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# Output and Productivity Performance of Hong Kong and Singapore's Transport and Communications Sector, 1990 to 2005\*

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This paper uses the industry of origin approach to analyze value added and labor productivity outcomes arising from progressive liberalization of government and from statutory board control of transport and communications in Singapore. The paper compares these outcomes with those from the market-orientated, more privatized transport and communications sector in Hong Kong, for the benchmark year 2004 and a review period from 1990 to 2005. The study is among the first to carefully compare labor productivity in specific sectors between the two countries. Although Singapore generally recorded higher levels of labor productivity, there was some catch-up by Hong Kong in the later part of the review period. There was also substantial variation in labor productivity performance within sectoral branches in the two sectors. The study suggests there is some evidence that the different political-economic structures and policy approaches to deregulation and liberalization played a role in determining productivity performance in the transport and communications sectors in Singapore and Hong Kong. The analysis infers a potential, increasing focus on privatization as the driving force for further liberalization of the transport and communications sector in Singapore.

*Keywords:* productivity, purchasing power parity, comparative price level.

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## I. Introduction

Over the past two decades, the deregulation of industry and public utilities in industrial countries and a more general liberalization of markets and international trade and investment have ensured that service sectors have become major contributors to employment and GDP growth. Singapore has responded to this international trend by gradually moving its state-owned enterprises from a highly regulated, bureaucratic system to a stronger commercial style of operation aimed at increasing market competition. This is evident in the electricity industry deregulation reforms of 1995, the corporatization of the Port of

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Singapore Authority in 1997, the deregulation of taxi fares in 1998, the financial sector liberalization in 1999 and the liberalization of telecommunications in 2000. The main aim of this paper is to provide an analysis of value added or labor productivity outcomes arising from the liberalization process in the transport and communication sector in Singapore and to compare these results with productivity outcomes in the same sector in Hong Kong over the period 1990–2005.

There are two principal motivations for the present study. First, to make any meaningful comparisons and assessment of real improvements as a result of the sectoral liberalization process in Singapore, it is necessary to compare these developments to those in a country that is similar in many respects. Hong Kong is an appropriate benchmark comparator for Singapore. Both countries, as city states, are widely regarded as two of the world's most open economies (Heritage Foundation, 2008). They are densely populated with limited land mass and natural resources but have excellent public transport systems, container ports and airline and airport services. In 2005, Singapore overtook Hong Kong as the world's busiest container port (Singapore's National Shippers' Council, 2006). From 2001 to 2005, and for the 2006 airport survey conducted by Skytrax, Hong Kong was rated the best airport in the world.<sup>1</sup> Therefore, both rely on efficient public transport systems domestically and efficient sea and air transport facilities internationally. Each country also has a well-reputed financial sector and over the past decade both have developed modern socioeconomic infrastructures and sophisticated information technology through extensive mobile telephony and internet telecommunications industries. Internet subscribers per capita in Singapore and Hong Kong are now broadly in line with the main internet users in the OECD: Korea, Denmark, Sweden and the USA.<sup>2</sup> These are essential facilities for encouraging growth and development of the service sector in general. By 2005, the service sector accounted for 82.7 and 63.1 percent of Hong Kong and Singapore's GDP, respectively. In 2005, the share of the service sector contribution by transport and communications stood at 10.1 and 11.8 percent, respectively, for Hong Kong and Singapore.<sup>3</sup>

Second, although the two countries have much in common, Table 1 indicates that the current transport and communications sectors evolved through different political–economic structures and policy management approaches in each

1. Data are drawn from <http://www.worldairportawards.com>.

2. Data for OECD is from *The Communications Outlook* (OECD, 2003). The number of internet subscribers for Hong Kong is drawn from the Census and Statistics Department (2006b). The number of internet subscribers for Singapore is drawn from the Singapore Department of Statistics (2005). The figures for Hong Kong refer to the year 2000 and for Singapore, 2001. Population data are drawn from ILO (2000, 2005).

3. Data on local currency constant prices are drawn from each country's statistical yearbook: for Singapore, the Singapore Department of Statistics (2006) in 2000 prices and for Hong Kong in 2005 prices, the Census and Statistics Department (2006a) from [http://www.censtatd.gov.hk/hong\\_kong\\_statistics/statistical\\_tables/index.jsp?charsetID=1&tableID=037](http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables/index.jsp?charsetID=1&tableID=037).

