to the markets become important again. It is recognized by companies as a strategy too much faster response to market shifts and much faster innovation. Therefore, the movement of manufacturing will give consequences on services, too.

The relatively low contribution of export effect in the growth of services output in BRIIC economies might relate to the challenging services export itself. Goswami et al. (2012) acknowledge that barriers to trade in services are more complex than barriers to trade in goods. The study mentions some examples of the types of barriers exporters face for the four modes of supply, which are cross-border trade, consumption abroad, commercial presence and movement of natural persons. The barriers for foreign services providers include not only explicit restrictions on entry but also on policy and regulation of domestic services. Domestic regulation is established either purely because countries differs in the choice and strictness (such as qualification or licensing requirements) or because of the purpose of merely protecting domestic providers.

Besides the effect from demand side (domestic final demand and export), the other effect which contributes to growth in services output is a technical coefficient effect. Except for the first sub-period in Brazil, the result suggests that production technology changes have positively contributed to the growth of services output associated with final demand shifts. In the second sub-period for instance, as shown in Appendix 3, the adoption of production technology has contributed to 2.4%, 19.12%, 6.87%, 4.98% and 6.74% increase in the output of services in Brazil, Russia, India, Indonesia and China respectively.

Moreover, the contribution of services technology has higher portion compared to non-services technology. It indicates that there has been an escalation of the role of services technology in services growth. This fact is somewhat anticipated since many services activities utilize and even rely on services input. For instance, financial and logistics industry much rely on information and telecommunication technology (ICT). The rise of ICT, in turn, enhances services output growth. This phenomenon has been identified much earlier in developed countries. Roach (1988) finds that in the United States, a much larger proportion of the services sector's capital budgets is spent on information technology relative to goods-producing industries. The result pinpoints a high dependence of services on service technology itself as a factor of production. Also, one of the findings of Guerrieri and Meliciani (2005) study suggest that in selected advanced countries, the same service producers are also intensive users of these producer services, namely Financial, Communication, and Business services. BRIIC as emerging economies, in this case, seems to follow the path of services in advanced economies.

## Conclusion

According to the analysis of services intensity, it is found that there has been an increase in the average of services intensity in the period 2005–2010 compared to that in 2000 – 2005. Furthermore, by developing basic structural decomposition analysis of Miller, this study has been able to explain various factors which affect the growth of service sector in BRIIC economies namely domestic final demand, export and changes in technology. Each of the factors is decomposed into services and non-services.

Except for the case of Brazil during sub-period 2000–2005, all BRIIC economies show increasing services output. In general, the result suggests that in BRIIC economies, final domestic demand has been the main driver of the growth of services. Nevertheless, there is heterogeneity across economies regarding the contribution of other effects. In most of the economies, the role of technology is still relatively small in acquiring increasing contribution, where the contribution of technology effect in services is higher than that in non-services. While there is variation in the export effect, the empirical findings show that India and China experienced the deteriorating effect of export between two sub-periods. The decline might be affected by the re-shoring phenomenon which recently arises.

Some existing literature (i.e., Jorgenson & Timmer, 2011; Noland, Park, & Estrada, 2012; OECD, 2005) have shown the rise and importance of service sector, particularly regarding its strong linkage in the economy. This study contributes to the services literature in explaining the factors affecting growth in services using the case of BRIIC as the largest emerging economies in today's world. Nonetheless, this study is not without limitation. Because it uses the data of aggregate level of services (comprises education and commercial services), it does not capture in detail each category of services (i.e., distribution, finance and business services and personal services, as discussed in Jorgenson & Timmer (2011). Moreover, aside from being five of the largest developing economies, BRIIC economies are quite heterogeneous in term of economic, social and political characteristics. Hence it is challenging to draw a specific conclusion which can represent the whole group.

Future research may focus on one particular economy and analyze and categorize some particular services instead of overall services. Furthermore, the opportunity to study service sector is still wide open and can be focused on different specific variables. Different objects of studies, such as developed and developing economies, might also lead to different result.

