

Outsourcing and Fragmentation in Singapore Manufacturing Industry

Toh Mun Heng *

Shandre M. Thangavelu

Ng Kwan Kee

National University of Singapore

***Correspondence address:** Department of Business Policy, National University of Singapore, Singapore 119260. Email Address:: ecssmt@nus.edu.sg .

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Abstract

This paper studies the impact of outsourcing on productive performance of manufacturing industries in Singapore. The paper develops an outsourcing measure based on the narrow definition of intermediate imports given by Feenstra and Hanson (1996, 1999). Based on the input-output tables, the study uses 5-digit industrial level classifications to measure the impact of outsourcing on productivity of the manufacturing industries in Singapore from 1995 to 2004. The outsourcing measure is further decomposed by imports of services, imports of IT services and imports of business and services. This decomposition allows us to study the impact of outsourcing of services in addition to the cross-border fragmentation of components. The results suggest strong positive impact of cross-border sourcing on the productivity of the manufacturing sector. The decomposition of outsourcing measure indicates that the manufacturing industries are more involved in cross-border sourcing of services and particularly in business services.

1. Introduction

The global landscape is constantly changing due to rapid globalization and technological shocks. These changes are more prevalent in the late 1990s as indicated by the Asian crisis, SARs, global terrorism, etc. In a small open economy, these external shocks have greater impact on the domestic markets in terms of fluctuations in output and employment. In Singapore, the global effects are felt through the “hallowing-out” effects as the MNCs fragment their production structure and move the more labour-intensive production to low labour cost economies.

The developments in information and communication technologies (ICT) is clearly the most important innovation that have led to the greater role in intensifying the impact of cross-border sharing, cross-border production fragmentation, in opening up markets and increasing global trade. The development of these technologies have reduced the cost of coordinating production across the borders and allowed producers to “unbundled” or break up the production structure by moving certain aspects of their less competitive activities such as component production and local assembly to neighbouring countries. The gains from trade from such cross-border production fragmentation activities are well defined in theoretical frameworks of Arndt and Kierzkowshi (2001), Jones and Kierzkowshi (2001) and Deardorff (2001). The capital- abundant and high-wage countries tend to have competitive advantage in skilled and capital intensive activities. In this case, they could maintain their competitiveness, with rising wages, by unbundling their labour-intensive activities to lower wage cost countries. This constant outsourcing and fragmenting of their production structure will enable them to maintain their competitiveness in terms lower cost of production and higher productivity. In fact, cross-border sourcing of activities and components could be treated as technical progress that would have similar effects on productivity and efficiency (Arndt, 1999; Jones and Kierzkowshi, 2001).

Singapore economy has been adopting cross-border sourcing in its development and growth strategy since the 1970s in the form of the “flying geese” with East Asian countries, Free Trade Agreements (FTAs) in the late 1990s and with the “growth triangle” or with the “sub-regional economic zones” (Toh, 2006). The recent announcement of new initiatives of ‘closer economic partnerships’ (CEPs) is a prime example of policy to encourage cross-border sourcing, forming the Indonesia-Malaysia-Singapore growth triangle (IMS-GT), is an interesting economic strategy of consolidating the Singapore economy as part of the regional and global value-chain.

This paper studies the impact of outsourcing on productivity of manufacturing industries in Singapore. The paper develops an outsourcing measure based on the narrow definition of intermediate imports given by Feenstra and Hanson (1996, 1999). Based on the input-output tables, the study uses 5-digit industrial level classification to measure the impact of outsourcing on productivity and export growth of the manufacturing industries in Singapore from 1995 to 2004. The outsourcing measure is further decomposed by imports of services, imports of IT services and imports of business and services. This decomposition allows us to study the impact of outsourcing of services in addition to the cross-border fragmentation of components.

The recent paper by Hoon and Ho(2002) provides an overview of the changing pattern of production fragmentation in Singapore since 1970s. The paper highlights the role of multinational corporations as the main driver of cross-border activities in Singapore and that the production fragmentation is expected to have a positive impact on the wage gap between skilled and unskilled workers as economy restructures towards a knowledge-intensive economy. More recent paper by Arndt (2002) on production sharing and global competitiveness of Singapore economy suggests that the economy’s comparative advantage tends to vary across the various components and its ability to compete in the global market

depends on how well it is able to source from lowest-cost suppliers. In fact, the paper suggests that cross-border sourcing of components could have important productivity and efficiency gains to the Singapore economy, which is very similar in nature to technical progress. The objective of the paper is to measure the productivity and efficiency gains from the outsourcing activities for the Singapore manufacturing industries.

The structure of the paper is given as follows. The next section provides the recent economic trends in Singapore. Section 3 gives the description of the data. The trends of outsourcing components are given in section 4. We discuss the impact of outsourcing in section 5. Section 6 gives the policy conclusion.

2. Key Trends in Singapore Economy

Since the Asian crisis in 1997, the growth of the Singapore economy has been moderate and volatile due to such events as the Asian financial crisis, the slowdown in the US and global economies, SARS, and the on-going war on terrorism. Over 1999-2003, Singapore's real output growth was at an average rate of 3.6% p.a. as compared to nearly an average of 9% in 1991-1997. The volatility in output is also reflected in the rising unemployment, as unemployment rate had risen from 3.5% in 1999 to nearly 4.7% in 2003. However, the economy has shown some strong output growth in 2004, growing at a rate of 8.7% with unemployment rate falling to 3.4% (MTI, 2005). It has been forecasted that the economy will grow at the average potential output level of 3-5% for the coming years with an average unemployment rate of 3.5%.

In addition to the volatility in output, the structural adjustment of the economy to higher value-added activities also contributed to the slower growth in employment. Throughout this period, the services sector has led much of the growth, both in the terms of GDP and employment growth. The share of the service industries account for nearly a total of

64% of Singapore's gross value-added and 72% of employment growth respectively over the period of 1999-2002. With the emergence of low-cost competitors in the region and in China, there is a strong pressure for the Singapore economy to move to higher value-added activities to sustain its competitiveness. However, the Government believes that both the manufacturing and services will form "twin engines" of growth, where manufacturing is expected to contribute around 20% of GDP (Economic Review Committee, 2002).

Table 1: Key Macroeconomic Indicators: 1999-2005

	1999	2000	2001	2002	2003	2004	2005
Real GDP (2000 market price & % change)	7.2	10.0	-2.3	4.0	2.9	8.7	6.4
Manufacturing	13.6	15.3	-12.8	8.4	3.0	13.9	9.3
Services	6.0	9.0	1.9	4.0	3.3	7.6	6.0
Construction	-8.8	-1.7	-1.2	-14.0	-9.0	-6.1	-1.1
Share of Gross Value Added (%)							
Manufacturing	23.1	26.8	23.7	25.8	26.3	27.7	27.3
Services	63.6	61.9	64.5	63.5	63.4	63.0	63.8
Construction	7.9	6.3	6.1	5.4	5.0	4.3	3.7
Others	5.1	5.0	5.7	5.3	5.3	5.0	5.2
Employment Share (%)							
Manufacturing	21.0	20.8	18.8	18.2	17.9	17.3	21.4
Services	71.1	65.5	74.2	75.0	75.6	76.3	69.6
Construction	6.9	13.1	6.1	5.9	5.6	5.5	8.1
Others	1.0	0.6	0.9	0.9	0.9	0.9	0.9
Unemployment rate (average)	3.5	3.1	3.3	3.6	4.0	3.4	3.2

Source: Thangavelu and Toh (2005)

Services sector includes: Wholesale and Retail trade, Hotels and Restaurants, Transport and Communication, Financial Services, Business Services, other services

Despite the volatile global economy, Singapore's exports rose at an average rate of 4.8% in 1999-2002 and strengthened further by 12% in 2003. Manufactured exports in electronics goods still form a significant component of its exports, where exports in office machines & telecommunication equipments and chemical products form nearly 42% and 17% of total domestic exports respectively (WTO-TPE Singapore 2004). In 1999, exports to China only accounted for 3.4% of total domestic exports, but it rose to nearly 10% in 2003.

ASEAN is the key trading partner for Singapore as it absorbs nearly 25% of total domestic exports from Singapore. The major sources of imports for Singapore are from Malaysia (16.8%), the United States (13.9%), the European Union (12.5%) and Japan (12%). Trade in services grew at the rate of 7.7% on an average in 1999-2003 and the exports in financial and transportation services have been the most vibrant.

3. Outsourcing Measures in Singapore Manufacturing Industries

The study is based on a panel data of 5-digit manufacturing industries of the Singapore economy from 1995-2004. The panel consists of around 170 industries. All the key industrial data is obtained from Census of Industrial Production and the Census of Manufacturing Activities (CIP), Singapore Economic Development Board (EDB). The data for the study was adopted from the Singapore Input-Output (IO) tables in 1995 and 2000 to construct the imported intermediate goods and map it to the industrial data. All the data in the study is based to year 2000 prices.

We adopted similar methodology of measuring the outsourcing variable as given in Feenstra and Hanson (1996, 1999). We developed 5 different measures of outsourcing: value of total import of goods and services, value of intra-industry imports, value of total inter-industry imports, value of total inter-industry imports of services, value of inter-industry imports of IT services and value of inter-industry imports of business and technical services. The trends of the outsourcing measures are given in Table 2 and 3.

From Table 2, we can identify the key industries that are actively involved in the cross-border outsourcing. The key industries that are involved in outsourcing activities are manufacture of coke and refined petroleum products, manufacture of chemical and chemical products, manufacture of pharmaceutical and biological products, manufacture of electronic products and components.

Table 2: Trends in Outsourcing Measures for Singapore Manufacturing Industries: 1995-2004

	Share of Imports		Share of Intra-Industry Imports		Share of Inter-Industry Imports		Share of Imports of Services	
	1995-1999	2000-2004	1995-1999	2000-2004	1995-1999	2000-2004	1995-1999	2000-2004
Manufacture of food products, beverage & tobacco	1.81	1.79	1.93	1.55	1.75	1.86	0.42	0.26
Manufacture of textiles	0.14	0.10	1.29	0.05	0.10	0.11	0.02	0.01
Manufacture of wearing apparel; dressing	0.64	0.55	0.93	0.89	0.51	0.39	0.12	0.08
Tanning and dressing of leather; manufacture	0.08	0.12	0.14	0.26	0.06	0.06	0.00	0.01
Manufacture of wood and of products of wood	0.16	0.29	0.23	0.53	0.13	0.18	0.01	0.05
Manufacture of paper and paper products	0.58	0.44	1.32	1.00	0.32	0.22	0.29	0.11
Printing and reproduction of recorded media	1.15	0.94	0.22	0.16	1.54	1.27	0.30	0.21
Manufacture of coke and refined petroleum products	9.61	16.23	1.06	0.28	13.30	22.88	1.57	3.71
Manufacture of chemicals and chemical products	4.79	8.92	4.04	5.91	5.12	10.00	6.10	6.62
Manufacture of pharmaceutical and biological products	0.96	1.97	0.35	0.57	1.23	4.08	6.90	25.33
Manufacture of rubber and plastic products	0.16	0.71	0.04	0.21	0.21	1.68	0.03	0.41
Manufacture of non-metallic mineral products	1.17	0.79	1.40	1.12	1.07	0.63	0.38	0.37
Manufacture of basic metals	0.46	0.31	1.07	0.64	0.20	0.20	0.02	0.02
Manufacture of fabricated metal products	3.67	3.19	1.42	1.50	4.62	3.87	0.83	0.71
Manufacture of machinery and equipment	3.69	3.73	5.21	6.45	3.03	2.45	2.70	1.99
Manufacture of electrical machinery	2.42	1.68	3.37	2.43	2.01	1.31	1.59	1.20
Manufacture of electronic products and components	64.44	53.45	71.70	70.88	60.83	44.49	74.77	54.50
Manufacture of medical, precision and optical equipment	1.20	1.40	1.32	2.04	1.15	1.09	2.24	1.86
Manufacture of transport equipment	2.11	2.65	2.15	2.55	2.09	2.63	1.55	2.46
Manufacture of furniture; manufacturing nec	0.75	0.73	0.81	0.98	0.71	0.61	0.15	0.10

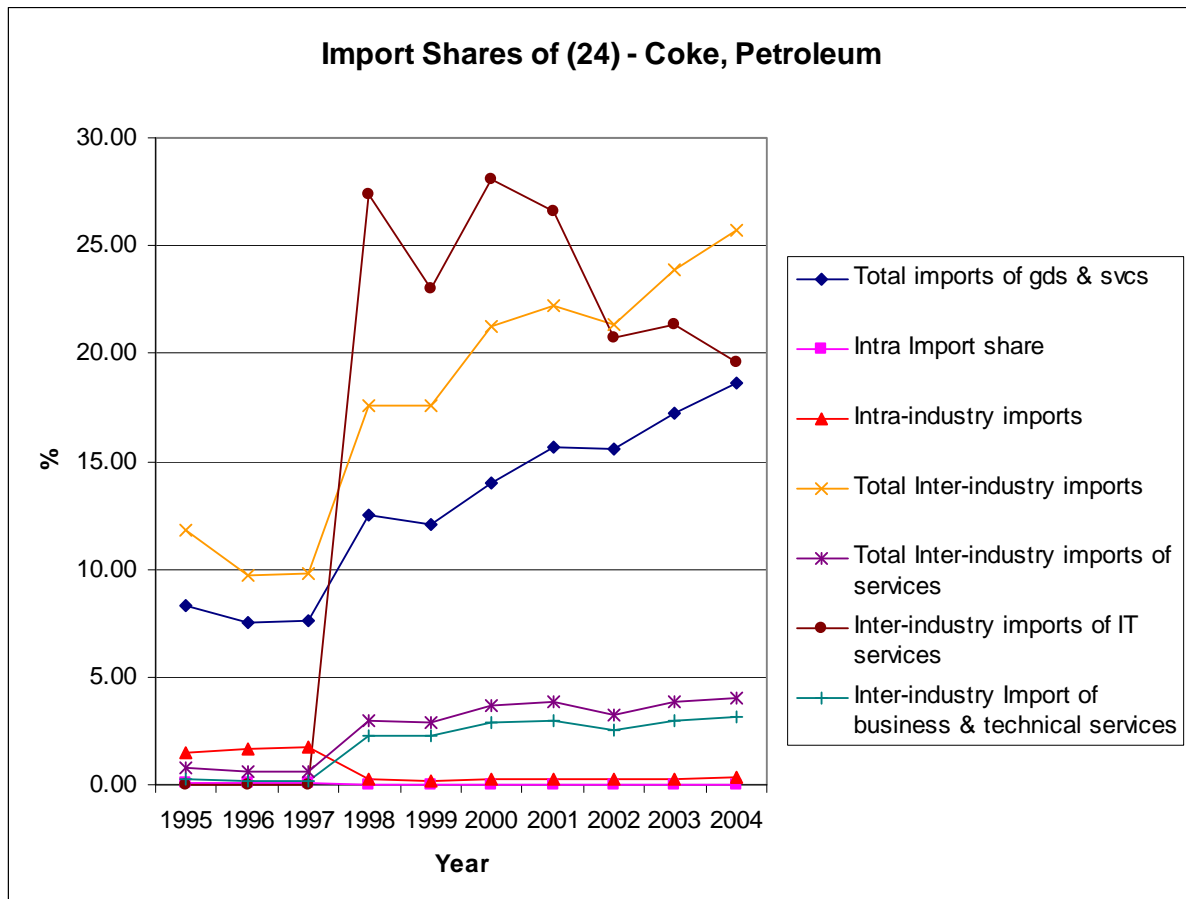
Table 3: Trends in Outsourcing Measures for Singapore Manufacturing Industries: 1995-2004