**Table 1 Comparison of the current liberalized/regulatory features of the transport and communications sectors in Singapore and Hong Kong**

	<i>Singapore</i>	<i>Hong Kong</i>
Bus	Currently provided by two private multi-modal companies (Singapore Bus Service (SBS) transit and Singapore Mass Rapid Transit (SMRT) buses), but still regulated by the Public Transport Council.	Currently provided by five privately-owned companies (franchised public bus services – Kowloon Motor Bus Company (1933) Limited; Citybus Limited; Long Win Bus Company Limited; New World First Bus Services Limited; and New Lantao Bus Company (1973) Limited.
Rail	In 2004 Temasek Holdings (private) Ltd owns 62.29 percent of SMRT thus making SMRT quasi-government owned.	In 2000, the Mass Transit Railway (MTR) Corporation Limited became Hong Kong's first privatized rail and metro company.
Taxi	In 1998, taxi fares were deregulated and by 2004 the taxi industry was fully deregulated. (7 taxi companies).	Taxis are either privately-owned or owned by companies but the industry is regulated by the Government, as are the fare scales.
Aviation	Singapore Airlines currently government owned. The Singapore Government investment and holding company, Temasek Holdings is the majority shareholder with a 56.7 percent shareholding in 2004. Singapore Changi Airport is owned by the Civil Aviation Authority of Singapore (CAAS), which is a statutory board under the Ministry of Transport.	Cathay Pacific (Hong Kong's flag carrier) is privately-owned. Hong Kong International Airport (HKIA) is operated by the Airport Authority Hong Kong, a statutory body wholly owned by the Government of Hong Kong Special Administrative Region.
Port	In 1997, Port of Singapore Authority (PSA) Corporation Ltd was corporatized.	The facilities of Port of Hong Kong: facilities are financed, owned and operated by the private sector.
Communications	In 2000, telecommunications industry was liberalized	In 1995, telecommunications industry was deregulated.
Postal	Partly divested (2004 – 31 percent owned by SingTel which is owned by Temasek Holdings)	In 1995, began operating as a trading fund to operate more commercially.

Note: Temasek Holdings (private) Ltd is the investment arm of the Government of Singapore.

country. Singapore has a long tradition of operating industries through statutory boards as government-owned business monopolies (Ow, 1986; Soon and Tan, 1993). Table 1 indicates that deregulation of this sector in Singapore occurred first through liberalization of statutory boards under government direction then, more recently, through partial privatization of the publicly-owned monopolies. In contrast, developments in the sector in Hong Kong reflect emphasis on a more market-orientated approach with little or no restrictions on the scope of private ownership even after the establishment of the Hong Kong Special Administration Region by China in 1997. Clearly, privatization has been a stronger driving force, historically, in Hong Kong, with Singapore moving latterly in this direction as a means of stimulating market competition.

Given these motivations, the sectoral comparative analysis in the present paper addresses three related questions. The first is, the extent to which the analysis sheds light on the relative performance of the transport and communications sector in Singapore and Hong Kong since 1990; the second is the extent to which the liberalization process in Singapore has improved value added and productivity outcomes for the traditionally heavily regulated transport and communication sector; and third, have the different political-economic structures and policy emphases had detectable influences on the relative sectoral productivity performances in the two countries?

The paper is among the first to carefully compare labor productivity in a specific service sector between the two countries. Previous studies, such as Young (1995), Chen (1997) and van Ark and McGuckin (1999), have analyzed service performance, but in more aggregated forms.

Because the paper undertakes a direct comparison of sectoral value added and productivity, it uses the well-recognized industry-of-origin methodological approach, which is explicitly designed for this purpose (van Ark, 1993; Mulder, 1994; van Ark et al., 1999; Lee and Shepherd, 2002). It draws on the concept of purchasing power parity of currencies for derivation of appropriate currency converters to enable quantification of output and productivity at various disaggregated levels in national currencies. The study uses a partial productivity analysis (i.e. it discusses only labor productivity). No doubt, a more robust productivity analysis would be achieved if a multifactor approach could be adopted. The lack of reliable capital stock data and appropriate capital stock purchasing power parities (PPP) prevent the adoption of a multifactor productivity approach.

The paper proceeds as follows. Section II is a literature review, which describes the industry-of-origin methodology used in the study. Section III presents the results of the real output and productivity comparisons between Singapore and Hong Kong for the benchmark year 2004 and the productivity trends over the period 1990 to 2005. Section IV offers general concluding comments.