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## Appendix 1: Data and Methodology

Table 1.1 List of Service Sector

NIOT code	Service Sector
50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
51	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
52	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods
F	Construction
H	Hotels and Restaurants
60	Inland Transport
61	Water Transport
62	Air Transport
63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies
64	Post and Telecommunications
J	Financial Intermediation
70	Real Estate Activities
71t74	Renting of M&Eq and Other Business Activities
M	Education
N	Health and Social Work

Source: National Input Output Table

Table 1.2. Basic Outline of NIOT

	Industry			Final use/demand		Total output	
	1	2	3	Domestic	Export		
Industry	1	Z <sub>11</sub>	Z <sub>12</sub>	Z <sub>13</sub>	D <sub>1</sub>	E <sub>1</sub>	X <sub>1</sub>
	2	Z <sub>21</sub>	Z <sub>22</sub>	Z <sub>23</sub>	D <sub>2</sub>	E <sub>2</sub>	X <sub>2</sub>
	3	Z <sub>31</sub>	Z <sub>32</sub>	Z <sub>33</sub>	D <sub>3</sub>	E <sub>3</sub>	X <sub>3</sub>
Imports							
Value added							
Total output							

Note: the yellow-shaded area shows inter-industry linkages or the use of intermediate inputs in production stages.

## Appendix 2: Services Intensity

Table 2.1 Services coefficients of various sectors in Brazil for 2000, 2005 and 2010

Industry	Total Services Used				
	2000	2005	2010	Change 2000-2005	Change 2005-2010
1 Agriculture, Hunting, Forestry and Fishing	0.1653	0.1899	0.1897	0.0246	-0.0002
2 Mining and Quarrying	0.3446*	0.3623*	0.4150*	0.0177	0.0527
3 Food, Beverages and Tobacco	0.3265	0.3349*	0.3842*	0.0084	0.0494
4 Textiles and Textile Products	0.2428	0.2586	0.2789	0.0158	0.0203
5 Leather, Leather and Footwear	0.3495*	0.3292*	0.3265	-0.0203	-0.0028
6 Wood and Products of Wood and Cork	0.2079	0.2394	0.2330	0.0314	-0.0064
7 Pulp, Paper, Paper, Printing and Publishing	0.2752	0.2727	0.2869	-0.0025	0.0142
8 Coke, Refined Petroleum and Nuclear Fuel	0.3311	0.2990	0.2913	-0.0321	-0.0078
9 Chemicals and Chemical Products	0.3568*	0.3426*	0.3715*	-0.0142	0.0290
10 Rubber and Plastics	0.3361*	0.3138	0.3273	-0.0222	0.0135
11 Other Non-Metallic Mineral	0.3136	0.2938	0.3213	-0.0198	0.0276
12 Basic Metals and Fabricated Metal	0.2823	0.2807	0.2947	-0.0016	0.0140
13 Machinery, Nec	0.3025	0.3142	0.3284*	0.0117	0.0142
14 Electrical and Optical Equipment	0.3139	0.3150	0.3265	0.0011	0.0115
15 Transport Equipment	0.3559*	0.3653*	0.3792*	0.0094	0.0139
16 Manufacturing, Nec; Recycling	0.2444	0.2421	0.2528	-0.0023	0.0107
17 Electricity, Gas and Water Supply	0.1745	0.1679	0.1853	-0.0066	0.0174
18 Public Admin and Defence; Compulsory Social Security	0.3023	0.3184	0.3008	0.0161	-0.0176
19 Other Community, Social and Personal Services	0.2853	0.2642	0.2714	-0.0211	0.0071
20 Private Households with Employed Persons	0.0000	0.0000	0.0000	0.0000	0.0000
21 Services	0.2583	0.2431	0.2567	-0.0151	0.0136
			Average	-0.0010	0.0131