	Share of Imports of IT Services		Share of Imports of Business Services	
	1995-1999	2000-2004	1995-1999	2000-2004
Manufacture of food products, beverage & tobacco	0.00	0.00	0.16	0.11
Manufacture of textiles	0.00	0.00	0.01	0.01
Manufacture of wearing apparel; dressing	0.00	0.00	0.09	0.06
Tanning and dressing of leather; manufacture	0.00	0.00	0.00	0.00
Manufacture of wood and of products of wood	0.00	0.11	0.00	0.00
Manufacture of paper and paper products	0.15	0.22	0.11	0.01
Printing and reproduction of recorded media	0.21	0.46	0.15	0.06
Manufacture of coke and refined petroleum products	10.06	23.26	1.05	2.89
Manufacture of chemicals and chemical products	11.17	6.53	4.72	5.38
Manufacture of pharmaceutical and biological products	15.34	48.42	7.23	28.34
Manufacture of rubber and plastic products	0.00	0.05	0.03	0.32
Manufacture of non-metallic mineral products	1.44	0.07	0.43	0.42
Manufacture of basic metals	0.00	0.00	0.00	0.03
Manufacture of fabricated metal products	0.21	0.35	0.38	0.38
Manufacture of machinery and equipment	4.06	0.33	2.59	1.80
Manufacture of electrical machinery	0.00	0.05	1.63	1.16
Manufacture of electronic products and components	44.66	15.01	78.73	56.24
Manufacture of medical, precision and optical equipment	3.87	0.97	2.21	1.79
Manufacture of transport equipment	8.49	3.92	0.43	0.94
Manufacture of furniture; manufacturing nec	0.33	0.24	0.06	0.06

The trends clearly suggest that the cross-border activities in these industries have increased in 2000-2004 as compared to 1995-1999. In particular, the cross-border outsourcing of services has also increased in all the key industries. Electronic products and

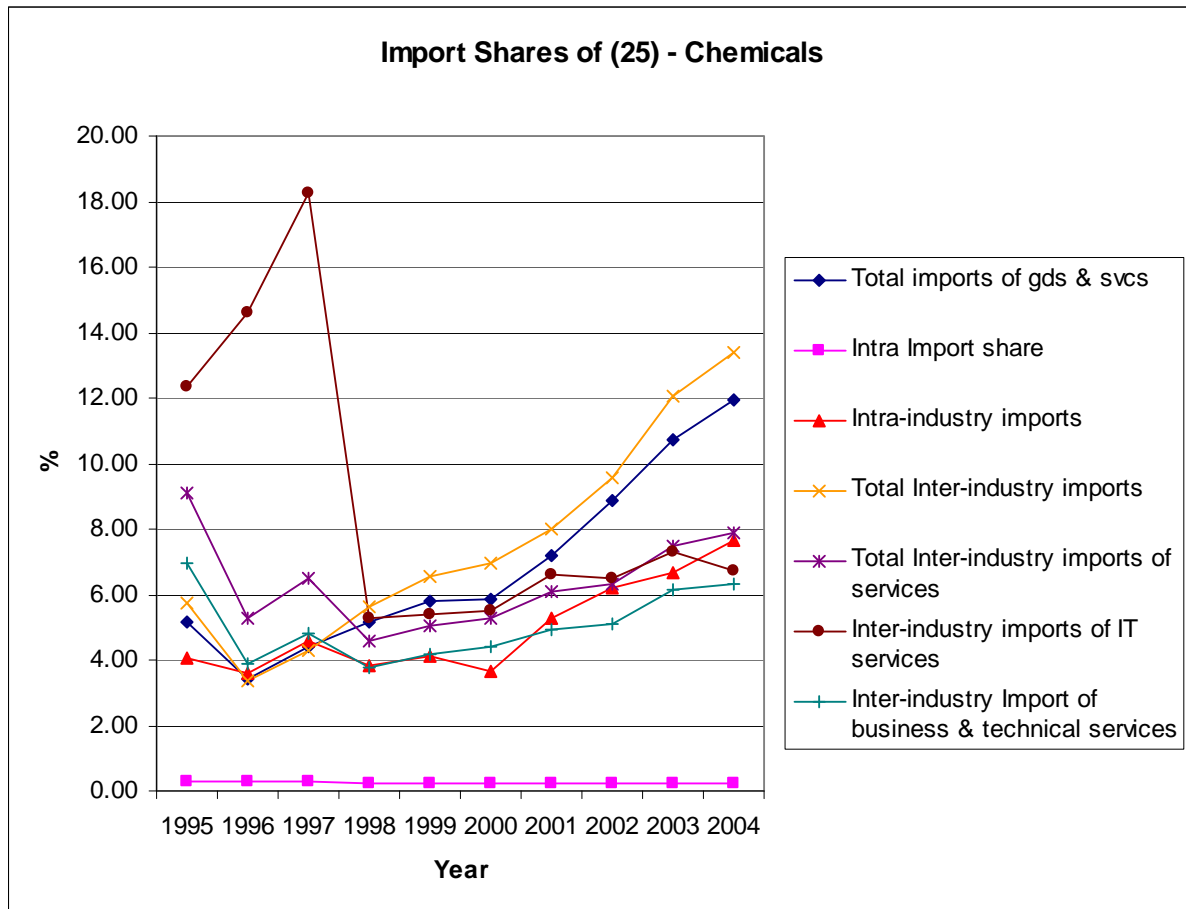
components, pharmaceutical and biological products, and chemical and chemical products are the key industries that outsource their IT and business services.

Figure 1: Trends of Import Shares for Manufacture of Coke and Petroleum: 1995 to 2004.



From Figure 1, the manufacture of coke and refined petroleum products shows consistent upwards trend in their share of total imports of goods and services (especially total inter-industry imports) from 1995 to 2004. Total inter-industry imports rose from 11.8% share in 1995 to 25.8% share in 2004. Further analysing the components of these inter-industry imports revealed that inter-industry imports of IT services constituted, on average, above 20% share of the total manufacturing industry, although on a downward trend. Inter-industry import of business & technical services, although constituted only about 2 to 3% of the industry share, is on an upward trend.

Figure 2: Trends of Import Shares for Manufacture of Chemical and Chemical Products: 1995 to 2004.

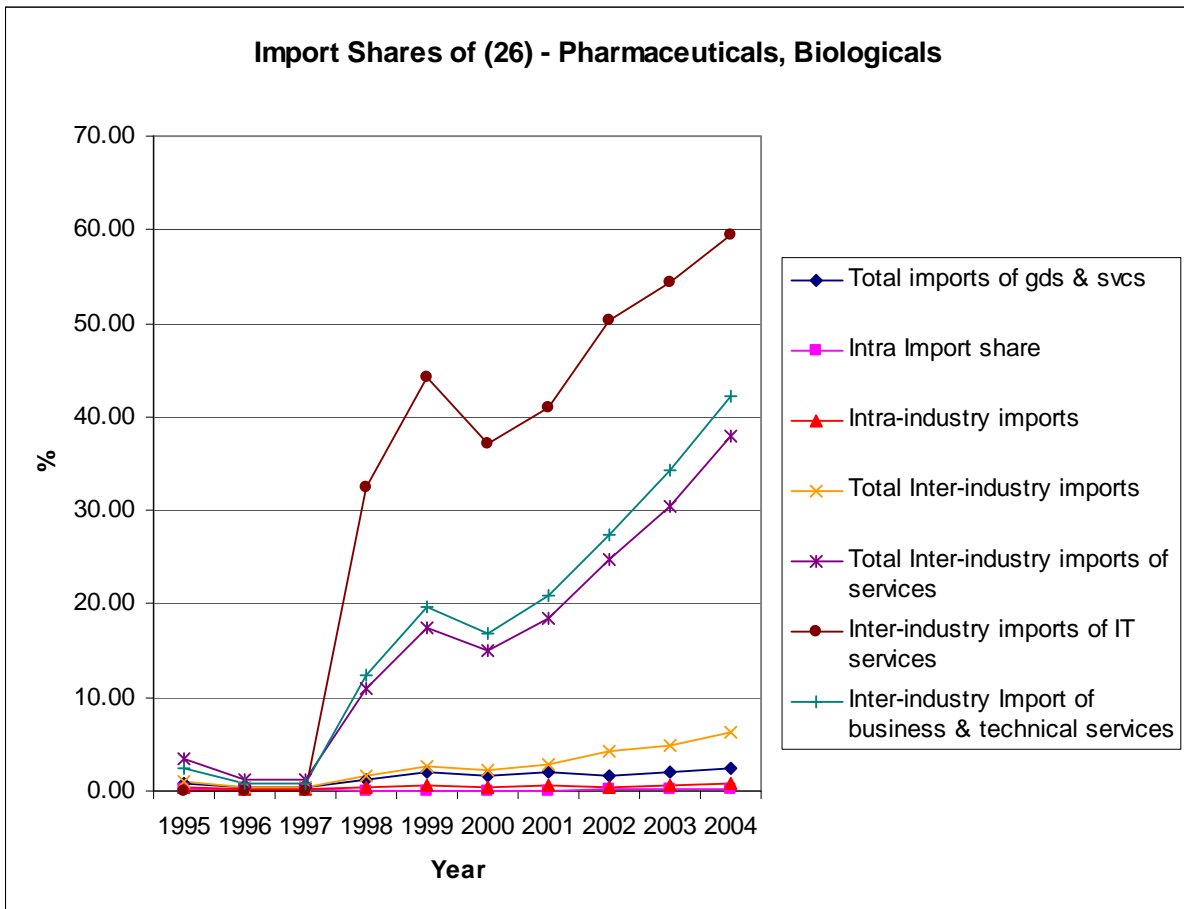


The manufacture of chemicals and chemical products as given in Figure 2, indicates an increase in industry share in inter-industry imports (from 5.8% in 1995 to 13.4% in 2004), especially the industry share in the inter-industry import of business & technical services (fluctuating between 4% and 7%). The import of IT services has declined from the peak in 1997 (18.3%) to 6.7% in 2004.

The most promising trend is observed in the manufacture of pharmaceutical and biological products as given in Figure 3. Sharp increases in industry shares were observed for the inter-industry import of services, particularly IT services and business & technical services. Inter-industry import of services has increased its share from 3.4% in 1995 to 38% in 2004. The increase in industry share was more prominent in the import of IT services (from 0% in 1995 to 59.4% in 2004), followed by import of business & technical services

(from 2.4% in 1995 to 42.3% in 2004). Its industry share of 59.4% in the import of IT services is the largest in the whole manufacturing industry, indicating possibly a high potential for IT outsourcing. Similarly, the 42.3% industry share for the import of business & technical services is also the largest, indicating possibility of business service outsourcing.

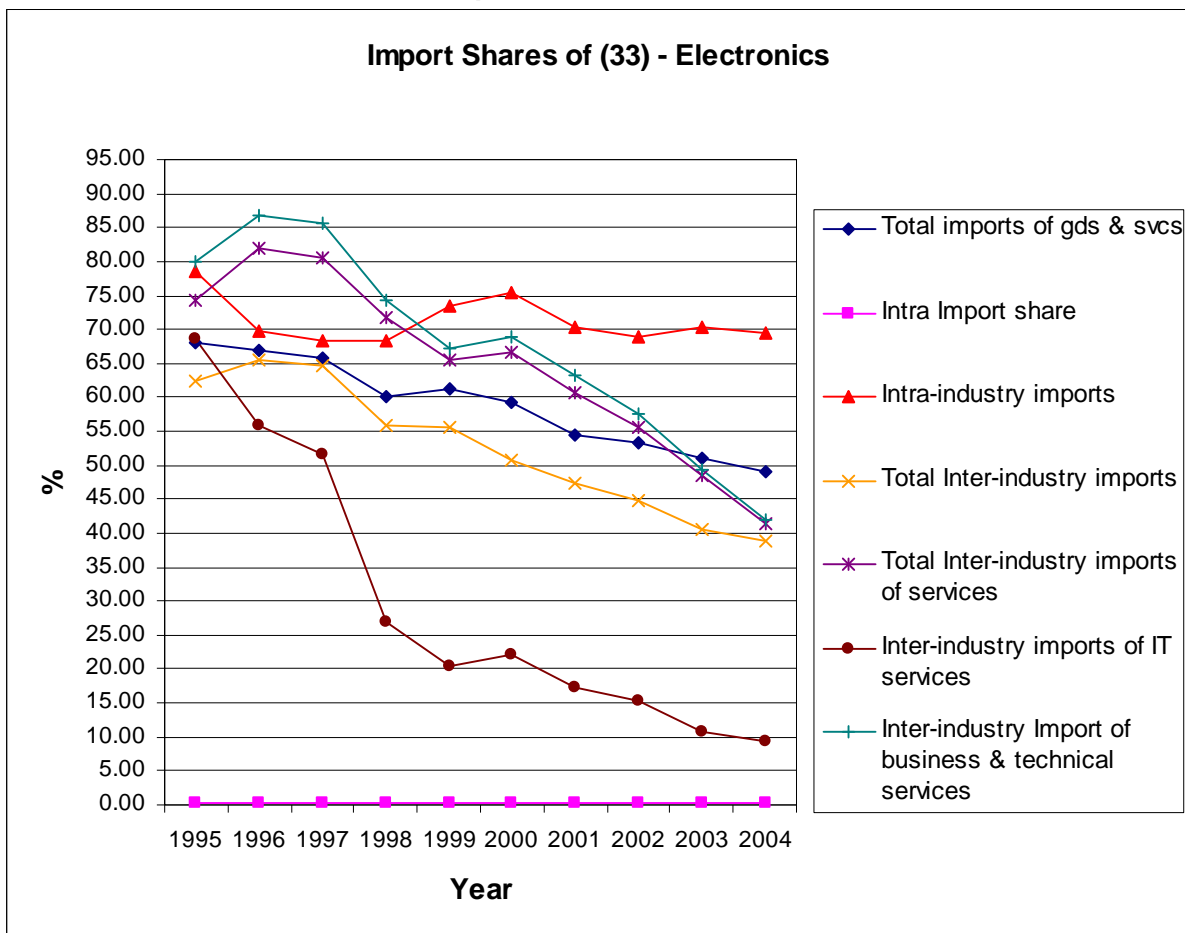
Figure 3: Trends of Import Shares for Manufacture of Pharmaceutical and Biological Products: 1995 to 2004.