## II. Literature Review

When a comparative analysis involves services, two major problems arise. The first is the difficulty in distinguishing prices, quantities and quality of services. Hill (1977) notes that the quantity of a service is difficult to capture as it often represents a process by which a consumer or consumer good is changing. Unlike manufactured goods, services are characterized by a greater degree of heterogeneity, which makes aggregation difficult. Some studies measure output only in physical terms. For example, Girard (1958) and Gadrey et al. (1990) measure output in terms of tones-km and passenger-km for the transport industry. Some studies consider the importance of differing average haul distances or passenger trip lengths and that the output measure must take separate account of loading and unloading services and costs, which are more important, proportionately, in a country with shorter hauls or passenger trips. This activity of loading and unloading, called terminal services, is taken into account in studies such as Paige and Bombach (1959), Smith et al. (1982), Mulder (1994) and Lee and Shepherd (2002). For the communications industry, Rostas (1948) and Paige and Bombach (1959) use the number of calls and access lines and the volume of mail handled.

Second, meaningful real output comparisons are difficult as each country's output is expressed in its own currency unit and has to be converted into a common currency. Direct comparisons require the use of an appropriate currency converter. The use of official exchange rates is not suitable because they are heavily influenced by capital movements and exchange rate adjustments and do not reflect real price differences between countries. Appropriate currency conversion makes use of the concept of PPP. Some well-known studies (see Kravis et al., 1982; OECD, 1992) have derived PPP through the expenditure side of national accounts. However, PPPs derived from the expenditure side of national accounts are not appropriate for use in the current study as they cannot be used directly in sectoral analysis of output and labor productivity comparisons because they do not produce real product by industry. This implies that the PPP to be used in the present study must be derived from the production side in order to develop real output and productivity comparisons.

The PPP derived in this paper follows the International Comparisons of Output and Productivity (ICOP) approach used in studies such as Maddison and van Ark (1988), Szirmai and Pilat (1990), van Ark (1993), Pilat (1994) and Lee and Shepherd (2002). The ICOP approach is essentially a three-stage process. The first stage matches item/service activity of similar characteristics in both countries. Assume the activity of 'mail handling' to be the same in both countries. A unit value for this matched service is derived from the ratio of its value of output to its corresponding quantity. Conceptually, this unit value represents the average price per unit of mail handling for each country. In turn, the implicit price average provides a relative price comparison between these two countries for mail handling. The second stage involves aggregation of the

matched service activities to derive branch-level aggregates and PPP. For example, under the branch ‘Communications,’ the matched services would include ‘mail handling,’ ‘telephone subscription,’ ‘mobile phone subscription,’ and ‘internet subscription.’ The aggregation of these industries yields branch-level PPP. The third and final stage is an aggregation of all branch PPP to derive the overall PPP, which in this case is the PPP for transport and communications. Real output and productivity levels can thus be derived using the ICOP PPP.<sup>4</sup>

**III. Results**

*III.1 Relative size and structure of the transport and communications sectors in Hong Kong and Singapore, 2004*

Table 2 shows the value output and quantities of freight and passengers in transport and communications in Singapore and Hong Kong for the year 2004.

**Table 2 Quantity and value output of freight and passengers in transport and communications, Hong Kong and Singapore, 2004**

	<i>Quantities produced ('000) Terminal services (passengers or tonnes)</i>			<i>Gross value of output (d)</i>	
	<i>Singapore (1)</i>	<i>Hong Kong (2)</i>	<i>HK/Sin (%) (3)</i>	<i>Singapore (\$m) (4)</i>	<i>Hong Kong (HK\$m) (5)</i>
<b>Passenger transport</b>					
Rail	487 878 <sup>a</sup>	1 400 056	287.0	} 1223 <sup>c</sup>	} 25 042
Buses	} Land 1 020 408 <sup>a</sup>	} 2 203 317 <sup>b</sup>	} 215.9		
Taxis					
Sea/coastal water transport	7482	21 407	286.1	80	2323
Air (arrival and departure)	28 606	36 287 <sup>c</sup>	126.8	8129	31 813
<b>Freight transport</b>					
Rail	} Land NA	} 272	} NA	} 921	} 13 179
Trucks					
Sea (cargo throughput)	393 418	220 879	56.1		
Port container throughput (TEU)	21 329	21 984	103.1	7318	13 709 <sup>e</sup>
Air	1775	3090 <sup>f</sup>	174.1	3450	17 795

4. For a more detailed description of the ICOP approach and the algebraic equations used, see Lee and Shepherd (2002). Note that the current study excludes the use of outputs in terms of tons/km and passenger/km as these data were not released in any of the statistical publications and affiliated annual reports and surveys for each country.

