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# HAVE IMPORTED PRODUCER SERVICES IMPROVED MANUFACTURING IN SHANGHAI?

# ДА ЛИ СУ УВЕЗЕНЕ ПРОИЗВОЂАЧКЕ УСЛУГЕ ПОБОЉШАЛЕ ПРОИЗВОДЊУ У ШАНГАЈУ?

**Summary:** *Imported producer services play a vital role in the continued development of the industrialized economies. Countries like the U.S., UK, Japan, Germany, etc., utilize imported scientific research to help domestic manufacturing. Most developing nations are in the early stages of adopting this strategy, China is no exception. Among the four mega metropolitans (Beijing, Shanghai, Tianjin and Chongqing) in China, Shanghai is the most advanced in the area of producer services; however, still lacking significantly behind Hong Kong and Singapore. The objective of this study is to examine whether imported producer services have been able to improve the manufacturing in Shanghai. We employ the input-output method to measure the effects of imported producer services on Shanghai manufacturing. Our findings are disappointing. Though Shanghai's imported producer services continue to rise, the high-end knowledge-based producer services are severely lacking; and, to make matters worse, the trend is downwards and thus the gap with its advanced neighboring economies is ever widening. If Shanghai is to achieve the lofty goal of becoming an international financial service hub, there remains much work to be done. The Shanghai government, indeed the Chinese government, needs to take more conservative actions towards achieving this objective rather than just to pay lip service.*

**Keywords:** *imported producer service; input-output method; manufacturing development*

**JEL classification:** *F14, F43*

**Резиме:** *Увезена производњачке услуге играју виталну улогу у континуираном развоју индустријских економија. Земље попут САД-а, Велике Британије, Јапана, Њемачке, итд, користе увезена научна истраживања како би помогли домаћу производњу. Већина земаља у развоју су у раним фазама усвајања ове стратегије, и Кина није изузетак. Међу четири метрополе (Пекинг, Шангај, Тјенцин и Хонг Конг) у Кини, Шангај је најнапреднији у области производњачких услуга; међутим, још увијек знатно заостаје иза Хонг Конга и Сингапура. Циљ ове студије је да испита да ли су увезене производњачке услуге могле утицати на побољшање производње у Шангају. У раду се користи метод инпута-аутпута за мјерење ефеката увезених производњачких услуга на производњу у Шангају. Резултати до којих смо дошли су разочаравајући. Иако увезене производњачке услуге у Шангају настављају да расту, производњачке услуге засноване на врхунском знању озбиљно недостају; и, да ствар буде гора, постоји тренд пада тако да се јаз у односу на напредне сусједне економије стално шири. Ако Шангај жели да постигне узвишени циљ да постане међународно чвориште финансијских услуга, мора још много тога да уради. Шангајска влада, односно кинеска влада, треба да предузме више конзервативних мјера у правцу постизања овог циља, него што је пуко плаћање услуга.*

**Кључне ријечи:** *увезене производњачке услуге, метод инпута-аутпута, развој производње*

**JEL класификација:** *F14, F43*

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## 1. INTRODUCTION

Bell (1973) divided the social development of an economy based on its per capita disposable income: pre-industrial society (per capita disposable income between $50-$600), early industrial society ($200-$600), industrial society ($600-$1500), advanced industrial society ($1,500-$4,000), and post-industrial society ($4,000-$20,000). The Shanghai metropolitan area, per capita disposable income is now $7000, suggesting that with some adjustment for inflation Shanghai is in the post-industrial stage of social development. Does Shanghai's economic structure reflect this status?

Shanghai has historically been one of the most open and westernized cities in China and was a major international metropolis by the end of the 19th century. The nightlife of Shanghai, especially the Bund, had appeared in numerous major Western motion pictures since the early 20th century. With the initiation of economic reform in 1978, Shanghai quickly regained its position as China's main gateway with the West, and replaced Hong Kong as the entry point for foreign investors.

Beijing will always be the center of political power. Since Deng Xiaoping's pivotal Southern Tour and the subsequent establishment of the Pudong special economic zone in the mid-1990s, Shanghai had been the focal point of China's economic reform and a major showcase for China's prosperity. As with all major municipalities, Shanghai has a minimal primary sector and is heavily dependent on the manufacturing and service sectors. Within the service sector, "Wholesale & Retail Trade" and "Financial Services" are the two dominant categories accounting for more than 60% of the value generated. With "Wholesale & Retail Trade" growing over time, expanding from 29% of all producer services in 2001 to more than 36% by 2011. In contrast financial services have decreased somewhat, down from 37% to around 27% during the same period. This is shown in Table 1. Within the producer service sector, "Leasing and Commercial Business" services showed the highest growth rate, close to three fold within the sample period. In contrast, "Information, and Software" services showed no growth, while "Science and Technical" services show some growth, but still account for only a minor portion of the overall producer service value added.

*Table 1 2001-2011 Shanghai Producer Service Structure (Billions of Yuan)*

| Year | Producer Service (billion yuan) | Traffic and Transportati-on, Storage and Postal Industry (%) | Information Transmission , Computer Service and Software (%) | Wholesale and Retail Trade (%) | Finance (%) | Leasing and Business Services (%) | Science Research, Technological Service and Geological Exploration (%) |
|---|---|---|---|---|---|---|---|
| 2001 | 1669.29 | 16.44 | 9.54 | 29.23 | 37.14 | 3.81 | 3.83 |
| 2002 | 1750.61 | 16.8 | 11.09 | 30.22 | 33.4 | 4.47 | 4.03 |
| 2003 | 1886.85 | 16.25 | 12.11 | 30.2 | 33.11 | 4.38 | 3.94 |
| 2004 | 1974.34 | 49.35 | 13.22 | 30.86 | 37.57 | / | / |
| 2005 | 2962.92 | 19.66 | 12.12 | 28.38 | 22.79 | 9.86 | 7.19 |
| 2006 | 3411.78 | 19.61 | 12.35 | 27.23 | 24.19 | 9.76 | 6.86 |
| 2007 | 4255.66 | 16.99 | 11.76 | 25.33 | 24.19 | 9.76 | 6.86 |
| 2008 | 5021.39 | 15.33 | 11.78 | 25.22 | 28.73 | 12.52 | 6.42 |
| 2009 | 6231.74 | 10.19 | 9.66 | 35.04 | 28.95 | 10.3 | 5.86 |
| 2010 | 7223.09 | 11.55 | 9.36 | 35.92 | 27.01 | 10.75 | 5.42 |
| 2011 | 8331.09 | 10.42 | 9.42 | 36.5 | 27.34 | 10.95 | 5.37 |

Source: Shanghai Statistical Yearbook (various years, 2000-2011).