\*five highest services coefficients

**Table 2.2.** Services coefficients of various sectors in Russia for 2000, 2005 and 2010

Industry	Total Information Used				
	2000	2005	2010	Change 2000-2005	Change 2005-2010
1 Agriculture, Hunting, Forestry and Fishing	0.1850	0.2111	0.2791	0.0261	0.0680
2 Mining and Quarrying	0.2892	0.2020	0.2131	-0.0872	0.0112
3 Food, Beverages and Tobacco	0.2766	0.3366	0.4390*	0.0599	0.1025
4 Textiles and Textile Products	0.2533	0.3417*	0.3350	0.0884	-0.0067
5 Leather, Leather and Footwear	0.4037*	0.4249*	0.4338*	0.0212	0.0090
6 Wood and Products of Wood and Cork	0.2512	0.3021	0.3711	0.0509	0.0690
7 Pulp, Paper, Paper, Printing and Publishing	0.2613	0.3165	0.3855	0.0552	0.0689
8 Coke, Refined Petroleum and Nuclear Fuel	0.2700	0.3259	0.4062*	0.0559	0.0803
9 Chemicals and Chemical Products	0.2773*	0.3333	0.3839	0.0560	0.0506
10 Rubber and Plastics	0.2583	0.3427*	0.4251*	0.0844	0.0824
11 Other Non-Metallic Mineral	0.3043*	0.3134	0.3800	0.0091	0.0667
12 Basic Metals and Fabricated Metal	0.2908	0.3093	0.3867	0.0185	0.0774
13 Machinery, Nec	0.2539	0.2673	0.3596	0.0134	0.0923
14 Electrical and Optical Equipment	0.2376	0.2559	0.3288	0.0183	0.0729
15 Transport Equipment	0.2243	0.2303	0.3439	0.0060	0.1135
16 Manufacturing, Nec; Recycling	0.2220	0.3033	0.3942	0.0812	0.0909
17 Electricity, Gas and Water Supply	0.3085*	0.3474*	0.4527*	0.0390	0.1052
18 Public Admin and Defence; Compulsory Social Security	0.3640*	0.3711*	0.3920	0.0071	0.0209
19 Other Community, Social and Personal Services	0.2555	0.2450	0.3066	-0.0104	0.0615
20 Private Households with Employed Persons	0.0000	0.0000	0.0000	0.0000	0.0000
21 Services	0.2353	0.2739	0.3144	0.0386	0.0405
			Average	0.0301	0.0608

\*five highest services coefficients

**Table 2.3.** Services coefficients of various sectors in India for 2000, 2005 and 2010

Industry	Total Information Used				
	2000	2005	2010	Change 2000-2005	Change 2005-2010
1 Agriculture, Hunting, Forestry and Fishing	0.1047	0.1186	0.1197	0.0139	0.0011
2 Mining and Quarrying	0.1213	0.1471	0.1508	0.0257	0.0038
3 Food, Beverages and Tobacco	0.3853*	0.4035*	0.4390*	0.0182	0.0356
4 Textiles and Textile Products	0.3961*	0.3899	0.4059	-0.0062	0.0160
5 Leather, Leather and Footwear	0.4165*	0.3720	0.3969	-0.0445	0.0249
6 Wood and Products of Wood and Cork	0.2878	0.3001	0.3270	0.0123	0.0269
7 Pulp, Paper, Paper, Printing and Publishing	0.3644	0.3764	0.4415*	0.0119	0.0651
8 Coke, Refined Petroleum and Nuclear Fuel	0.1192	0.3357	0.5323*	0.2166	0.1966
9 Chemicals and Chemical Products	0.3623	0.3927	0.4352	0.0304	0.0425
10 Rubber and Plastics	0.4007*	0.4139*	0.4802*	0.0133	0.0663
11 Other Non-Metallic Mineral	0.3320	0.3954*	0.4330	0.0633	0.0376
12 Basic Metals and Fabricated Metal	0.3574	0.3914	0.4114	0.0340	0.0200
13 Machinery, Nec	0.3523	0.3985*	0.4141	0.0462	0.0156
14 Electrical and Optical Equipment	0.3400	0.4087*	0.4495*	0.0687	0.0408
15 Transport Equipment	0.3883*	0.3821	0.3836	-0.0062	0.0016
16 Manufacturing, Nec; Recycling	0.3545	0.2870	0.2166	-0.0676	-0.0704
17 Electricity, Gas and Water Supply	0.3234	0.3434	0.3764	0.0200	0.0330
18 Public Admin and Defence; Compulsory Social Security	0.0000	0.0000	0.0000	0.0000	0.0000
19 Other Community, Social and Personal Services	0.1982	0.1083	0.0638	-0.0899	-0.0445
20 Private Households with Employed Persons	0.1966	0.1083	0.0638	-0.0883	-0.0445
21 Services	0.2270	0.2543	0.2693	0.0273	0.0149
			average	0.01425	0.02299