Table 2 (continued)

	<i>Quantities produced ('000)</i>			<i>Gross value of output (d)</i>	
	<i>Terminal services (passengers or tonnes)</i>				
	<i>Singapore</i>	<i>Hong Kong</i>	<i>HK/Sin</i>	<i>Singapore</i>	<i>Hong Kong</i>
	<i>(1)</i>	<i>(2)</i>	<i>(%) (3)</i>	<i>(\$m) (4)</i>	<i>(HK\$m) (5)</i>
Communications	Singapore	Hong Kong	HK/Sin	Singapore <sup>j</sup>	Hong Kong <sup>k</sup>
Telephone lines (subscriptions) <sup>h</sup>	('000 number)	('000 number)	(%)	(\$m)	(HK\$m)
Mobile phone subscriptions	1864	3780	202.8	3610	19 979 <sup>m</sup>
Internet Subs (broadband)	3861	8214 <sup>i</sup>	212.7	2105	11 970
Internet Subs (dial-up)	512	1484	289.8		2663
	1714	1004	58.6	1440	179
Total	7951	14 482	182.1	7155 <sup>n</sup>	34 791
	('000 number)	('000 number)			
Mail handled (excludes parcels)	834 402 <sup>l</sup>	1 273 000	152.6	295 <sup>o</sup>	3567 <sup>p</sup>

Notes: <sup>a</sup>Figures derived by multiplying average daily passenger-trips to the number of days for 2004 (ie. 366 days). <sup>b</sup>Includes franchised buses, public light buses, residents' services, KCRC light rail transit feeder bus. <sup>c</sup>This figure is drawn from the Civil Aviation Department via <http://www.cad.gov.hk/english/p-through.htm> (accessed on 12 September 2006). <sup>d</sup>Gross value output for Singapore and Hong Kong refer to gross receipts of their respective passenger and freight revenue. Note that the sum of the value output for each country does not tally with the value output given in each country's statistical publication due to omission of services incidental to transport and others not elsewhere classified such as storage and warehousing. In addition, the gross receipts for primary activity are only taken into account. All other sideline gross receipts are excluded. <sup>e</sup>Chartered bus and school bus not included. <sup>f</sup>Only international. Tonnes refer to air cargo throughput. <sup>g</sup>Port container throughput value output refers to business/operating receipts of 'supporting services to water transport.' This is based on the fact that the activity relates to the need for cargo-related facilities and services. <sup>h</sup>At end of period. Excludes fax lines. <sup>i</sup>Figure refers to fiscal year ending 31 March 2005. Data drawn from website of Office of the Telecommunications Authority via <http://www.ofta.gov.hk/en/datatstat/hktelecom-indicators.html> accessed on 6 September 2006. <sup>j</sup>Singapore figures drawn from individual annual reports of Singtel, Starhub, M1, and Pacific Internet. For Singtel this refers to operating revenue by service only within Singapore. Optus excluded. <sup>k</sup>Gross value output here refers to business receipts. It is important to note that the sum of all business receipts do not tally with the total business receipts as the primary subscription is only taken into account. All other sideline gross receipts are excluded. <sup>l</sup>Data drawn from IDA website <http://www.ida.gov.sg> (accessed on 31 October 2006). Data differs to that found in the *Yearbook of Statistics 2005* probably due to concept and coverage. Because the latter source does not clearly specify inclusion/exclusion of parcels (terms used are postal articles handled) whereas IDA only considers both domestic and international mail, the IDA data is therefore used. <sup>m</sup>Refers to telephone and telegraph services. <sup>n</sup>Figure here does not tally but are very similar to the revenue (\$7190m) from the Singapore Department of Statistics (2004a; accessed 12 September 2006). Revenue in this Table refers only to primary subscription. <sup>o</sup>Operating revenue for mail only refers to Singapore Post. Figure is for financial year 2004/0505 (ie. 1 April 2004 to 31 March 2005). <sup>p</sup>Refers to general mail services turnover referred to in the Hong Kong Post Annual Report 2004/2005. NA, not available.

Sources: Census and Statistics Department (2004a; 2004b; 2005; 2006); Hong Kong Post Annual Report (2004/2005); Singapore Department of Statistics (2004a; 2004b; 2004c; 2005).