Within China, Shanghai's producer services are among the most advanced; however, compared to other established service hubs in the area (e.g. Hong Kong and Singapore), there exists a large gap. To provide some context, in 2013 the Shanghai population was estimated to be 23.9 million, much larger than the 7.2 million of Hong Kong and 5.4 million of Singapore. Yet, Table 2 shows that for certain key producer services, Hong Kong and Singapore have larger value added of producer services even in absolute value. For traffic transportation and storage, Hong Kong is 24% higher than Shanghai (averaged between 2006 – 2010), while Singapore is an astonishing four times the size. In terms of wholesale and retail trade, Singapore is smaller, while Hong Kong is almost 50% higher than Shanghai.[1] In terms of financial services, Hong Kong and Singapore are 19% and 21% higher than Shanghai, respectively, but the gap is rapidly shrinking. In 2006, the value of financial services in Hong Kong was close to 25% higher than that of Shanghai, but by 2010, Shanghai had surpassed Hong Kong. A similar pattern exists for Singapore. This is certainly reflective of China's objective to establish Shanghai as a global financial hub by 2020 to rival London and New York.

*Table 2 Comparison of Shanghai, Hong Kong, and Singapore (Billions of Yuan)*

| Producer Service | Shanghai ( SH ) | | | | Hongkong ( HK ) | | | | Singapore ( SQ ) | | | | Comparison | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2006 | 2009 | 2010 | Average | 2006 | 2009 | 2010 | Average | 2006 | 2009 | 2010 | Average | HK/SH | SQ/SH |
| Traffic,Transportation and Storage | 669.01 | 635.01 | 834.40 | 712.80 | 944.25 | 755.40 | 956.05 | 885.24 | 2551.35 | 2809.84 | 3256.08 | 2872.42 | 1.24 | 4.02 |
| Wholesale and Retail Trade | 929.16 | 2183.85 | 2594.34 | 1902.45 | 2938.99 | 2785.55 | 2832.76 | 2852.44 | 1303.95 | 1347.40 | 1569.45 | 1406.93 | 1.49 | 0.73 |
| Finance | 825.20 | 1804.28 | 1950.96 | 1526.81 | 1853.10 | 1794.08 | 1817.69 | 1821.62 | 1531.45 | 1945.54 | 2085.12 | 1854.04 | 1.19 | 1.21 |

Source: Shanghai Statistical Yearbook 2000-2011

To achieve this ambitious goal, the prerequisites extend far beyond the financial services. To become a true international cosmopolitan, Shanghai needs to change its infrastructure, especially the "soft" infrastructure – the sphere of producer services, as China still lags behind in this aspect. This paper is an early attempt to explore how Shanghai can utilize imported producer services to promote manufacturing development and eventually break free from being the world's manufacturing sweatshop to become a major producer service provider and technical innovator. More importantly, we will examine the available empirical evidence to see whether Shanghai has made progress to this end.

## 2. SHANGHAI'S IMPORT TRADE IN PRODUCER SERVICES

Endogenous growth theory (Romer 1986; Lucas 1988; Rebelo 1991) postulates that the source of economic growth is endogenously driven via investments in human capital, innovations and knowledge. Thus, correct policy measures are instrumental in the long-run growth of an economy. For example, education and subsidies towards R&D will stimulate innovations and hence enhance the long-run growth rate of the economy. A country's technological advancements depend not only on domestic innovations however, but also on foreign research through international trade. As a result, a growing literature has focused on the diffusion and spillover of foreign technology through import trade.

[1] To most readers this should come as no surprise as Hong Kong is much more commercialized than Singapore, and is the top shopping destination for the Chinese.

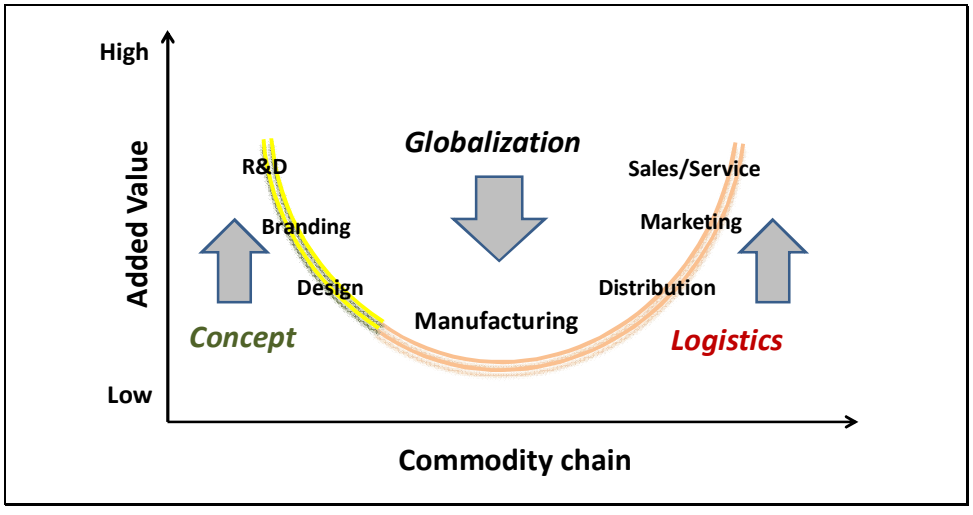
Madsen showed that the U.S., Japan, and the Scandinavian countries experienced approximately 300% GFP growth due to such technology spillovers (Madsen 2007). Keller estimated that benefits derived from foreign R&D in the same industry are on the order of 50% to 95% of the productivity of old R&D (Keller 2002). With the exception of the U.S., OECD countries derive almost all of their productivity growth from absorbing technology developed abroad, and even for the U.S. the absorption of foreign innovations stimulates two-thirds of its own technology growth (Eaton and Kortum 1996).

Trade has been an integral part of China's economic reform since its inception. By the mid-1990s, attracting FDI and the expansion of trade had taken center stage. Upon joining the WTO in 2001, China's staggering trade growth has been well documented and propelled China to the top of the watch list of the Federal Trade Commission - FTC (Hou et al. 2014). The object here is to gauge whether China benefited from Western technology through import trade and to develop appropriate policies to enhance the long-term growth of China. Our focus is on the positive externality and spillover effects associated with import trade of services in the city of Shanghai.