The manufacture of electronic products and components highlights a decreasing trend in the industry share of total inter-industry imports, from 62.5% in 1995 to 39% in 2004 (see Figure 4). The industry share of import of services declined from 74.4% in 1995 to 21.3% in 2004, whereas the industry share of import of business & technical services decreased from 80% in 1995 to 42.1% in 2004. The most drastic fall in industry share comes from the import of IT services, down from 68.7% in 1995 to 9.5% in 2004. This could mean that the industry

is in its maturity stage now, increasingly requires less of such services compared to the period in the 1990s. Nevertheless, it is still the industry with the largest share in the import of services (41.3%) in 2004, above the pharmaceutical and biological product manufacturing industry which has a share of 38% in 2004. Its industry share of 42.1% in the import of business & technical services in 2004 is only second to the pharmaceutical and biological product manufacturing industry which has a share of 42.3% in 2004.

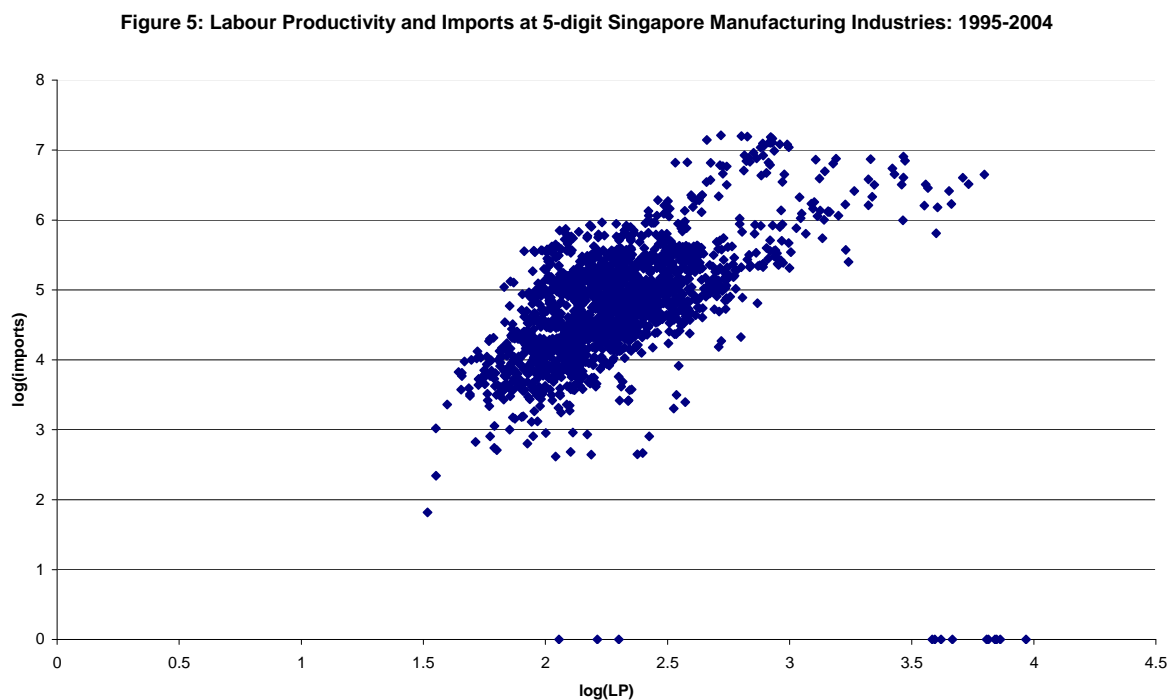
Figure 4: Trends of Import Shares for Manufacture of Electronic Products and Components: 1995 to 2004.



4. Outsourcing and Productivity Improvements in Singapore Manufacturing Industries

Based on the theoretical framework, cross-border sourcing activities should have positive impact on productivity and efficiency of the outsourcing country and the overall impact on

productivity and efficiency is still based on how well the economy adjusts to the outsourcing activities (Feenstra and Hanson, 1998). To study the impact of outsourcing on productivity growth, the measure of labour productivity (total output per worker) is used as a measure of productivity in the paper. The scatter plot of labour productivity and imports is given in Figure 5. The trend clearly indicates that imports tend to have positive impact on the productive performance for most of the manufacturing industries, including those that are not involved in the cross-border sourcing. The impact of the rest of the outsourcing measures are given in Figure 6 to 10.



The impact of outsourcing from intra-industry and inter-industry imports is given in Figure 6 and 7. Both Figures indicates that there is positive impact on the productivity of the manufacturing industries. In fact, the impact of intra-industry imports on productivity tends to be much higher and more responsive than inter-industry imports. However, we could also

observe from Figure 6 and 7 that more industries are involved in inter-industry than in intra-industry outsourcing.

Figure 6: Labour Productivity and Intra-Industry Imports for 5-digit Manufacturing Industries: 1995-2004

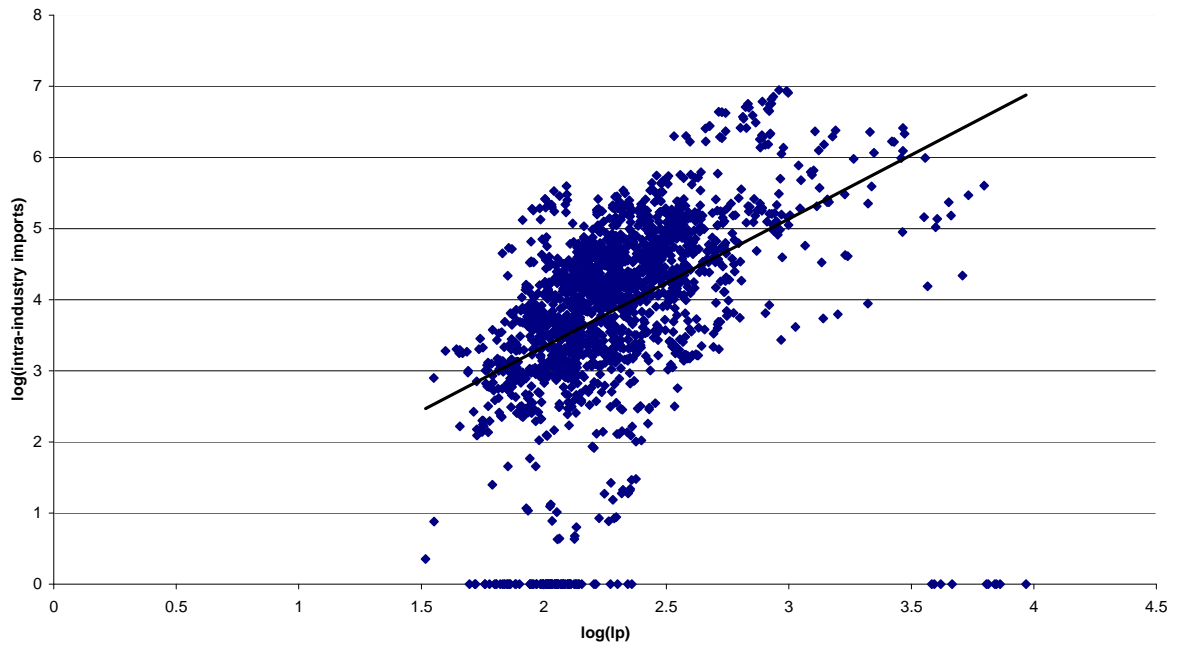


Figure 7: Labour Productivity and Inter-Industry Imports at 5-digit Manufacturing Industries: 1995-2004

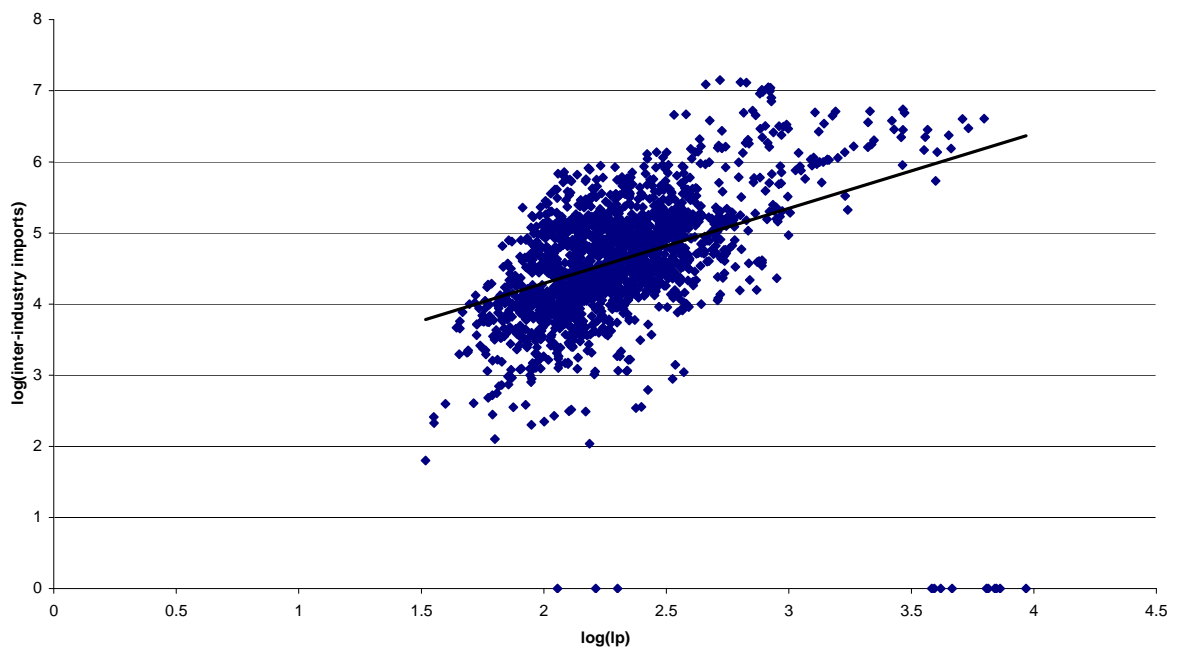


Figure 8: Labour Productivity and Imports of Services at 5-digit Manufacturing Industries: 1995-2004

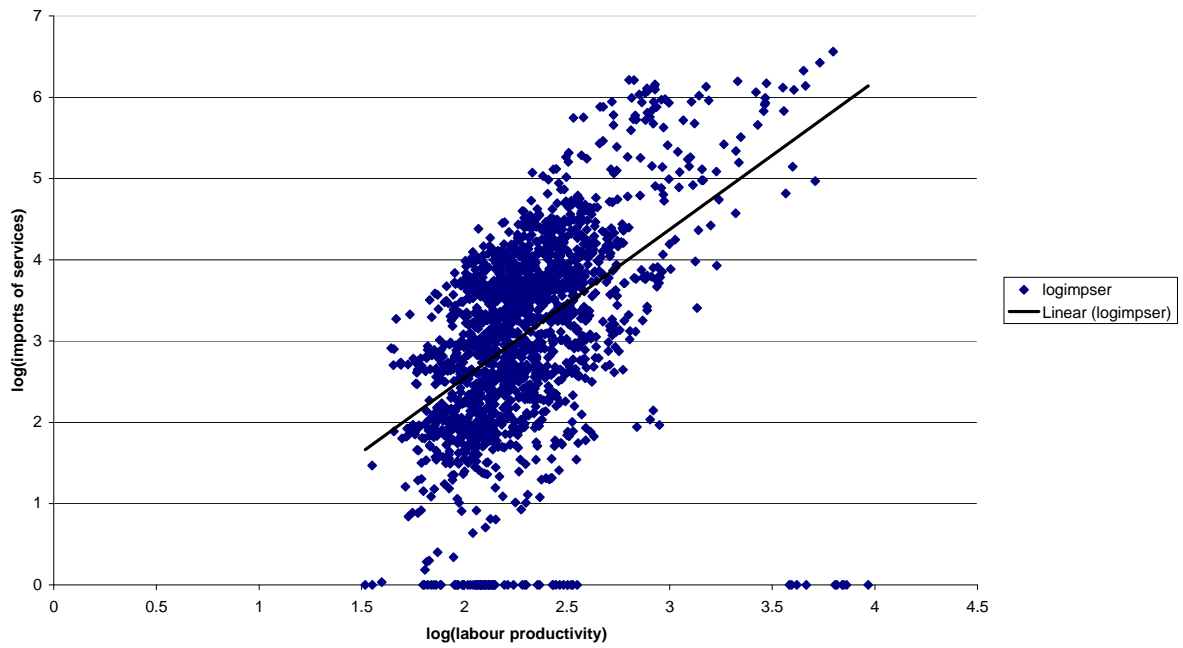


Figure 9: Labour Productivity and Import of IT Services at 5-digit Manufacturing Industries: 1995-2004