**Table 2.4** Services coefficients of various sectors in Indonesia for 2000, 2005 and 2010

Industry	Total Information Used				
	2000	2005	2010	Change 2000-2005	Change 2005-2010
1 Agriculture, Hunting, Forestry and Fishing	0.0830	0.0881	0.0888	0.0050	0.0008
2 Mining and Quarrying	0.0245	0.0359	0.0462	0.0114	0.0103
3 Food, Beverages and Tobacco	0.1976	0.2100	0.1840	0.0123	-0.0260
4 Textiles and Textile Products	0.1720	0.2319	0.2010	0.0599	-0.0309
5 Leather, Leather and Footwear	0.2388	0.2690*	0.2755*	0.0302	0.0065
6 Wood and Products of Wood and Cork	0.2508*	0.2316	0.2484	-0.0192	0.0168
7 Pulp, Paper, Paper, Printing and Publishing	0.2517*	0.2471*	0.2957*	-0.0046	0.0486
8 Coke, Refined Petroleum and Nuclear Fuel	0.0149	0.0151	0.0228	0.0002	0.0077
9 Chemicals and Chemical Products	0.0649	0.0931	0.1145	0.0281	0.0214
10 Rubber and Plastics	0.1449	0.2058	0.2291	0.0609	0.0233
11 Other Non-Metallic Mineral	0.1183	0.1330	0.1878	0.0147	0.0548
12 Basic Metals and Fabricated Metal	0.1355	0.1420	0.1904	0.0065	0.0484
13 Machinery, Nec	0.2405	0.2537*	0.3295*	0.0132	0.0758
14 Electrical and Optical Equipment	0.3520*	0.3370*	0.2761*	-0.0149	-0.0609
15 Transport Equipment	0.1570	0.1987	0.2375	0.0417	0.0389
16 Manufacturing, Nec; Recycling	0.2284	0.2393	0.2628	0.0109	0.0235
17 Electricity, Gas and Water Supply	0.0761	0.1572	0.2299	0.0811	0.0728
18 Public Admin and Defence; Compulsory Social Security	0.2680*	0.2077	0.2356	-0.0603	0.0279
19 Other Community, Social and Personal Services	0.1313	0.2142	0.2272	0.0829	0.0130
20 Private Households with Employed Persons	0.0000	0.0000	0.0000	0.0000	0.0000
21 Services	0.2591*	0.2664*	0.3092*	0.0074	0.0428
Average				0.0175	0.0198