With the establishment of the Pudong Special Economic Zone in 1993 and the subsequent establishment of the Lujiazui Finance and Trade Zone and the Shanghai stock exchange, Shanghai has emerged as a major manufacturing center and financial hub for modern China. As China continues to improve its production structure and move up the world supply chain, manufacturing development has become a central focal point. With the degradation of the environment and the exhaustion of local resources, promoting manufacturing structure improvements is perhaps the optimal strategy to sustain long-term economic growth of greater Shanghai. The route that the Shanghai government hopes to pursue in terms of structural improvements is to enhance the post- sales services of manufacturing firms.

Vandermerwe and Rada introduced “servitization” in a manufacturing context, extending manufacturing firms from producing "material" finished products to material finished products plus services (Vandermerwe and Rada 1988). Recent studies have shown that globally 30% of manufacturing firms have servitized (Neely et al. 2011). There is widespread heterogeneity in terms of the degree of servitization across countries, but the gap may be narrowing. In 2007, 58% of U.S. manufacturers offered services while less than 1% of Chinese manufacturers offered services. By 2011, the U.S. figure had fallen slightly to 55% while the Chinese figure had grown significantly to just under 20%. This is viewed as strong evidence that China is attempting to evolve from the world manufacturing workhorse to a higher value-added service-complemented manufacturer.

*Figure 1 Smiling Curve: global commodity supply chain*



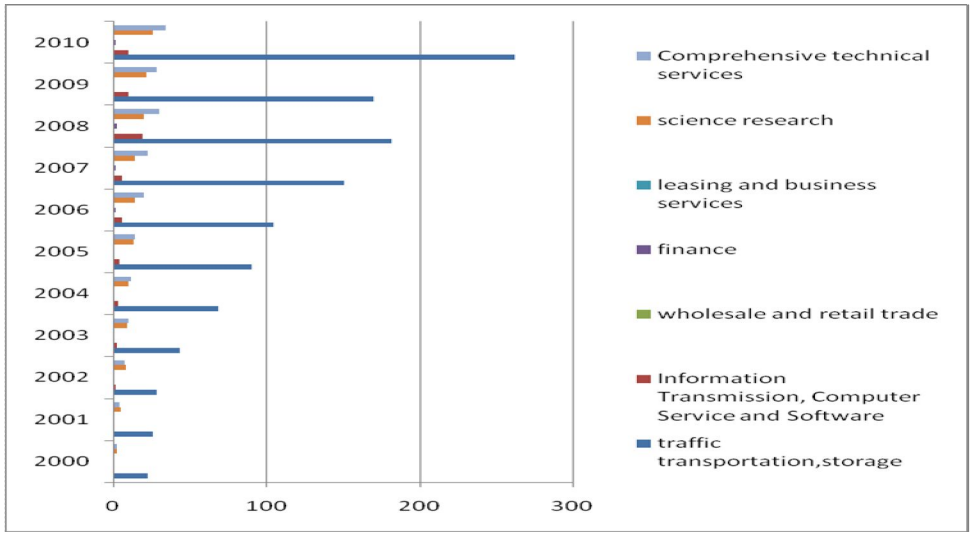

Source: Adapted from the Stan Shih “Smile Curve” concept

Economic success of China's reform is well-established. China, however, is facing many obstacles as it continues to further its economic development. The very factors that have been responsible for China's economic success are rapidly diminishing, either due to strains in the factor markets, faulty institutions, or past policies.[2] Despite the continued impressive GDP growth (though lower compared to the cost), the profit margin of China's manufacturing has decreased sharply (Choudhri and Schembri 2002). For example, the profit margin of China's steel industry dropped 56% between 2010 and 2012. This is perhaps best illustrated by the smiling curve shown in Figure 1. The tremendous growth of China's manufacturing after joining the WTO in 2001 has inevitably led to the thinning of the profit margin. As indicated in the graph, China has two routes to improve the profit margin, either moving up the product chain and engage in R&D research, product design and innovations, or post-sale services the manufacturing industry.

For a city like Shanghai, the aforementioned constraints that China faces are perhaps even more severe. Being a major port city, external trade is one of its vital staples. The import service trade can perhaps serve both of the above channels to increase the profitability of manufacturing firms by tapping into the positive externality and spillover effects of foreign technology and integrating service into the after sales of manufacturing products.

Imported producer services in Shanghai increased continuously since 2000 (Figure 2), with imported "Traffic, Transportation and Storage" as the most dominate component, which accounted for 78.33% of the producer service imports in 2000, totaling 26.22 billion Yuan, and increased more than tenfold by 2010. The second largest component is the imported "Comprehensive Technical Services" valued at 3.45 billion dollars, and accounted for 10.3% of the producer service imports in 2010. The vital producer services of "Science Research," and "Information Transmission" are lower at 2.63 billion and 0.97 billion, respectively; making up 7.85% and 4.37% of Shanghai's producer service imports in 2010. Imported Financial services rounded out the bottom, accounting for a mere 0.59% (0.2 billion Yuan).[3]

*Figure 2 Shanghai's Imported Producer Services, 2000-2010 (Billions of Yuan)*




Source: Shanghai Service Trade Development Report 2000-2011

[2] These include rent seeking (corruption), environmental degradation, aging population due to the one child policy, etc.

[3] This, of course, reflects the fact that the Chinese government has not liberated the financial sector and continues to maintain a firm grip by the State. The high savings rate of China, combined with the limited investment channels for households has led to the rational financial "herding" effects. The rush to hoard gold a few years ago was an example. The current stock market volatility in China is also a direct consequence.

In order to advance the manufacturing development of a nation, the import of Science Research producer services is perhaps most critical. To find a direct comparison of developed versus developing nations regarding this matter, we turn to the OECD database. The statistics are summarized in Table 3. As can be clearly seen, developed nations uniformly imported its actual amount of Science Research of and beyond what these nations produce themselves. This is certainly consistent with the conclusion of the literature (Madsen 2007; Keller 2002; Eaton and Kortum 1996). Among these developed nations, the U.S. stands out both in terms of growth rate and absolute dollar value. In terms of relative size by GDP, however, many other countries so even that of the U.S. When it comes to the developing countries, it is a completely different picture. As can be seen in the Table, with the exception of Russia, all the BRICS showed zero import of Science Research. Even Russia has shown dramatic decline and is probably zero currently. This is strong evidence supporting our findings and perhaps point to the Grand Canyon separating the developed from the developing countries.