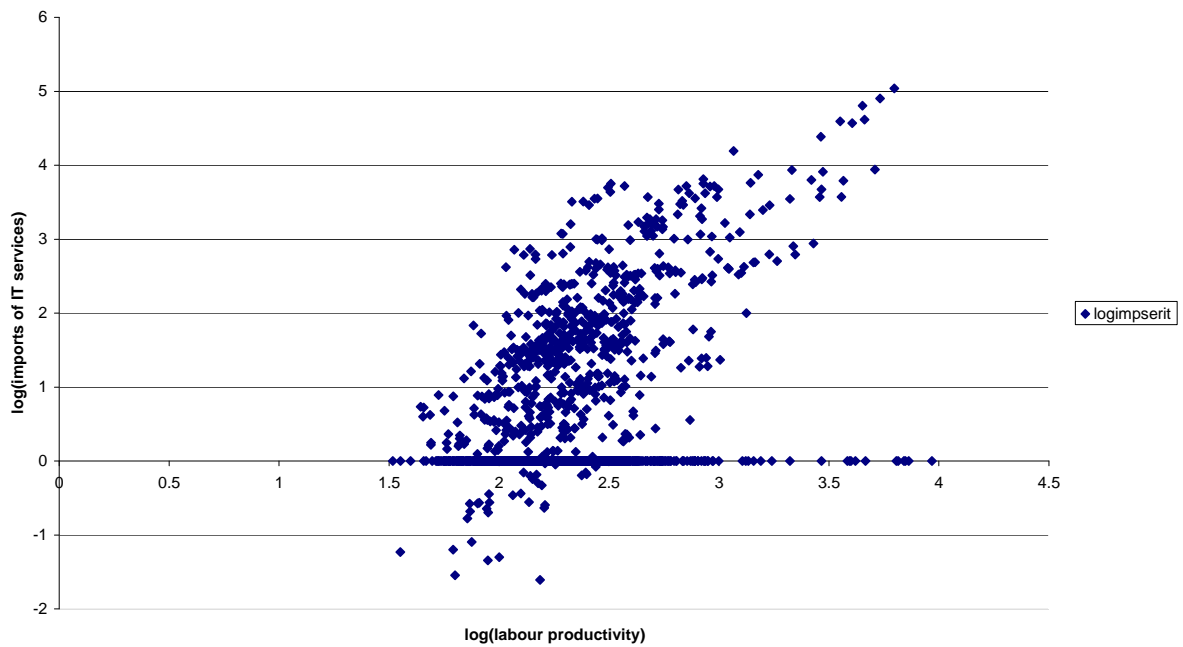
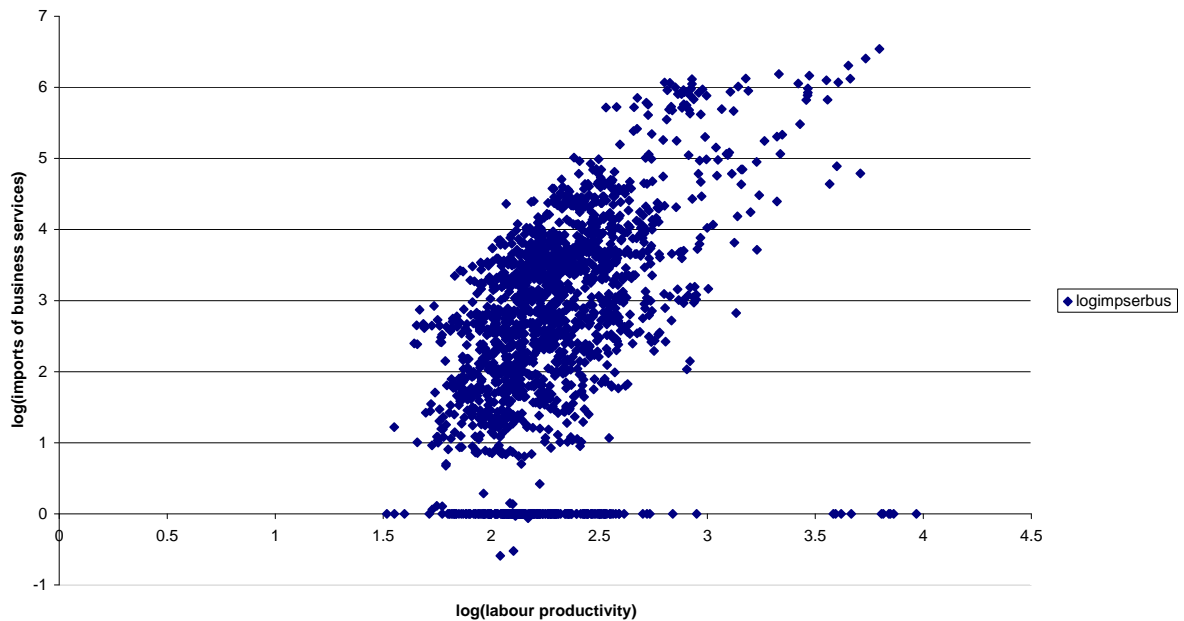


Figure 10: Labour Productivity and Import of Business Services at 5-digit Manufacturing Industries in Singapore: 1995-2004



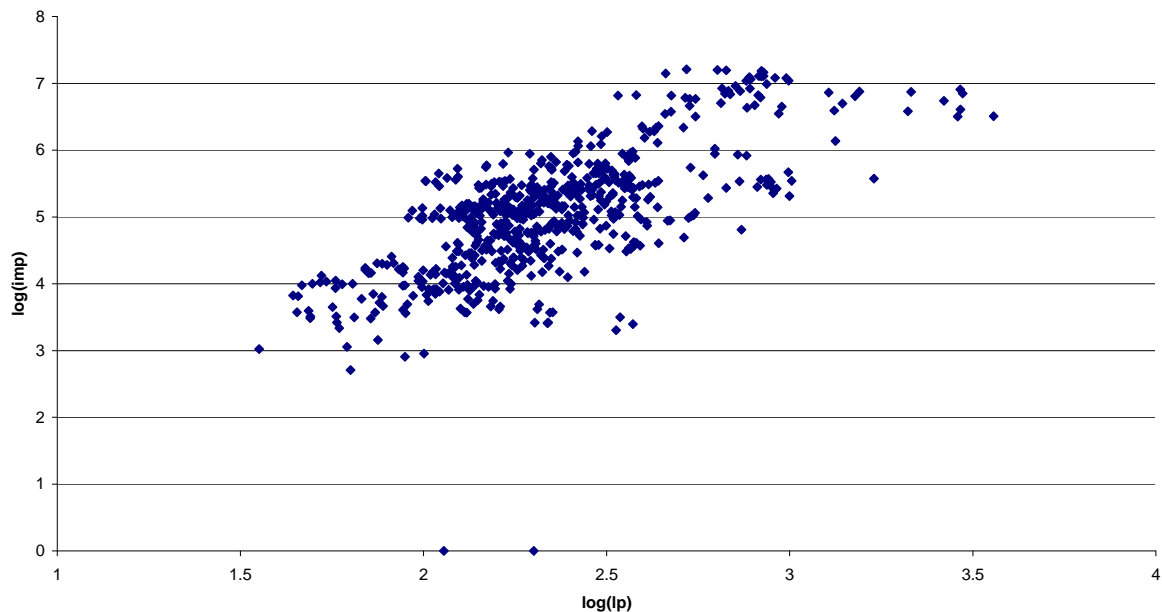
The impact of cross-border sourcing of services is given in Figure 8. Again, the impact is positive on the labour productivity of the manufacturing sector, thereby suggesting that the outsourcing some of the services activities tend to increase the labour productivity of the industries. The decomposition of services imports also gives very interesting trends. The responsiveness of the manufacturing industries to cross-border sourcing of business services is much stronger than the sourcing of IT services, which is indicated by greater number of the manufacturing firms are involved in business services outsourcing.

Outsourcing and Productivity: Electronics Cluster

Given that the electronics products and components industry is one of the key manufacturing industry that drive the overall performance of the manufacturing sector in Singapore, we also examine the cross-border sourcing in the electronics cluster (see Table A1 in the Appendix). The impact of cross-border sourcing on productivity growth is also robust in the electronics

products and components industry. Figure 11 shows the strong positive impact of imports on productivity growth of the electronics cluster.

Figure 11: Labour Productivity and Imports in Electronic Products and Components at 5-digit Manufacturing Industries in Singapore: 1995-2004



The decomposition of the cross-border sourcing by intra- and inter-industry imports reveals interesting observation for the electronics cluster. As in aggregate level, we also observed that the electronics cluster is more active in inter-industry outsourcing than in intra-industry outsourcing. However, the effects from intra-industry outsourcing tend to be higher on productivity than inter-industry outsourcing in the electronics cluster. The impact of cross-border sourcing of services is given in Figures 14 to 16. Most of the industries in the electronics cluster are involved in cross-border outsourcing of its services and the impact of the activity is very positive on their productivity. The positive impact is also observable in the decomposition of services outsourcing into IT services and business services. However, the decomposition of the services outsourcing reveals that most industries are more involved in business services outsourcing than in IT outsourcing.

Figure 12: Labour Productivity and Intra-Industry Import in Electronic Products and Components at 5-digit Manufacturing Industries in Singapore: 1995-2004

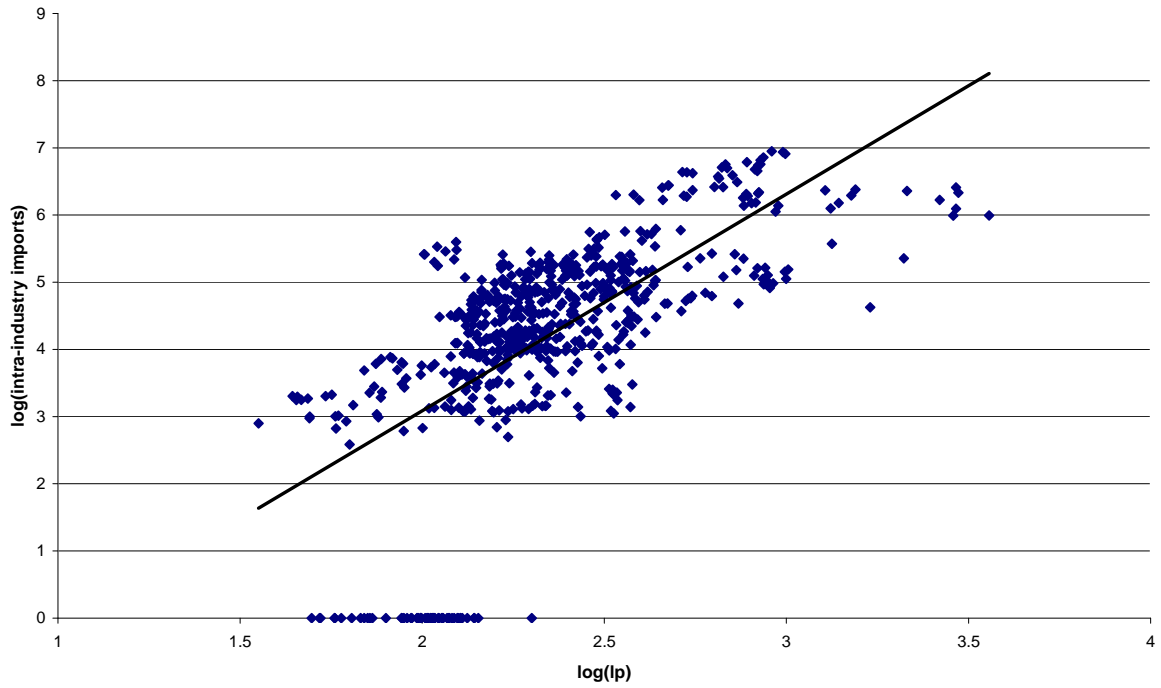


Figure 13: Labour Productivity and Inter-Industry Imports in Electronic Products and Components at 5-digit Manufacturing Industries in Singapore: 1995-2004

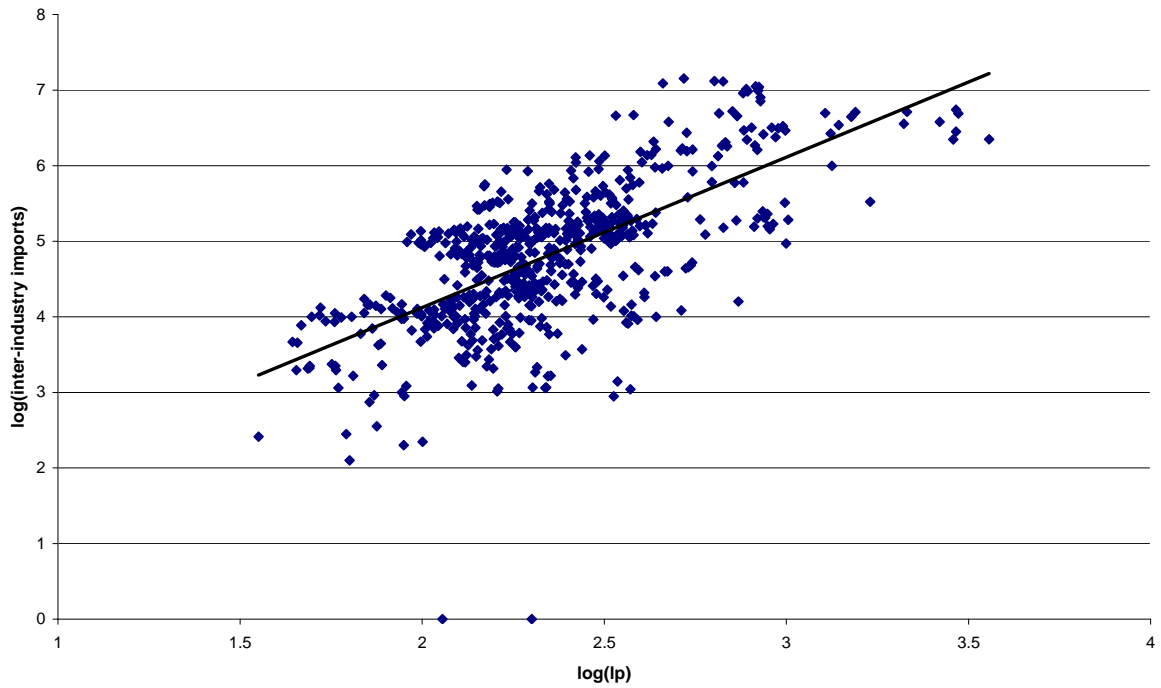


Figure 14: Labour Productivity and Import of Services in Electronic Products and Components at 5-digit Manufacturing Industries in Singapore: 1995-2004