\*five highest services coefficients

**Table 2.5** Services coefficients of various sectors in China for 2000, 2005 and 2010

Industry	Total Information Used				
	2000	2005	2010	Change 2000-2005	Change 2005-2010
1 Agriculture, Hunting, Forestry and Fishing	0.1705	0.1423	0.1613	-0.0282	0.0190
2 Mining and Quarrying	0.2441	0.2139	0.2612	-0.0302	0.0473
3 Food, Beverages and Tobacco	0.2615	0.2204	0.2541	-0.0411	0.0337
4 Textiles and Textile Products	0.2746	0.2434	0.2820	-0.0312	0.0386
5 Leather, Leather and Footwear	0.3215*	0.2478	0.2715	-0.0737	0.0237
6 Wood and Products of Wood and Cork	0.3015	0.2389	0.2755	-0.0627	0.0366
7 Pulp, Paper, Paper, Printing and Publishing	0.3200	0.2601	0.3011	-0.0599	0.0410
8 Coke, Refined Petroleum and Nuclear Fuel	0.2451	0.1828	0.1893	-0.0623	0.0065
9 Chemicals and Chemical Products	0.3003	0.2538	0.3088	-0.0465	0.0550
10 Rubber and Plastics	0.2897	0.2390	0.2927	-0.0507	0.0537
11 Other Non-Metallic Mineral	0.3428*	0.2781*	0.3315*	-0.0647	0.0534
12 Basic Metals and Fabricated Metal	0.3374*	0.2481	0.2856	-0.0893	0.0375
13 Machinery, Nec	0.3124	0.2679	0.3276	-0.0445	0.0597
14 Electrical and Optical Equipment	0.2911	0.2453	0.3302*	-0.0458	0.0849
15 Transport Equipment	0.3149	0.2834*	0.3452*	-0.0315	0.0618
16 Manufacturing, Nec; Recycling	0.2740	0.2145	0.2423	-0.0595	0.0278
17 Electricity, Gas and Water Supply	0.2754	0.2186	0.2855	-0.0569	0.0669
18 Public Admin and Defence; Compulsory Social Security	0.4740*	0.3737*	0.3708*	-0.1004	-0.0028
19 Other Community, Social and Personal Services	0.3134	0.2824*	0.3242	-0.0311	0.0419
20 Private Households with Employed Persons	0.0000	0.0000	0.0000	0.0000	0.0000
21 Services	0.3420*	0.3088*	0.3508*	-0.0332	0.0420
Average				-0.0497	0.0394

\*five highest services coefficients

## Appendix 3: Sources of Output Growth

**Table 3.1** Source of output growth for service sector of Brazil 2000-2010  
(Constant price 2005)

Brazil	Overall Services			
	2000-2005		2005-2010	
	US\$ million	%	US\$ million	%
Change in services output	<b>-114,368.95</b>	<b>100.00</b>	<b>660,774.08</b>	<b>100.00</b>
1 Domestic final demand effect	<b>-122,580.10</b>	<b>107.18</b>	<b>615,911.96</b>	<b>93.21</b>
Services	-113,454.88	99.20	516,836.35	78.22
Non-services	-9,125.23	7.98	99,075.61	14.99
2 Export effect	<b>12,727.12</b>	<b>-11.13</b>	<b>28,877.49</b>	<b>4.37</b>
Services	1,732.63	-1.51	17,438.79	2.64
Non-services	10,994.49	-9.61	11,438.70	1.73
3 Technical coefficient effect	<b>-4,515.97</b>	<b>3.95</b>	<b>15,984.63</b>	<b>2.42</b>
Services	-11,471.51	10.03	29,105.56	4.40
Non-services	6,955.54	-6.08	-13,120.93	-1.99