*Table 3 Science Research Importation: Cross Country Comparison (U.S.$, Million)*

| Country \ Period | | **Mid-1990s** | **Eearly 2000s** | **Mid-2000s** |
|---|---|---|---|---|
| **Developed Countries** | US | 379.00000000 | 5608.83100000 | 9710.80350000 |
| | UK | 1009.99260000 | 1095.42450000 | 3674.55336000 |
| | Germany | 3041.97460000 | 4082.36590000 | 5795.15500000 |
| | Japan | 346.85455000 | 373.48860900 | 232.74783000 |
| | France | 1311.52500000 | 1052.14667000 | 2032.03502000 |
| | Italy | 441.10102000 | 339.93274000 | 478.75815000 |
| | Norway | 104.81188000 | 122.13350000 | 240.12417500 |
| | Netherland | 1493.47140000 | 1661.13880000 | 4484.40530000 |
| | Denmark | 0.00000000 | 116.09849200 | 293.93841000 |
| | Korea | NA | 0.00000000 | 2313.27580000 |
| **Developing Countries** | Brazil | 0.00000000 | 0.00000000 | 0.00000000 |
| | Russia | 232.70493000 | 11.75639500 | NA |
| | India | 0.00000000 | 0.00000000 | 0.00000000 |
| | South Africa | 0.00000000 | 0.00000000 | 0.00000000 |
| | China | 0.00000000 | 0.00000000 | 0.00000000 |

Source: OECD Stats 2015

How does importation of foreign producer service affect manufacturing development of the home country? Consoli (2005) showed that in an open economy, information technologies (ICT) were adopted by users that are most capable of improving manufacturing upgrades. ICT could optimize producer service trade structure through reducing technology gap in order to realize manufacturing upgrading. Research has also shown that when a country increases its producer service trade to compensate for the shortage of domestic final products, it generates an externality by introducing technology advancements (Markusen 1989; Markusen, et al. 2005; Francois 1990; Arnold et al. 2008; Amit and Konings 2007). Yang also found that the OECD countries often utilize imported producer services to enhance the development of the industries that they have traditional enjoyed comparative advantages (Yang 2015).

Hoekman found that certain producer services in India (such as finance, telecom, and transportation) help decrease the cost of downstream manufacturing sectors and improve the competitiveness of their final products (Hoekman 2006).[4] This suggests that developing countries with low productivity in their own producer services sector can reverse this adverse situation by importing producer services. Using EU data, Guerrieri and Meliciani (2005) found that imports of producer

[4] Arnold et al. 2015 and Bas 2014 has similar findings for India, while Fernandes and Paunov 2012 found strong evidence of FDI in services increased manufacturing productivity in Chile .

services help manufacturing accumulate knowledge. Macpherson (2008) found that outsourcing of producer services contributes to local manufacturing development. Hijzen et al provides the first firm-level evidence of the impact of the trade in producer services ('offshoring') on the labor market (Hijzen et al. 2011). They found that firms who utilize imported intermediate services experience faster employment growth than firms that do not.

Therefore, imports of producer services can generate externalities that can spur endogenous growth of the importing country. A small literature has found such evidence for Korea (Kim and Kim 2000) and China (Yang 2015; Ye and Zhao 2008; Meng 2010). This study attempts to add to this body of research.

## 3. METHODOLOGY

In terms of measuring manufacturing development, the literature is divided into two major camps. The first method is based on a variation of the traditional Cobb-Douglas production function. Within this camp, there are three major versions. One is to add energy, raw materials, and services to the traditional labor and capital inputs (Banga and Goldbar 2004). The second is to simply specify the production function as a function of labor, capital, and commercial services (Drejer 2002). The third is to specify the production function as a function of material inputs, labor, and knowledge intensive services (Antonelli 2000; Tomlinson 2000). Under this specification, the researcher can estimate the production function and examine the effect of service imports on manufacturing output and productivity.

The second approach is based on input-output analysis. It examines the relationship between manufacturing and service industries in an input-output table to examine the contribution of service imports to manufacturing production (Park 1994; Tomlinson 2000; Pilat and Wölfi 2005). This study is based on this line of research.

We start with a simplified input-output table for an open economy which can be summarized as:

| | Intermediate Use i=1,2,3…n | Final Use | | | | Import | Total Output |
|---|---|---|---|---|---|---|---|
| | | Consumption | Capital Formation | Export | Total | | |
| Intermediate Input j=1,2,3…n | $X_{i,j}$ | $C_i$ | $K_i$ | $EX_i$ | $Y_i$ | $M_i$ | $X_i$ |
| Added Value | $V_j$ | | | | | | |
| Total Input | $X_j$ | | | | | | |

The focus of this study is on the contribution of imported producer services on Shanghai's manufacturing sector. As such, we need a distribution of imported producer services across the advanced manufacturing. The problem is that the input-output table only provides an aggregate measure of the imported producer services and not the disaggregate distribution of the imported services across the manufacturing industries. This is shown in Table 4. A couple of things immediately catch the eye. First of all, in terms of "Science Research," the import values for 2002, 2005 and 2007 are zero. The explanation we received from the Bureau "the numbers were too small to be meaningful and hence recorded as zero." Our inquiry regarding "comprehensive technical services" of 2007 and 2010, and "wholesale and retail trade" for 2010 was met with the same answer.

*Table 4 Total Imported Producer Services in Shanghai (10,000 Yuan)*

| Year | Traffic Transportation,Storage | Information Transmission, Computer Service and Software | Wholesale and Retail Trade | Finance | Leasing and Business Services | Science Research | Comprehensive Technical Services |
|---|---|---|---|---|---|---|---|
| 2002 | 2210387.49000000 | 143357.78000000 | 6879.14000000 | 176870.99000000 | 1461413.06000000 | 0.00000000 | 49589.95000000 |
| 2005 | 5753767.00459273 | 241964.83882434 | 6762262.61533531 | 298529.73858866 | 2466629.82308096 | 0.00000000 | 83699.84704741 |
| 2007 | 5580720.00000000 | 2556261.00000000 | 2292027.00000000 | 87500.00000000 | 3186787.00000000 | 0.00000000 | 0.00000000 |
| 2010 | 17749629.00000000 | 651903.00000000 | 0.00000000 | 2585949.00000000 | 20396504.00000000 | 1780379.00000000 | 0.00000000 |

Source: Shanghai input-output table of 2002, 2005, 2007 and 2010

Whether this is genuine or a brush off is uncertain. Anyone who has dealt with local administration in China will most certainly not be surprised. If we take the official response as genuine, it could be the explanation for the low numbers. For the "wholesale and retail trade," it could simply reflect the overcapacity following the subprime crisis. For "science research," it could be the combination of the reluctance of foreign countries to sell such services to China and reflect the fact that Shanghai manufacturing was still at a relatively low level that advanced producer services in this category were not in demand.