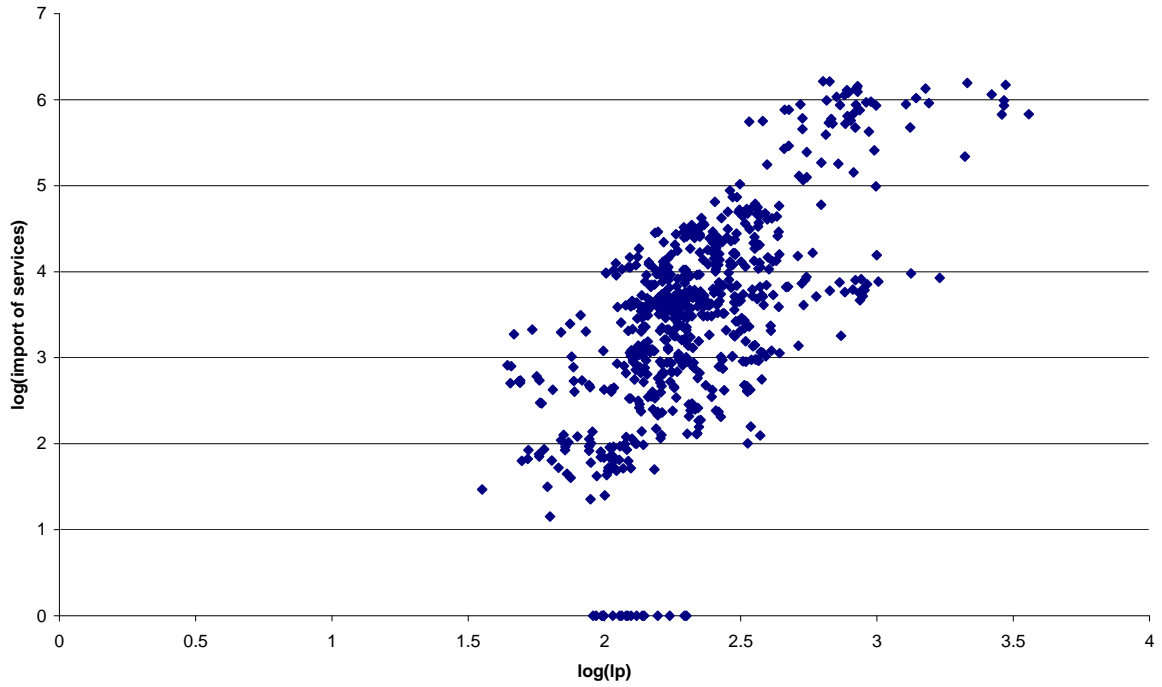


Figure 15: Labour Productivity and Import of IT Services in Electronic Products and Components at 5-digit Manufacturing Industries in Singapore: 1995-2004

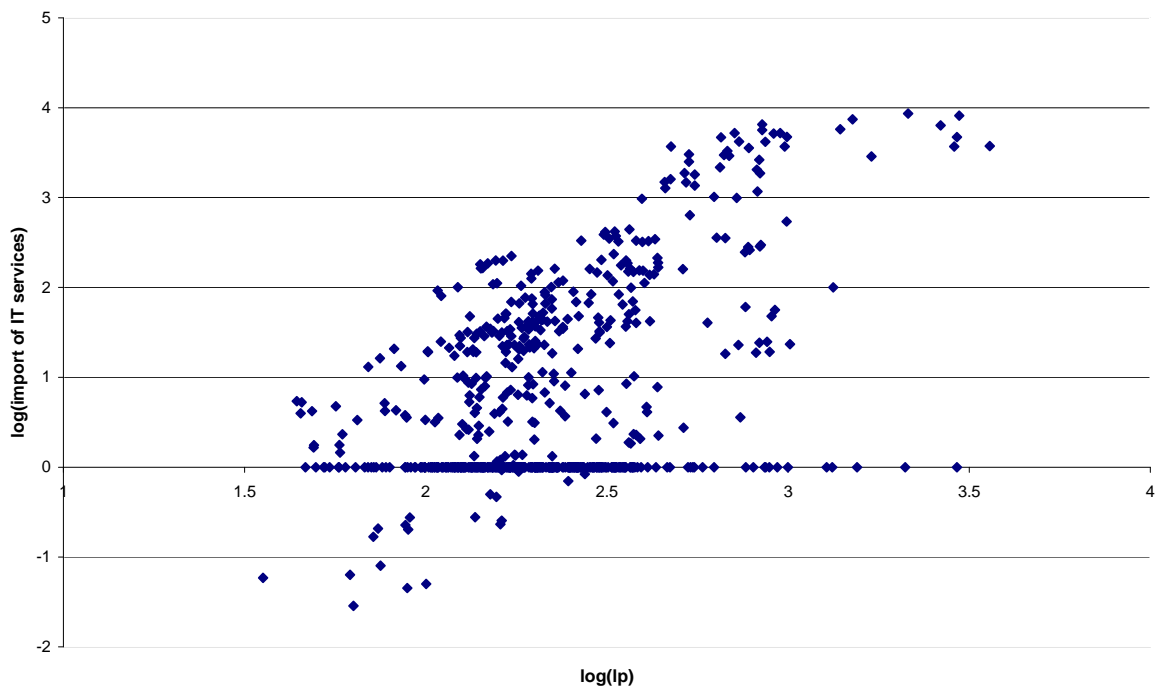
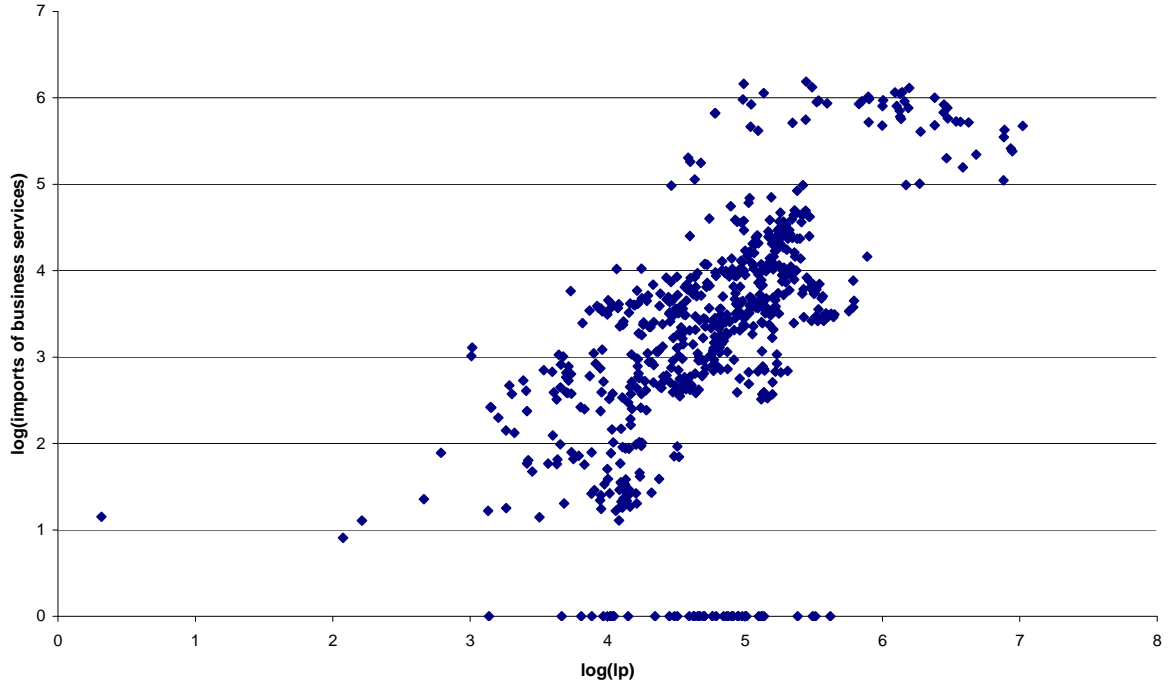


Figure 16: Labour Productivity and Import of Business Services in Electronic Products and Components at 5-digit Manufacturing Industries in Singapore: 1995-2004



4.1 Empirical Analysis of Outsourcing on Productivity in Manufacturing Industries

We adopt a simple Cobb-Douglas production function framework to analyze the impact of cross-border outsourcing on productivity at the 5-digit manufacturing industries.

$$Y_{it} = A_{it} L_{it}^{\alpha_1} K_{it}^{\alpha_2}, \quad i=1, \dots, n; \quad t=1, \dots, T_i. \quad (\text{EQ. 1})$$

where Y_{it} is the real output, L_{it} is number of workers, K_{it} is the real capital stock, and A_{it} is the technology parameter. We will assume the outsourcing affects the efficiency of the firms through the technology factor. When constant returns to scale is assumed the production function can be written in the form that shows the dependence of labor productivity on capital-labor ratio and the technology parameter:

$$(Y/L)_i = A_i (K/L)_i^{\alpha} \quad (\text{EQ. 2})$$

In logarithmic form:

$$\text{Ln}(Y/L)_i = \ln A_i + \alpha \cdot \ln (K/L)_i \quad (\text{EQ. 3})$$

$\ln A_i$ is in turn dependent on a set of factors including outsourcing (OSI).

$$\ln A_i = b_0 + b_1 \ln \text{OSI}_i \quad (\text{EQ. 4})$$

Hence the empirical equation for estimation becomes:

$$\ln(Y/L)_i = b_0 + b_1 \ln \text{OSI}_i + \alpha \cdot \ln(K/L)_i \quad (\text{EQ. 5})$$

The results for the regressions are given in Table 4 and it substantiates the observations in the scatter plots given above. The impact of cross-border sourcing is positive on the labour productivity. The effects of intra- and inter-industry imports are almost similar but with the inter-industry effects are slightly stronger. The impact of cross-border sourcing of service is also positive with around 8 percent impact on labour productivity. As observed, cross-border sourcing of business services has strong positive impact on labour productivity of manufacturing industry.

Table 4: The Impact of Outsourcing on Labour Productivity in Singapore Manufacturing Industries (fixed effects):
Independent variable – $\ln(Y_{it}/L_{it})$

	(1)	(2)	(3)	(4)
$\ln(K_{it}/L_{it})$	0.181 (10.731)*	0.172 (10.250)*	0.186* (10.900)	0.188 (10.800)*
$\ln(\text{imports}_{it})$	0.117 (14.430)*			
$\ln(\text{intra-industry imports}_{it})$		0.061 (8.890)*		
$\ln(\text{inter-industry imports}_{it})$		0.062 (6.700)*		
$\ln(\text{import of services}_{it})$			0.086 (13.350)*	
$\ln(\text{import of IT services}_{it})$				0.032 (4.660)*
$\ln(\text{import of Business services}_{it})$				0.045 (7.940)*
Constant	1.323 (30.830)*	1.429 (33.290)*	1.607 (44.490)*	1.808 (55.090)*
R-square	0.385	0.407	0.418	0.429
Obs	1883	1883	1883	1883

t-values in the parenthesis, all regressions include time dummies, * - 5% level of significance

5. Policy Conclusion

The paper studies the impact of cross-border sourcing on the productive performance of manufacturing industries of the Singapore economy. Electronic, Chemicals, Pharmaceutical, and Biological industries are outsourcing their components and services and integrated strongly in the global value-chain. In fact, there is a rising trend of greater outsourcing of services in the manufacturing industries. The results also clearly indicates that outsourcing tend to have positive impact on the productive performance of the manufacturing industries. The decomposition of the outsourcing measure by IT and business services indicates that manufacturing firms are more responsive to business services outsourcing than IT services. As the economy matures and move into higher value-added activities, productive performance of the economy will be crucial for the Singapore economy to sustain its long-term growth in the global economy. The results suggest that productive performance of the industries improves as its embrace the global competition from production fragmentation and cross-border production sharing.

Several important issues are crucial for the Singapore economy as it adjusts the industrial structure to the cross-border sourcing and production sharing. It is important for Singapore to integrate its economy to the regional economies and ASEAN will play an important role in the outsourcing process and value-chain activities. The Indonesia-Malaysia-Singapore growth triangle is the one of the key regional responses to synchrony with the global value chain. However, with the growth of China and India, the impact on cross-border sourcing activities is expected to increase further as companies search for lowest cost of production of their components. Thus the economy should expect greater fragmentation of its production structure. The ability of the economy to adjust to the new structures will be very important. In this respect, the implementation of flexible labour market policy and initiatives to upgrade skills of workers will play a crucial role to create the flexibility in the economy.

Given that Singapore still have nearly 34% of its labour force with below secondary education, it is imperative that the workforce should be retrained and upgraded for the new growth areas in both the manufacturing and services sector. The aim of the Workers Development Agency (WDA) is to enhance the productivity and employability of the workers through training, retraining, and retaining workers in the labour market.

However, there are two key areas of concern as the industrial structure matures and companies could fragment its components and production line. The displacement effect of outsourcing on wage gap (skilled and unskilled wages) and on employment has not been thoroughly investigated in the economy. Although there is some anecdotal evidence that globalization and fragmentation could have some impact on the wage gap of the workers. The other importance component for sustainable productive improvements of the Singapore economy is the development of strong small and medium size enterprises (SMEs). Formation of a cluster of SMEs that support the activities of the larger conglomerates can also be a conduit to develop enterprises which excel in niche activities. These enterprises will provide employment to high VA workers providing commodities and services demanded by companies within and beyond Singapore. With the disinvestment of government linked corporations (GLCs) and with the introduction of the competition policy, there should be greater scope for small medium sized enterprises (SMEs) to compete in critical markets that were mainly dominated by GLCs. The industrial strategy for moving to higher value-added activities mostly focuses on multinational activities and GLCs to move the economy into key industries. In this process, SMEs are critically marginalized and “crowded-out” of the industrial development. The development of SMEs will be crucial for the next phase of growth for the Singapore economy and to reap the full-potential benefits of the FTAs through linkages and spillovers from open industrial activities.