**Table 3.2** Source of output growth for service sector of Russia 2000-2010  
(Constant price 2005)

Russia	Overall Services			
	2000-2005		2005-2010	
	US\$ million	%	US\$ million	%
Change in services output	<b>205,048.38</b>	<b>100.00</b>	<b>208,941.18</b>	<b>100.00</b>
1 Domestic final demand effect	<b>177,062.46</b>	<b>86.35</b>	<b>160,891.27</b>	<b>77.00</b>
Services	159,911.03	77.99	150,548.40	72.05
Non-services	17,151.43	8.36	10,342.87	4.95
2 Export effect	<b>13,243.48</b>	<b>6.46</b>	<b>8,097.40</b>	<b>3.88</b>
Services	7,268.05	3.54	9,666.57	4.63
Non-services	5,975.44	2.91	-1,569.17	-0.75
3 Technical coefficient effect	<b>14,742.44</b>	<b>7.19</b>	<b>39,952.51</b>	<b>19.12</b>
Services	4,397.96	2.14	36,364.00	17.40
Non-services	10,344.47	5.04	3,588.52	1.72

**Table 3.3** Source of output growth for service sector of India 2000-2010  
(Constant price 2005)

India	Overall Services			
	2000-2005		2005-2010	
	US\$ million	%	US\$ million	%
Change in services output	<b>265,356.68</b>	<b>100.00</b>	<b>245,482.11</b>	<b>100.00</b>
1 Domestic final demand effect	<b>198,743.07</b>	<b>74.90</b>	<b>203,374.05</b>	<b>82.85</b>
Services	172,920.52	65.17	178,233.25	72.61
Non-services	25,822.55	9.73	25,140.81	10.24
2 Export effect	<b>50,500.10</b>	<b>19.03</b>	<b>25,249.58</b>	<b>10.29</b>
Services	35,758.48	13.48	13,167.03	5.36
Non-services	14,741.62	5.56	12,082.55	4.92
3 Technical coefficient effect	<b>16,113.51</b>	<b>6.07</b>	<b>16,858.48</b>	<b>6.87</b>
Services	23,109.35	8.71	17,750.30	7.23
Non-services	-6,995.84	-2.64	-891.82	-0.36

**Table 3.4** Source of output growth for service sector of Indonesia 2000-2010  
(Constant price 2005)

Indonesia	Overall Services			
	2000-2005		2005-2010	
	US\$ million	%	US\$ million	%
Change in services output	<b>19,659.33</b>	<b>100.00</b>	<b>183,120.23</b>	<b>100.00</b>
1 Domestic final demand effect	<b>17,114.64</b>	<b>87.06</b>	<b>169,073.01</b>	<b>92.33</b>
Services	16,344.44	83.14	151,205.51	82.57
Non-services	770.19	3.92	17,867.50	9.76
2 Export effect	<b>-2,046.13</b>	<b>-10.41</b>	<b>4,934.60</b>	<b>2.69</b>
Services	1,251.29	6.36	2,291.51	1.25
Non-services	-3,297.42	-16.77	2,643.09	1.44
3 Technical coefficient effect	<b>4,590.90</b>	<b>23.35</b>	<b>9,112.60</b>	<b>4.98</b>
Services	4,083.23	20.77	5,816.63	3.18
Non-services	507.66	2.58	3,295.96	1.80

**Table 3.5** Source of output growth for service sector of China 2000-2010  
(Constant price 2005)

China	Overall Services			
	2000-2005		2005-2010	
	US\$ million	%	US\$ million	%
Change in services output	<b>906,661.00</b>	<b>100.00</b>	<b>3,003,478.00</b>	<b>100.00</b>
1 Domestic final demand effect	<b>769,778.16</b>	<b>84.90</b>	<b>2,527,689.21</b>	<b>84.16</b>
Services	672,114.85	74.13	2,247,281.10	74.82
Non-services	97,663.32	10.77	280,408.11	9.34
2 Export effect	<b>227,607.42</b>	<b>25.10</b>	<b>273,416.47</b>	<b>9.10</b>
Services	102,862.78	11.35	105,724.88	3.52
Non-services	124,744.64	13.76	167,691.59	5.58
3 Technical coefficient effect	<b>4,590.90</b>	<b>23.35</b>	<b>9,112.60</b>	<b>4.98</b>
Services	4,083.23	20.77	5,816.63	3.18
Non-services	507.66	2.58	3,295.96	1.80