As for "comprehensive technical services," it may reflect China's success in its push towards self-reliance on technical innovations. Hu Jingtao (former General Secretary of the Chinese Communist Party) emphasized that "self-reliance in terms of innovations is the critical link towards structural adjustment." Wen Jiabao (former Premier) also stated that "self-reliance of innovation is the core structure for the rise of a nation." When China revealed the guidelines for the 11th Five-Year-Plan in October of 2005, the self-reliance of innovation was again a key emphasis. The lack of imports of "comprehensive technical services" could reflect progress in this front.

To cope with this incomplete information, we adopt the method proposed by Shen and Wu 2003 and construct a noncompetitive input-output table:

| | Intermediate Use | Final Use | | | | Import | Total Output |
|---|---|---|---|---|---|---|---|
| | i=1,2,3…n | Consumption | Capital Formation | Export | Total | | |
| Intermediate Input j=1,2,3…n | $X_{ij}^{d}$ | $C_i^d$ | $K_i^d$ | $EX_i^d$ | $Y_i^d$ | | $X_i$ |
| Import Intermediate Input j=1,2,3…n | $X_{ij}^{m}$ | $C_i^m$ | $K_i^m$ | $EX_i^m$ | $Y_i^m$ | $M_i$ | |
| Added Value | $V_j$ | | | | | | |
| Total Input | $X_j$ | | | | | | |

where $X_{ij}^{d}$, $C_{ij}^{d}$, $K_{ij}^{d}$, $EX_{ij}^{d}$,and $Y_{ij}^{d}$ denote domestic intermediate use, domestic consumption, domestic capital formulation, domestic export, and domestic final output , respectively. $X_{ij}^{m}$, $C_{ij}^{m}$, $K_{ij}^{m}$, $EX_{ij}^{m}$, $Y_i^m$ represent the imported counterpart of the above. We thus construct the following relationships:

$$X_{ij}^{d} + X_{ij}^{m} = X_{ij} \tag{1}$$

$$C_i^d + C_i^m = C_i \tag{2}$$

$$K_i^d + K_i^m = K_i \tag{3}$$

$$EX_i^d + EX_i^m = EX_i \tag{4}$$

$$Y_i^d + Y_i^m = Y_i \tag{5}$$

Imports, both for intermediate and final uses are characterized as:

$$M_i = \sum_{j=1}^{n} X_{ij}^m + Y_i^m \tag{6}$$

$$Y_i^m = M_i \frac{Y_i}{\sum_{j=1}^{n} X_{ij} + Y_i} \tag{7}$$

$$\sum_{j=1}^{n} X_{ij}^m = M_i \frac{\sum_{j=1}^{n} X_{ij}}{\sum_{j=1}^{n} X_{ij} + Y_i} \tag{8}$$

By assuming that imports are homogeneous to domestic products, and hence perfect substitutes, we can scale imports for final use as follows:

$$C_i^m = \frac{C_i}{Y_i} Y_i^m \tag{9}$$

$$K_i^m = \frac{K_i}{Y_i} Y_i^m \tag{10}$$

$$EX_i^m = \frac{EX_i}{Y_i} Y_i^m \tag{11}$$

$$Y_i^m = C_i^m + K_i^m + EX_i^m \tag{12}$$

Imports for intermediate use are scaled in the same fashion:

$$X_{ij}^m = (\sum_{j=1}^{n} X_{ij}^m) \frac{X_{ij}}{\sum_{j=1}^{n} X_{ij}} \tag{13}$$

Thus we arrive at:

$$X_{ij}^d = X_{ij} - X_{ij}^m \tag{14}$$

Inherit in the input-output tables are the accounting consistency relationships:

$$\sum_{j=1}^{n} a_{ij}^d X_j^d + Y_i^d = X_i - M_i \tag{15}$$

and

$$\sum_{i=1}^{n} X_{ij}^d + \sum_{i=1}^{n} X_{ij}^m + V_j = X_j \tag{16}$$

where

$$\sum_{j=1}^{n} a_{ij}^{m} X_{j}^{m} + Y_{i}^{m} = M_{i} \tag{17}$$

Based on equations (9) – (14), we construct the non-competitive input-output table suggested above. The focus of this study is the impact of imported producer services on manufacturing. To this end, we will examine the consumption of imported producer services as a percentage of each industries total output. This import consumption coefficient (MCij) is defined as the ratio of the imported producer services of industry i used in the manufacturing of the output of industry j. In our context, the specific calculation is:

$$MC_{ij} = X_{ij}^{m} / X_{j} \tag{18}$$

This will be our primary measurement of the development of manufacturing industries.

## 4. EXPLORATORY EMPIRICAL ANALYSIS

The National Bureau of Statistics of China publishes the national input-output tables every five years. The Shanghai Bureau of Statistics constructs the Shanghai input-output table based on this. In our sample period, 2002 and 2007 tables came from this lineage. The Shanghai Bureau of Statistics also compiles "extension" tables for intermediate years, and this is where 2005 and 2010 tables come from. Based on methods described in the previous section, we compute the effect of imported producer service Shanghai's advanced manufacturing industries.

Following Yang 2013, we classify imported producer services into three categories based on their complexity level. The first category consists of imported high technology producer services: Science Research (SR), Comprehensive Technical Services (CTS), and Finance. The second category covers middle technology producer services: Information Transmission, Computer Service and Software (ITCSS), Leasing and Business Services (LBS). The final category is made up of low technology producer services: Wholesale and Retail Trade (WRT), Traffic Transportation and Storage (TTS).

*Table 5 Effect of Imported Producer Services on Shanghai Manufacturing, 2010*

| Imported Producer Services / Advanced Manufacturing | Petroleum Processing,Coking and Nuclear Fuel Processing | Chemical Industry | Non Metallic Mineral Products Industry | Metal Smelting and Pressing Industry | Metal Products Industry | General and Special Equipment | Transportation Equipment and Equipment Manufacturing Industry | Electrical Machinery and Equipment Industry | Communication, Computer and Other Electronic Equipment | Instruments and Stationary Office Industry |
|---|---|---|---|---|---|---|---|---|---|---|
| Traffic Transportation,Storage | 0.66954378 | 0.82938444 | 1.18509813 | 1.15737133 | 0.61108332 | 0.83196559 | 0.57926551 | 0.78195612 | 0.41660431 | 0.59793894 |
| Information Transmission, Computer Service and Software | 0.03819000 | 0.02865916 | 0.06015531 | 0.04075932 | 0.05612356 | 0.04210290 | 0.03841865 | 0.04556081 | 0.04874450 | 0.02697453 |
| Wholesale and Retail Trade | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| Finance | 0.11207364 | 0.13855886 | 0.14673601 | 0.15744282 | 0.11899705 | 0.13442213 | 0.21514715 | 0.30295148 | 0.11921399 | 0.07348858 |
| Leasing and Business Services | 0.05180177 | 1.19065916 | 1.32608182 | 0.13425747 | 0.84039513 | 0.81501265 | 2.65114499 | 1.62098189 | 0.69343292 | 0.36024931 |
| Science Research | 0.00000000 | 0.00904964 | 0.00384995 | 0.00606783 | 0.02106721 | 0.16300210 | 0.21741845 | 0.00833595 | 0.13546178 | 0.05394279 |
| Comprehensive Technical Services | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |