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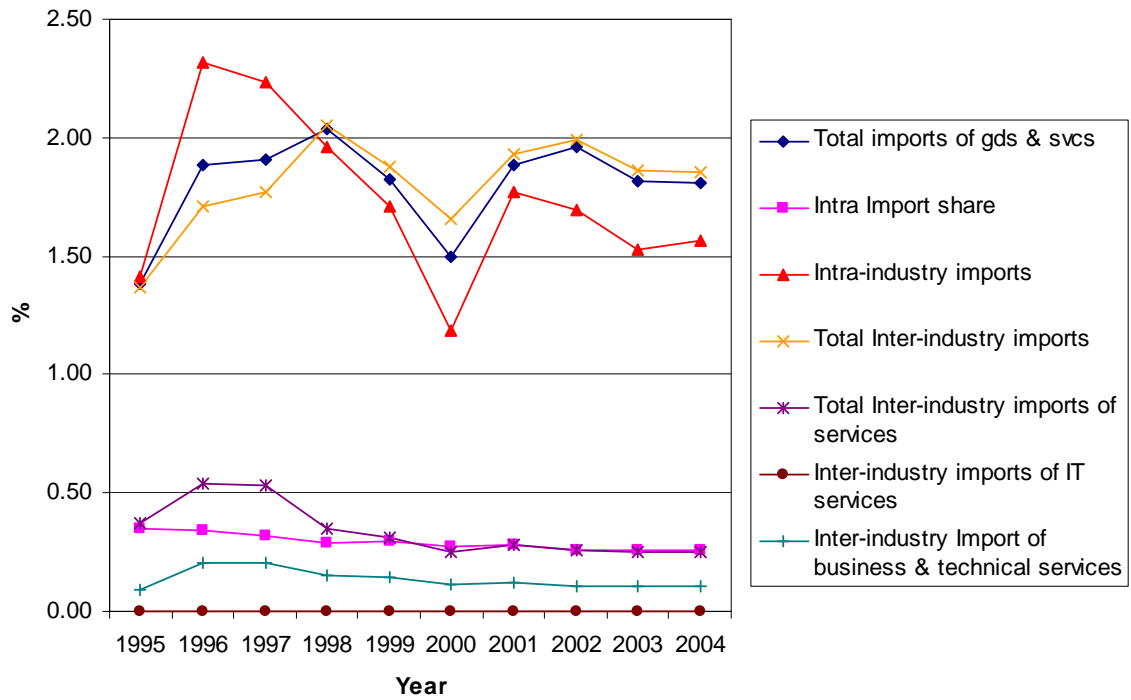
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APPENDIX 1 – OUTSOURCING INTENSITY OF OTHER INDUSTRIES

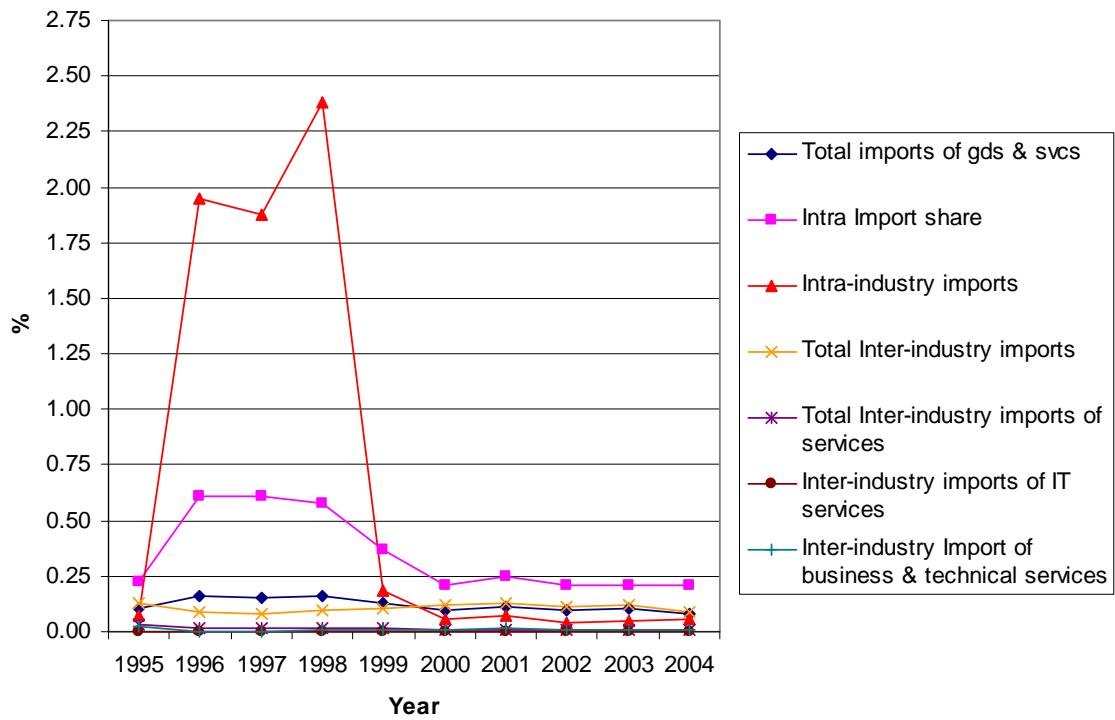
Table A1: Key Indicators for the Manufacturing Industries in Singapore: 1995-2004

	Share of Output		Share of Exports		Share of Employment		Share of Net Fixed Assets	
	1995-1999	2000-2004	1995-1999	2000-2004	1995-1999	2000-2004	1995-1999	2000-2004
Manufacture of food products, beverage & tobacco	2.81	2.51	1.92	1.56	4.21	5.01	4.39	3.29
Manufacture of textiles	0.14	0.13	0.08	0.08	0.35	0.36	0.19	0.14
Manufacture of wearing apparel; dressing	0.71	0.60	0.91	0.77	2.53	2.57	0.59	0.41
Tanning and dressing of leather; manufacture	0.12	0.13	0.12	0.13	0.29	0.28	0.08	0.07
Manufacture of wood and of products of wood	0.22	0.17	0.10	0.10	0.45	0.47	0.21	0.18
Manufacture of paper and paper products	0.69	0.54	0.39	0.34	1.39	1.25	1.37	0.81
Printing and reproduction of recorded media	2.11	1.75	0.83	0.67	5.23	5.21	3.32	2.77
Manufacture of coke and refined petroleum products	11.20	13.31	5.84	7.95	0.92	0.84	12.70	8.24
Manufacture of chemicals and chemical products	6.18	9.85	6.04	8.53	3.84	4.43	18.51	24.40
Manufacture of pharmaceutical and biological products	2.33	5.36	3.72	7.75	0.50	0.85	1.69	5.31
Manufacture of rubber and plastic products	2.09	1.88	0.97	1.20	5.92	5.84	3.24	2.57
Manufacture of non-metallic mineral products	1.62	0.91	0.37	0.38	1.83	1.58	2.25	1.52
Manufacture of basic metals	0.44	0.36	0.17	0.13	0.50	0.40	0.70	0.33
Manufacture of fabricated metal products	5.02	4.32	2.44	2.57	10.46	10.89	6.07	4.63
Manufacture of machinery and equipment	4.84	4.98	4.32	4.62	10.03	11.39	5.08	3.74
Manufacture of electrical machinery	2.49	1.75	2.36	1.69	4.10	3.19	2.26	1.42
Manufacture of electronic products and components	50.05	43.38	63.03	53.89	32.25	26.92	29.36	33.55
Manufacture of medical, precision and optical equipment	1.60	2.02	2.30	2.85	2.58	2.92	1.48	1.41
Manufacture of transport equipment	4.35	5.10	3.58	4.37	10.05	12.70	5.25	4.16
Manufacture of furniture; manufacturing nec	1.00	0.95	0.50	0.40	2.56	2.89	1.25	1.03

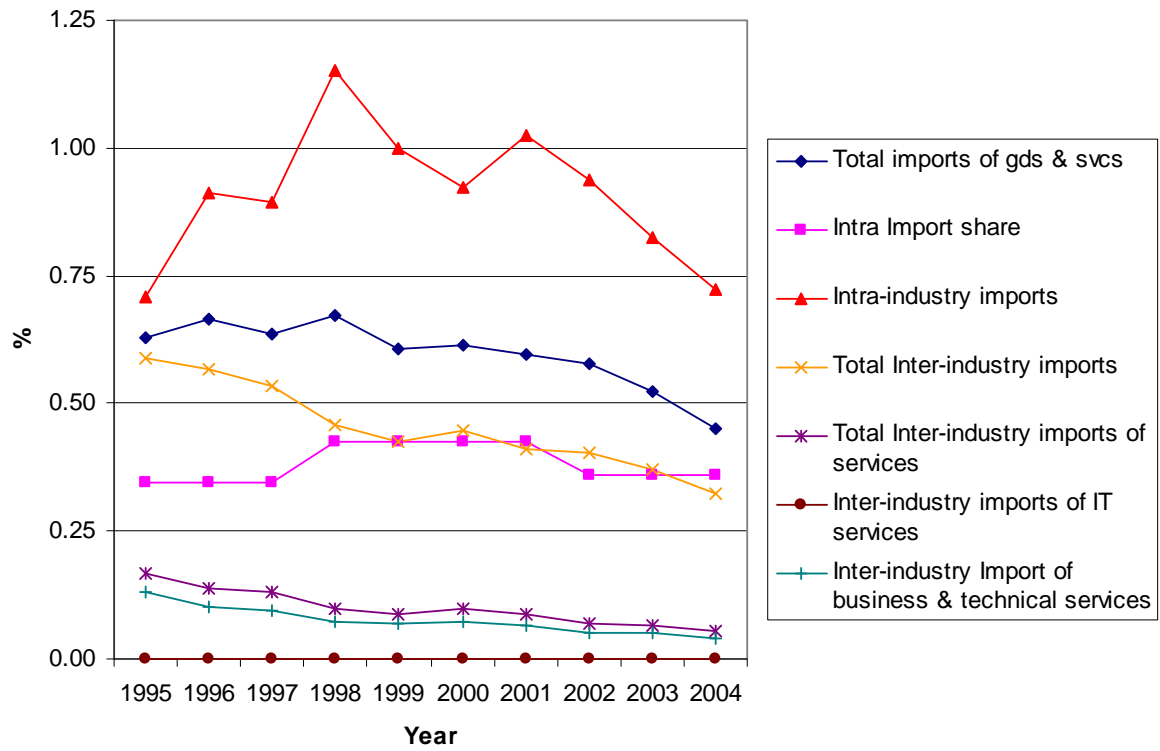
Import Shares of (15/16/17) - Food, Beverage & Tobacco