Source: authors calculation based on 2010 input-output table of Shanghai

We start with the most recent wave of data in our sample, 2010, shown in Table 5. The iimported producer services that have the most significant effect on manufacturing development in Shanghai are TTS and LBS, low- and middle-level producer services, respectively. Out of the 10 advanced

manufacturing industries in this study, two had an import consumption coefficient (MCij) exceeding 1% of the total imports used in the manufacturing process which came from the imported producer services. If we round to two decimals, 7 of the 8 remaining industries will come out to 1% also.

For the middle level producer services LBS, the picture is a little bit more promising. Four of the ten advanced manufacturing industries exhibited an import consumption coefficient exceeding 1%, with "transportation equipment and equipment manufacturing" topping the list at 2.65.5 If we round to two decimals, an additional three out of the six remaining advanced manufacturing industries will have an import consumption coefficient approaching 1%. For the high-end producer services, saying the effect is marginal are being overly generous. CTS could be a data issue, but "Finance" and "Science Research" also show little impact as an input in the advanced manufacturing industries of Shanghai.

*Table 6 Effect of Imported Producer Services on Shanghai Manufacturing, 2007*

| Imported Producer Services / Advanced Manufacturing | Petroleum Processing,Coking and Nuclear Fuel Processing | Chemical Industry | Non Metallic Mineral Products Industry | Metal Smelting and Pressing Industry | Metal Products Industry | General and Special Equipment | Transportation Equipment and Equipment Manufacturing Industry | Electrical Machinery and Equipment Industry | Communication, Computer and Other Electronic Equipment | Instruments and Stationary Office Industry |
|---|---|---|---|---|---|---|---|---|---|---|
| Traffic Transportation,Storage | 0.53109658 | 0.48137272 | 0.63548080 | 0.59656013 | 0.35601766 | 0.41697842 | 0.31270260 | 0.46540833 | 0.17799343 | 0.41473944 |
| Information Transmission, Computer Service and Software | 0.44308640 | 0.35828340 | 0.41416196 | 0.45252863 | 0.47825639 | 0.45452510 | 0.44671799 | 0.48370179 | 0.44858377 | 0.27366236 |
| Wholesale and Retail Trade | 0.48553569 | 0.44896129 | 0.47256470 | 0.45949109 | 0.50835983 | 0.22685000 | 0.14923822 | 0.43113857 | 0.43894823 | 0.53493188 |
| Finance | 0.00757375 | 0.00835353 | 0.00588436 | 0.00889711 | 0.00590634 | 0.00854447 | 0.01206423 | 0.01551069 | 0.00529075 | 0.00434264 |
| Leasing and Business Services | 0.02044110 | 0.43145536 | 0.31051888 | 0.04430114 | 0.24356813 | 0.30250523 | 0.89353166 | 0.47994837 | 0.18497270 | 0.12430295 |
| Science Research | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| Comprehensive Technical Services | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |

Source: authors calculation based on 2007 input-output table of Shanghai.

One could speculate that this could be reflecting the slow recovery from the subprime crisis. This could be verified or refuted by examining the 2007 situation (as shown in Table 6). Clearly, the less than stellar performance of 2010 was not the result of a slow recovery from the global subprime crisis, as the pre-crisis 2007 was far worse. Not a single industry exhibited an import consumption coefficient higher than 1% for any imported producer services. The closest was a 0.89 coefficient for the utilization of LBS (middle-level producer service) for the "transportation equipment and equipment manufacturing" industry.

[5] The high-speed railroad system in China (the G-trains and D-trains) is a modern marvel, both in its quality and its immense scale. It is largely manufactured in China domestically. Let us not forget that Airbus industries have several joint venture operations in China producing A320 family aircrafts and the new A350 XWB since 2009.

*Table 7 Effect of Imported Producer Services on Shanghai Manufacturing, 2005*

| Imported Producer Services / Advanced Manufacturing | Petroleum Processing,Coking and Nuclear Fuel Processing | Chemical Industry | Non Metallic Mineral Products Industry | Metal Smelting and Pressing Industry | Metal Products Industry | General and Special Equipment | Transportation Equipment and Equipment Manufacturing Industry | Electrical Machinery and Equipment Industry | Communication, Computer and Other Electronic Equipment | Instruments and Stationary Office Industry |
|---|---|---|---|---|---|---|---|---|---|---|
| Traffic Transportation,Storage | 1.23216394 | 0.38995820 | 0.58456742 | 0.31495793 | 0.28166888 | 0.16110561 | 0.27122865 | 0.17335151 | 0.08265254 | 0.19137757 |
| Information Transmission, Computer Service and Software | 0.01085366 | 0.02754341 | 0.03018112 | 0.00783928 | 0.01302279 | 0.01693918 | 0.02326642 | 0.01673474 | 0.01110517 | 0.02810773 |
| Wholesale and Retail Trade | 2.32607557 | 1.09183251 | 0.94112259 | 0.86683238 | 0.89822710 | 0.46588854 | 0.86900945 | 0.83238426 | 0.62321108 | 0.81946537 |
| Finance | 0.06936307 | 0.03833507 | 0.03512465 | 0.02563377 | 0.01611276 | 0.01312658 | 0.01867506 | 0.01881651 | 0.01825239 | 0.02717936 |
| Leasing and Business Services | 0.26138989 | 1.08461702 | 0.80586283 | 0.19136051 | 0.44542224 | 0.23127412 | 0.72628651 | 0.35406509 | 0.16772477 | 0.48049272 |
| Science Research | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| Comprehensive Technical Services | 0.01412839 | 0.00695578 | 0.00993789 | 0.00222463 | 0.00623632 | 0.00631754 | 0.00856091 | 0.00930443 | 0.00637531 | 0.01338266 |

Source: authors calculation based on 2005 input-output table of Shanghai.

*Table 8 Effect of Imported Producer Services on Shanghai Manufacturing, 2002*

| Imported Producer Services / Advanced Manufacturing | Petroleum Processing,Coking and Nuclear Fuel Processing | Chemical Industry | Non Metallic Mineral Products Industry | Metal Smelting and Pressing Industry | Metal Products Industry | General and Special Equipment | Transportation Equipment and Equipment Manufacturing Industry | Electrical Machinery and Equipment Industry | Communication, Computer and Other Electronic Equipment | Instruments and Stationary Office Industry |
|---|---|---|---|---|---|---|---|---|---|---|
| Traffic Transportation,Storage | 0.75183184 | 0.42536262 | 0.66469481 | 0.48049205 | 0.43349684 | 0.10093437 | 0.36840235 | 0.29801587 | 0.16320818 | 0.29857513 |
| Information Transmission, Computer Service and Software | 0.00370616 | 0.01681337 | 0.01920521 | 0.00669277 | 0.01121624 | 0.00593905 | 0.01768529 | 0.01610002 | 0.01227176 | 0.02454055 |
| Wholesale and Retail Trade | 0.00434330 | 0.00364453 | 0.00327475 | 0.00404681 | 0.00423036 | 0.00089321 | 0.00361206 | 0.00437905 | 0.00376587 | 0.00391235 |
| Finance | 0.04570873 | 0.04516024 | 0.04313386 | 0.04223426 | 0.02678155 | 0.00888175 | 0.02739475 | 0.03493570 | 0.03892460 | 0.04579525 |
| Leasing and Business Services | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| Science Research | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| Comprehensive Technical Services | 0.00711543 | 0.00626245 | 0.00932692 | 0.00280122 | 0.00792195 | 0.00326688 | 0.00959762 | 0.01320256 | 0.01039067 | 0.01723303 |

Source: authors calculation based on 2002 input-output table of Shanghai.

Going further back to 2005 and 2002 (Tables 7 and 8, respectively) does not provide much additional insight. To better use the process from a time trend perspective, we summarized Tables 5 thru 8 into Table 9. If you examine in terms of aggregate growth levels (AGL), the imported producer service that show the largest increase in terms of import consumption coefficient seems to be LBS, which is a middle-level producer service. This is somewhat misleading, however, as the 2002 input output table had a zero value for LBS. And if we look at the AGLLBS from 2005 through 2010, the growth would be far less impressive. Wholesale and retail trade (WRT) has just the opposite pattern. If we ignore 2010 (where the input output table had a zero value for WRT) the AGL would be positive and very large. This would make WRT and TTS as the two imported producer services that have the largest impact on Shanghai's advanced manufacturing industries.

*Table 9 Effect of Imported Producer Services on Shanghai Manufacturing, 2002-2010*

| Imported Producer Services / Advanced Manufacturing | Year | Petroleum Processing,Coking and Nuclear Fuel Processing | Chemical Industry | Non Metallic Mineral Products Industry | Metal Smelting and Pressing Industry | Metal Products Industry | General and Special Equipment | Transportation Equipment and Equipment Manufacturi | Electrical Machinery and Equipment Industry | Communication,Computer and Other Electronic Equipment | Instruments and Stationary Office Industry |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Traffic Transportation,Storage | 2002 | 0.75183184 | 0.42536262 | 0.66469481 | 0.48049205 | 0.43349684 | 0.10093437 | 0.36840235 | 0.29801587 | 0.16320818 | 0.29857513 |
| | 2005 | 1.23216394 | 0.38995820 | 0.58456742 | 0.31495793 | 0.28166888 | 0.16110561 | 0.27122865 | 0.17335151 | 0.08265254 | 0.19137757 |
| | 2007 | 0.53109658 | 0.48137272 | 0.63548080 | 0.59656013 | 0.35601766 | 0.41697842 | 0.31270260 | 0.46540833 | 0.17799343 | 0.41473944 |
| | 2010 | 0.66954378 | 0.82938444 | 1.18509813 | 1.15737133 | 0.61108332 | 0.83196559 | 0.57926551 | 0.78195612 | 0.41660431 | 0.59793894 |
| | AGL | -0.02057201 | 0.10100545 | 0.13010083 | 0.16921982 | 0.04439662 | 0.18275781 | 0.05271579 | 0.12098506 | 0.06334903 | 0.07484095 |
| Information Transmission, Computer Service and Software | 2002 | 0.00370616 | 0.01681337 | 0.01920521 | 0.00669277 | 0.01121624 | 0.00593905 | 0.01768529 | 0.01610002 | 0.01227176 | 0.02454055 |
| | 2005 | 0.01085366 | 0.02754341 | 0.03018112 | 0.00783928 | 0.01302279 | 0.01693918 | 0.02326642 | 0.01673474 | 0.01110517 | 0.02810773 |
| | 2007 | 0.44308640 | 0.35828340 | 0.41416196 | 0.45252863 | 0.47825639 | 0.45452510 | 0.44671799 | 0.48370179 | 0.44858377 | 0.27366236 |
| | 2010 | 0.03819000 | 0.02865916 | 0.06015531 | 0.04075932 | 0.05612356 | 0.04210290 | 0.03841865 | 0.04556081 | 0.04874450 | 0.02697453 |
| | AGL | 0.00862096 | 0.00296145 | 0.01023753 | 0.00851664 | 0.01122683 | 0.00904096 | 0.00518334 | 0.00736520 | 0.00911818 | 0.00060850 |
| Wholesale and Retail Trade | 2002 | 0.00434330 | 0.00364453 | 0.00327475 | 0.00404681 | 0.00423036 | 0.00089321 | 0.00361206 | 0.00437905 | 0.00376587 | 0.00391235 |
| | 2005 | 2.32607557 | 1.09183251 | 0.94112259 | 0.86683238 | 0.89822710 | 0.46588854 | 0.86900945 | 0.83238426 | 0.62321108 | 0.81946537 |
| | 2007 | 0.48553569 | 0.44896129 | 0.47256470 | 0.45949109 | 0.50835983 | 0.22685000 | 0.14923822 | 0.43113857 | 0.43894823 | 0.53493188 |
| | 2010 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| | AGL | -0.00108583 | -0.00091113 | -0.00081869 | -0.00101170 | -0.00105759 | -0.00022330 | -0.00090302 | -0.00109476 | -0.00094147 | -0.00097809 |
| Finance | 2002 | 0.04570873 | 0.04516024 | 0.04313386 | 0.04223426 | 0.02678155 | 0.00888175 | 0.02739475 | 0.03493570 | 0.03892460 | 0.04579525 |
| | 2005 | 0.06936307 | 0.03833507 | 0.03512465 | 0.02563377 | 0.01611276 | 0.01312658 | 0.01867506 | 0.01881651 | 0.01825239 | 0.02717936 |
| | 2007 | 0.00757375 | 0.00835353 | 0.00588436 | 0.00889711 | 0.00590634 | 0.00854447 | 0.01206423 | 0.01551069 | 0.00529075 | 0.00434264 |
| | 2010 | 0.11207364 | 0.13855886 | 0.14673601 | 0.15744282 | 0.11899705 | 0.13442213 | 0.21514715 | 0.30295148 | 0.11921399 | 0.07348858 |
| | AGL | 0.01659123 | 0.02334966 | 0.02590054 | 0.02880214 | 0.02305388 | 0.03138510 | 0.04693810 | 0.06700394 | 0.02007235 | 0.00692333 |
| Leasing and Business Services | 2002 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| | 2005 | 0.26138989 | 1.08461702 | 0.80586283 | 0.19136051 | 0.44542224 | 0.23127412 | 0.72628651 | 0.35406509 | 0.16772477 | 0.48049272 |
| | 2007 | 0.02044110 | 0.43145536 | 0.31051888 | 0.04430114 | 0.24356813 | 0.30250523 | 0.89353166 | 0.47994837 | 0.18497270 | 0.12430295 |
| | 2010 | 0.05180177 | 1.19065916 | 1.32608182 | 0.13425747 | 0.84039513 | 0.81501265 | 2.65114499 | 1.62098189 | 0.69343292 | 0.36024931 |
| | AGL | 0.01295044 | 0.29766479 | 0.33152045 | 0.03356437 | 0.21009878 | 0.20375316 | 0.66278625 | 0.40524547 | 0.17335823 | 0.09006233 |
| Science Research | 2002 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| | 2005 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| | 2007 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| | 2010 | 0.00000000 | 0.00904964 | 0.00384995 | 0.00606783 | 0.02106721 | 0.16300210 | 0.21741845 | 0.00833595 | 0.13546178 | 0.05394279 |
| | AGL | 0.00000000 | 0.00226241 | 0.00096249 | 0.00151696 | 0.00526680 | 0.04075052 | 0.05435461 | 0.00208399 | 0.03386544 | 0.01348570 |
| Comprehensive Technical Services | 2002 | 0.00711543 | 0.00626245 | 0.00932692 | 0.00280122 | 0.00792195 | 0.00326688 | 0.00959762 | 0.01320256 | 0.01039067 | 0.01723303 |
| | 2005 | 0.01412839 | 0.00695578 | 0.00993789 | 0.00222463 | 0.00623632 | 0.00631754 | 0.00856091 | 0.00930443 | 0.00637531 | 0.01338266 |
| | 2007 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| | 2010 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| | AGL | -0.00177886 | -0.00156561 | -0.00233173 | -0.00070031 | -0.00198049 | -0.00081672 | -0.00239940 | -0.00330064 | -0.00259767 | -0.00430826 |