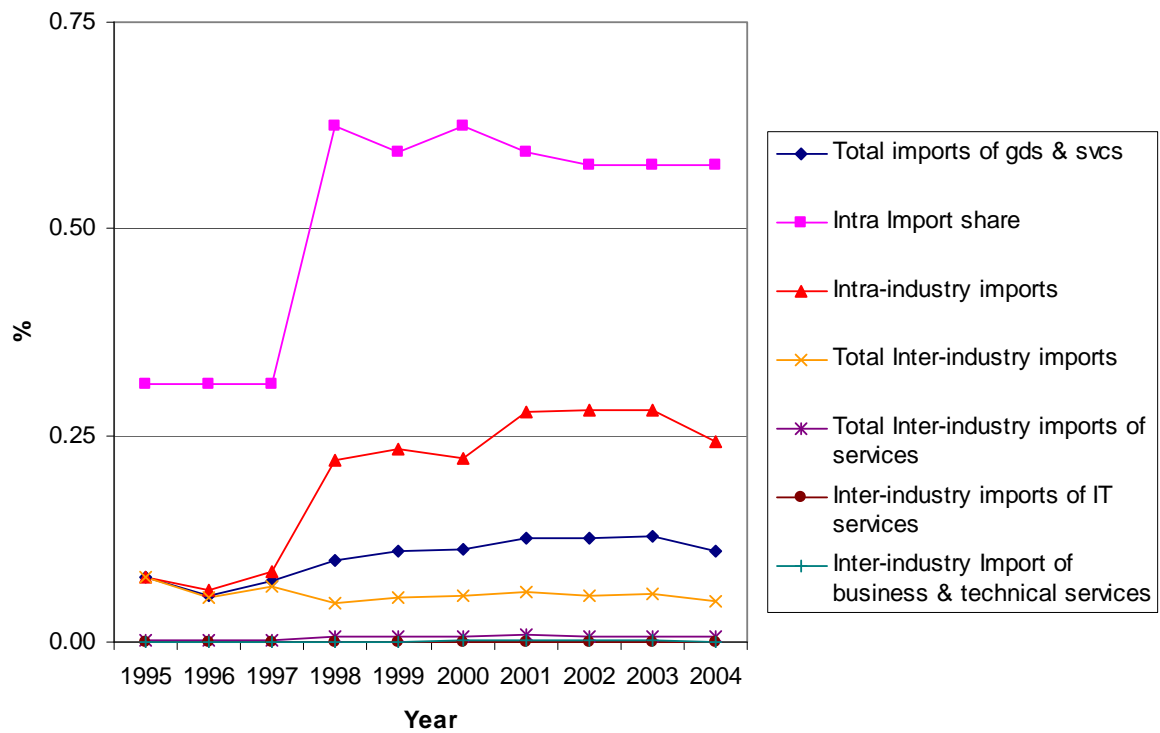
Import Shares of (18) - Textiles



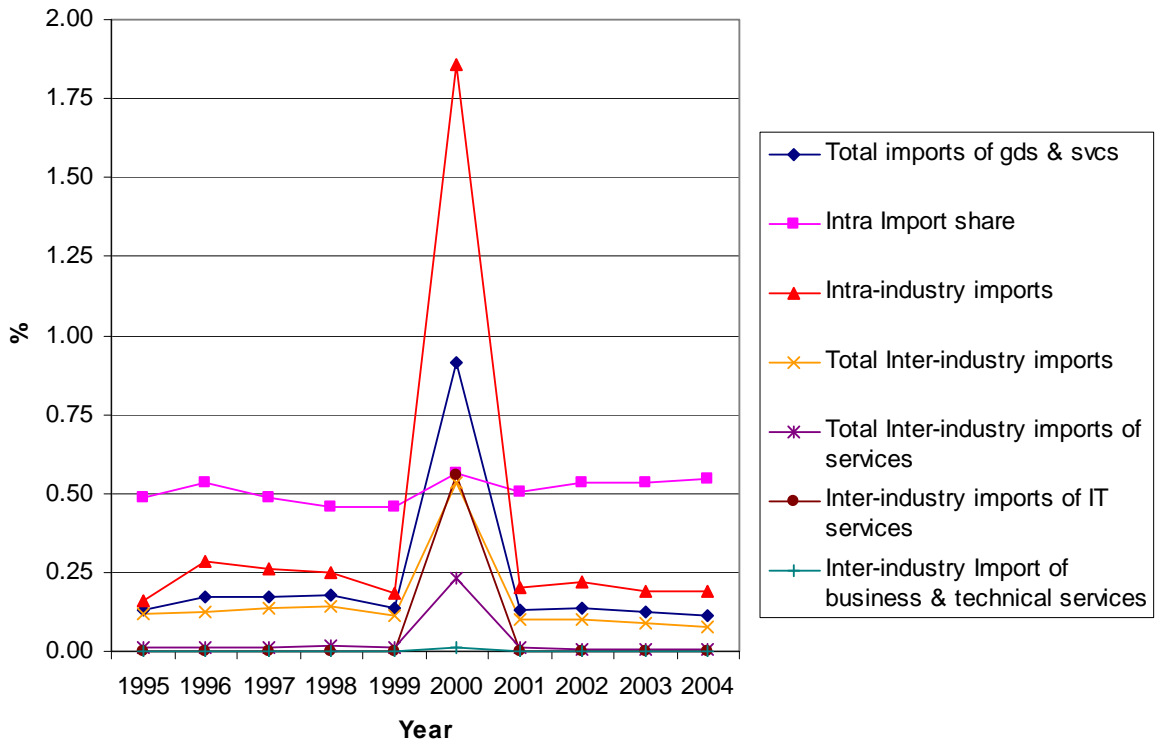
Import Shares of (19) - Clothing



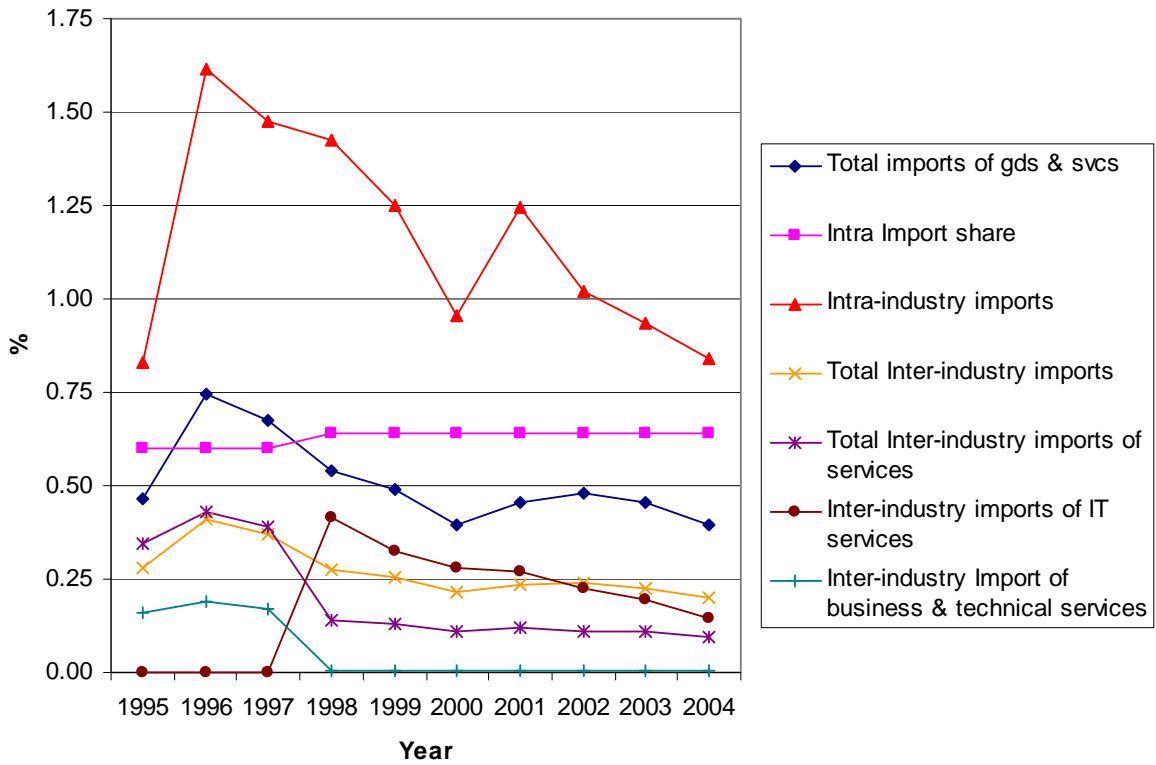
Import Shares of (20) - Leather



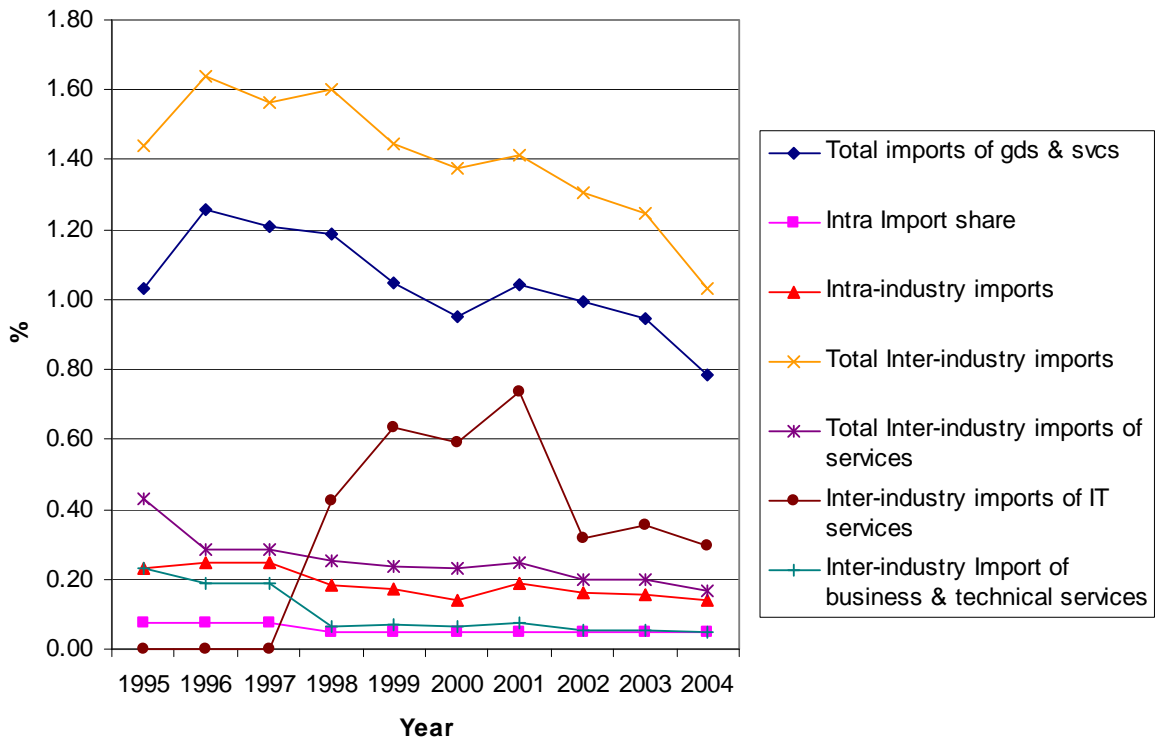
Import Shares of (21) - Wood



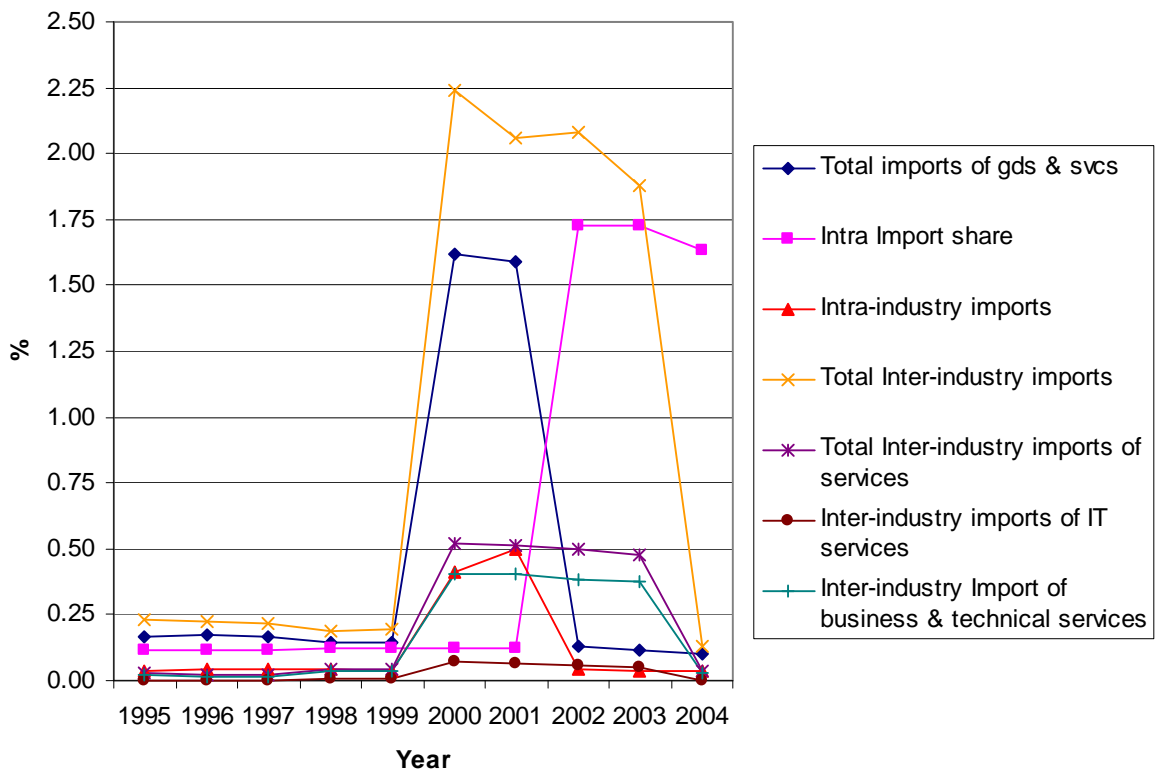
Import Shares of (22) - Paper



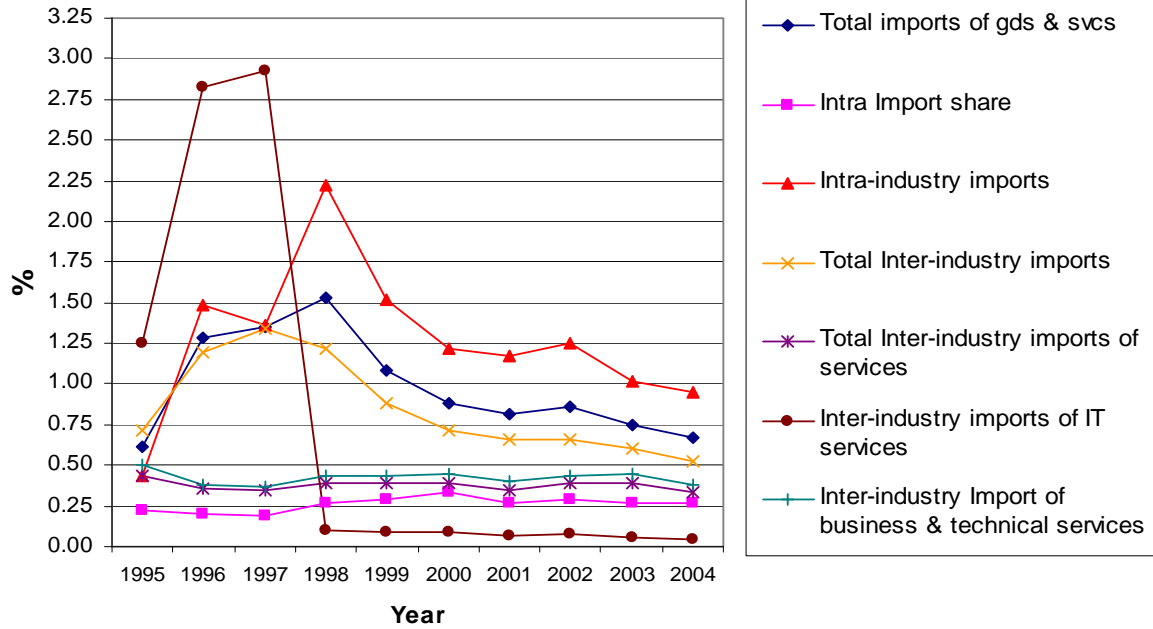
Import Shares of (23) - Publishing



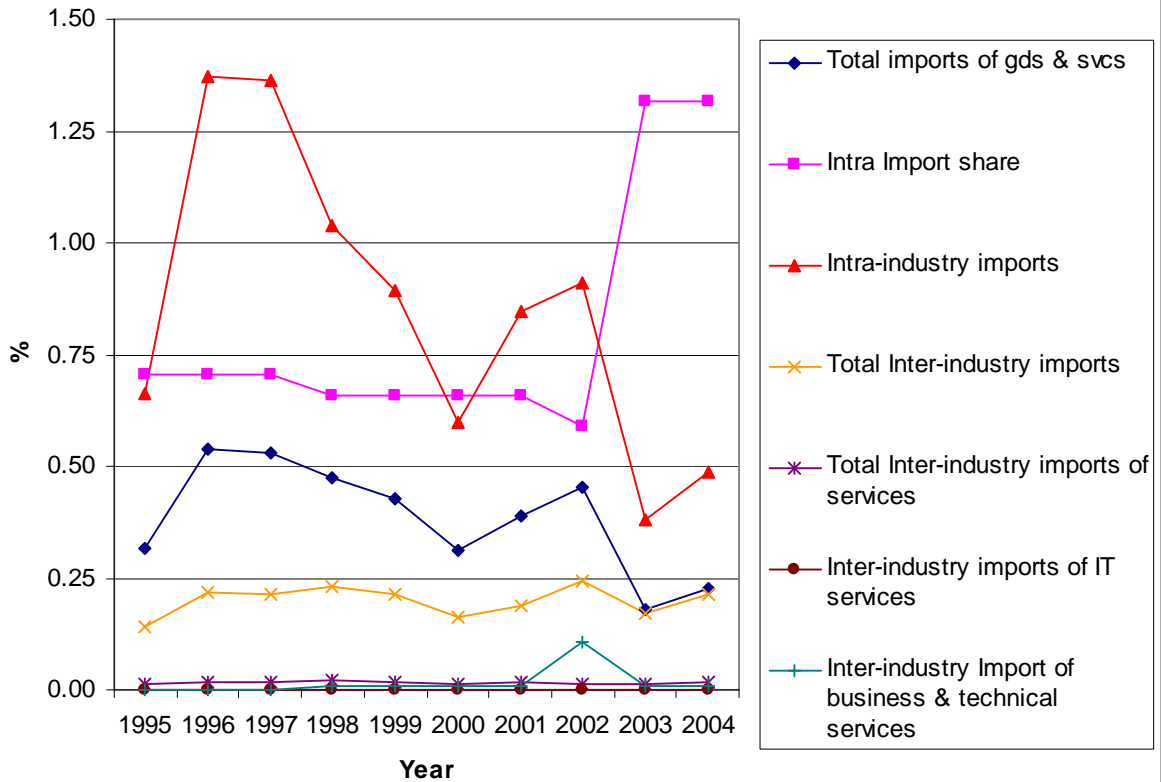
Import Shares of (27) - Rubber, Plastic