Source: authors calculation based on 2002, 2005, 2007, and 2010 input-output table of Shanghai.

Of course, the problem is both WRT and TTS are at the low-end of producer services. For the middle-level imported producer services, both ITCS and the adjusted LBS show marginal contribution. For the high-end imported producer services, only Finance showed a small positive contribution, while the other two (SR and CTS) have potential measurement issues. All in all, Shanghai's progress towards manufacturing development has shown limited progress at best.

## 5. CONCLUSION AND SUGGESTION

As China enters its fourth decade of economic reform characterized by a long series of pragmatic institutional restructuring (Hou 2011), its success has astonished the industrialized world and became the envy of all developing economies. As impressive as China's GDP growth has been, it is perhaps even more impressive by the fact that at the start of the reform (1978) less than 1% of the world's population lived at a per capita GDP lower than China, whereas now China can boast a standard of living higher than 55% of the world's population.

Despite China's success, it is mostly growth through perspiration as China has become the manufacturing factory of the world. In terms of the smiling curve (Figure 1), China is at the lowest point of value added in terms of the supply chain. China has repeatedly stated its intention to move both upstream and downstream in the global supply chain, towards growth through inspiration. To this end, endogenous growth theory postulates that investments in human capital, innovations and knowledge are needed. China has indeed implemented various policies in this direction.

A country's technological advancements, not only depend on domestic innovations but also on foreign research through international trade. Literature has shown that many industrialized nations have benefited through from technology spillovers from foreign R&D. This paper is a preliminary inquiry into whether China benefited from Western technology through import trade. Our focus is on the positive externality and spillover effects associated with import trade of producer services in the city of Shanghai.

Utilizing the input-output table of Shanghai City compiled by the Shanghai Bureau of Statistics, we computed the import consumption coefficient of ten advanced manufacturing industries. We had hoped to find an increased consumption of high level imported producer services in Shanghai's advanced manufacturing. The evidence was clearly against this. Though we found weak evidence of Finance (a high-end imported producer service) exhibiting a positive and increasing impact on Shanghai's advanced manufacturing, the more pronounced imported producer services were "Traffic Transportation and Storage" and "Wholesale and Retail Trade" (both low-end imported producer services); while the middle level producer service "information transmission, computer service and software" showed positive but weak impact on the servitization of Shanghai's manufacturing.

There are several possibilities for this lack of evidence. As with many studies on China, data is a constant issue, and we are certainly not immune. The governing agency responded to our inquiries that the dollar numbers were too low and the Bureau felt actual recording was not necessary. We examined the input-output table of all 30 provinces and direct control cities and found that 14 of them had zero entries for the import of Comprehensive Technical Services, while 12 of them had zero entries for the import of Science Research. This lends credence to the explanation given by the Bureau, and is further substantiated when compared to the other BRICS nations in Table 3.

With the issue of the lack of imported producer services of Science Research resolved, the absence of advanced manufacturing industries in Shanghai remains. Two more plausible possibilities exist and are part of our immediate plan for further research. First, the imported producer services may play a more decisive role in the mid-level manufacturing industries at this stage of Shanghai's development. Second, our choice of using percentage of the imported producer service in the total input of a given manufacturing may not be the best measure; we are considering measuring the effect of the consumption of imported producer services on the value added of the manufacturing industry.

This is a preliminary and exploratory study. As far as we know this is the first study to examine Chinese manufacturing development using the input-output table approach. It is our goal to bring this interesting and important issue to the attention of scholars in this field and to further advance studies in this direction to provide guidance as China tries to evolve from "growth through perspiration" to "growth through inspiration" in its long march towards prosperity for all its people.

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