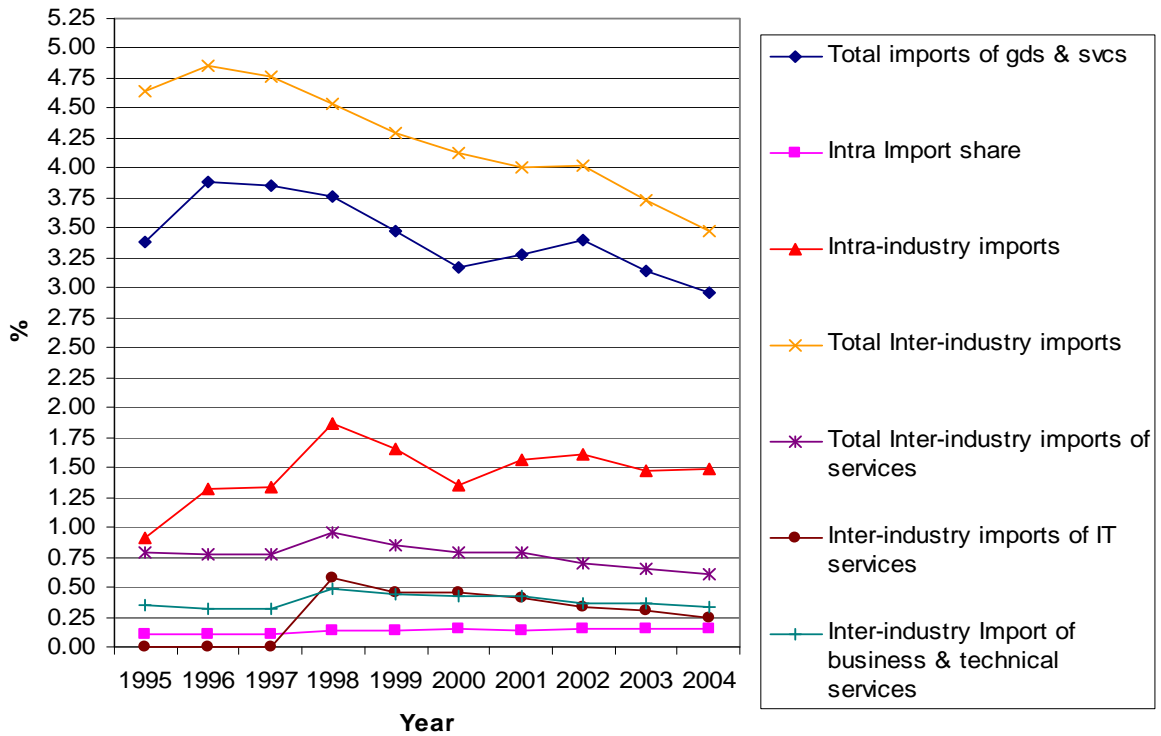
Import Shares of (28) - Non-metallic minerals



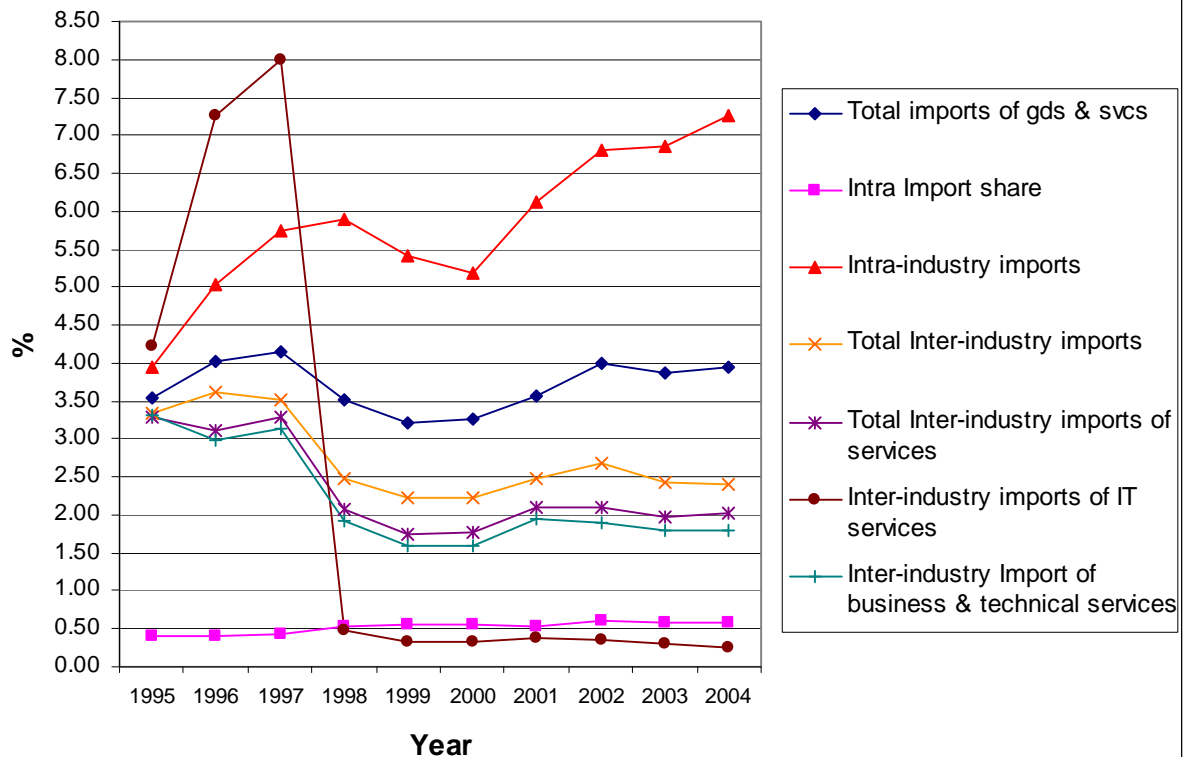
Import Shares of (29) - Basic metals



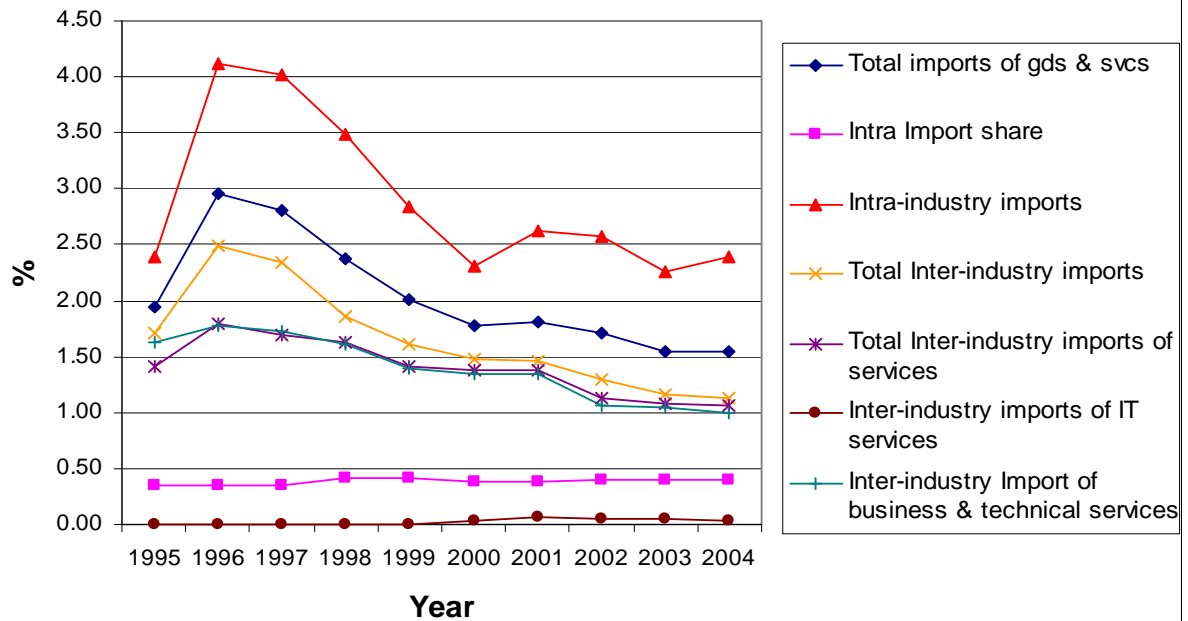
Import Shares of (30) - Fabricated metal



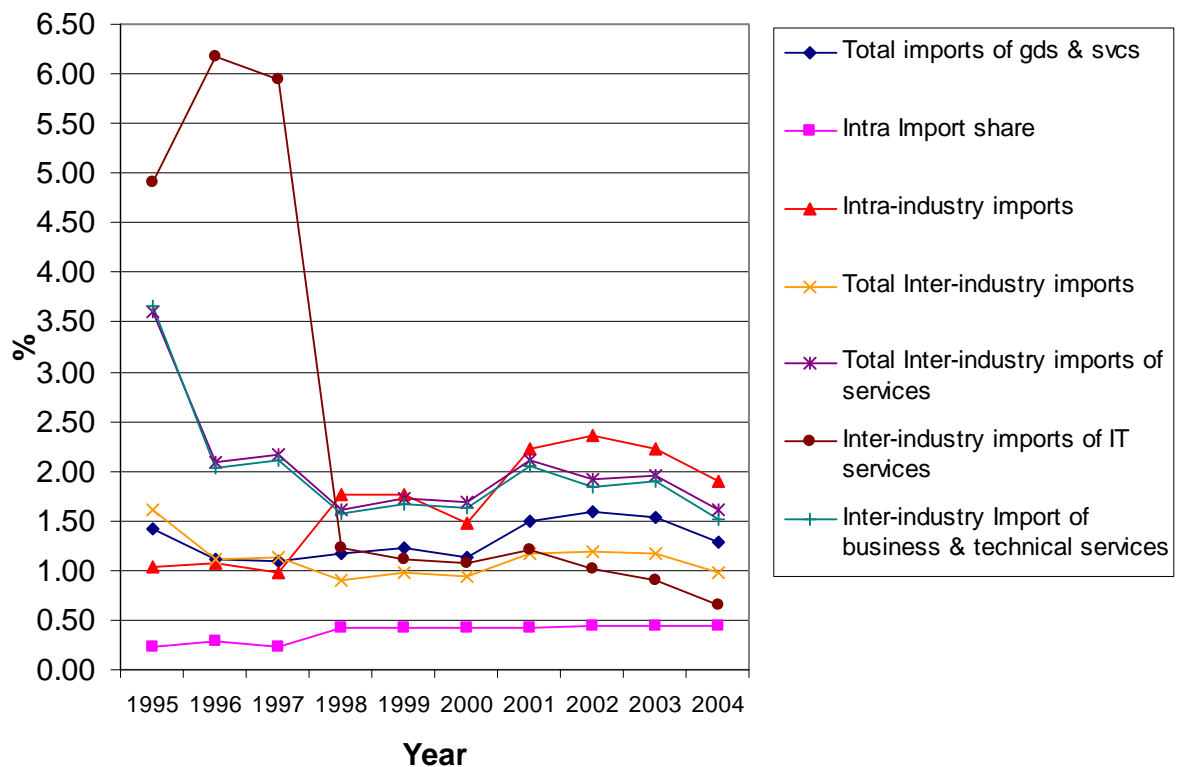
Import Shares of (31) - Machinery



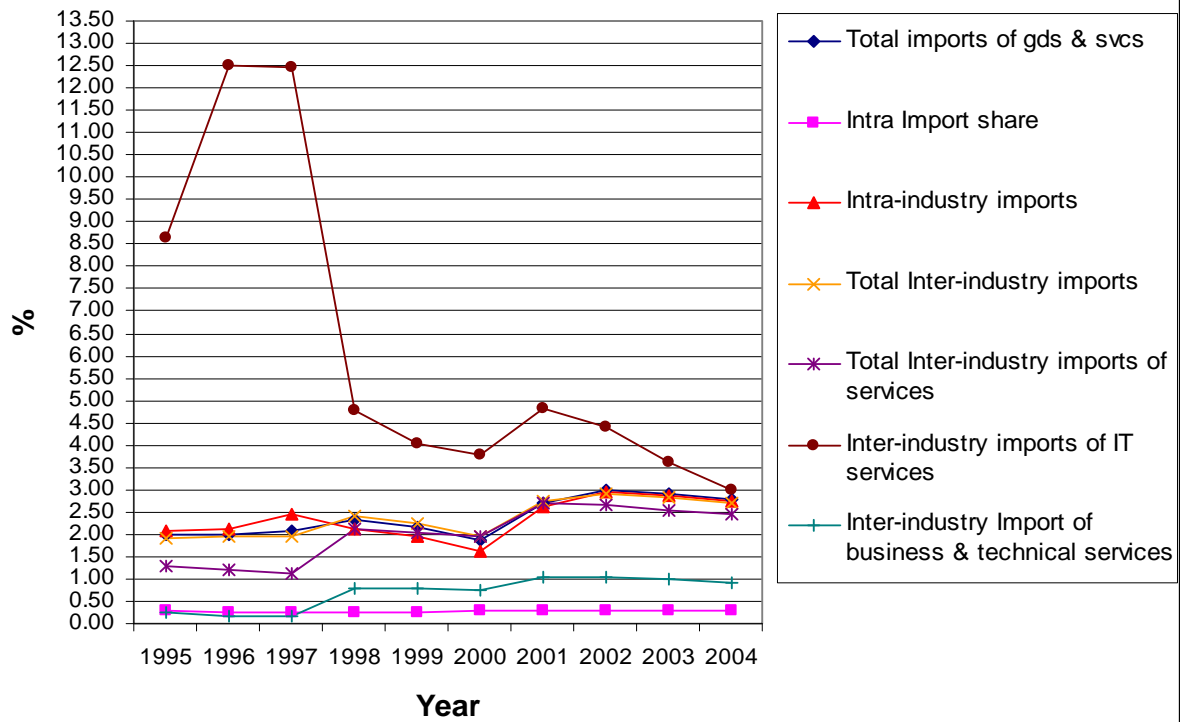
Import Shares of (32) - Electrical machinery



Import Shares of (34) - Medical, precision, optical equipment



Import Shares of (35) - Transport equipment



Import Shares of (36) - Furniture, n.e.c.