**Table 3 Gross value of output, gross value added, number of persons engaged by branch, transport and communications of Hong Kong, 2004**

	<i>Gross value of output<sup>b</sup></i> (HK\$m) (1)	<i>Gross value added<sup>b</sup></i> (HK\$m) (2)	<i>Share in total transport and communications</i> (% of value added) (3)	<i>Number of persons engaged</i> (4)	<i>Share in total transport and communications</i> (%) (5)
Transport	378 669	100 216	83.1	319 994	91.2
Land	50 419 <sup>a</sup>	29 662	24.6	204 103 <sup>c</sup>	58.2
Sea and PCT	75 857	24 131	20.0	34 288	9.8
Air	76 117	28 216	23.4	29 288	8.4
Services allied to transport <sup>d</sup>	176 277	18 207	15.1	52 315	14.9
Communications	61 717 <sup>e</sup>	20 358 <sup>e</sup>	16.9	30 706	8.8
Telecommunications	49 705	17 151	14.2	17 887	5.1
Postal services	12 012	3208	2.7	12 819	3.7
Transport and communications					
Current table	440 386	120 574	100.0	350 700 <sup>f</sup>	100.0
National accounts	NA	126 820	—	350 700	—
ILO	—	—	—	358 200	—

Notes: <sup>a</sup>Includes supporting services to land transport. <sup>b</sup>Values are most likely in market prices as they are based on gross receipts. Figures here differ to Table 2 as it includes all other incomes and business receipts besides passenger and freight revenue. <sup>c</sup>Communications figure is the sum of telecommunications and postal services. Figure here is for the whole industry and as such its figure is higher than Table 2 because Table 2 only covers primary activity. <sup>d</sup>The 2004 Annual Survey of Transport and Related Services does not include storage. Storage was thus included under 'services incidental to transport' so as to correspond to the Singapore concept and figures in the table. Data was drawn from the Report on 2004 Annual Survey of Storage, Communication, Banking, Financing, Insurance and Business Services. <sup>e</sup>From the survey coverage of land transport number of persons engaged in the 2004 Annual Survey of Transport and Related Services, non-owner operators of taxis and public light buses and individual transport labourers were excluded. Therefore, the true number of persons engaged for land transport excluding those identified is 97 562. As there was no sampling done for these and to include their numbers, we assume that the difference between the national accounts' number of persons employed and the aggregated figure of transport and communications from the annual surveys which gives an employment figures of 244 159 should arrive at a decent figure to represent the non-owner operators of taxis and public light buses and individual transport labourers. (350 700 – 244 159 = 106 541; 97 562 + 106 541 = 204 103). <sup>f</sup>Number of persons engaged less non-owner operators of taxis and public light buses and individual transport labourers was 244 159 persons. NA, not available; PCT, port container throughput.

Source: Census and Statistics Department (2004a) and 2004b; ILO (2005).

It is also the primary data source used in deriving PPPs. Tables 3 and 4, respectively, contain estimates of the gross value of output, gross value added and employment, by branch, for Hong Kong and Singapore for the benchmark year 2004. The output data refer to gross receipts expressed at market prices.

**Table 4** Gross value of output, gross value added, number of persons engaged by branch, transport and communications of Singapore, 2004

	Gross value of output <sup>a</sup> (S\$m) (1)	Gross value added <sup>b</sup> (S\$m) (2)	Share in total transport and communications (% of value added) (3)	Number of persons engaged <sup>(4)</sup>	Share in total transport and communications (%) (5)
Transport	50 723	16 508	80.2	173 752	89.1
Land	3539 <sup>a</sup>	1935	9.4	102 258 <sup>g</sup>	52.4
Sea and PCT	26 297	7831	38.1	21 177	10.9
Air	16 530	4811	23.4	21 682	11.1
Services allied to transport <sup>f</sup>	4358	1931	9.4	28 635	14.7
Communications	9345 <sup>c</sup>	4066 <sup>c</sup>	19.8	21 347	10.9
Telecommunications	8259	3574	17.4	15 067	7.7
Postal services <sup>c</sup>	1086 <sup>d</sup>	491	2.4	6280	3.2
Transport and communications					
Current table	60 069	20 573	100.0	195 099	100.0
National accounts	NA	21 489	—	212 500	—
ILO	—	—	—	212 500	—
MRSD – manpower 2005 <sup>h</sup>	—	—	—	191 974	—
MRSD – labour market 2005 <sup>i</sup>	—	—	—	188 224	—

Notes: <sup>a</sup>Includes supporting services to land transport. <sup>b</sup>Gross value output is most likely in market prices as they are based on gross receipts. Value added is in factor cost as the concept described in the survey excludes the impact of taxes including goods and services tax (and subsidies) on products. Figures here differ to Table 2 as the values in this table include all other incomes and business receipts besides passenger and freight revenue. <sup>c</sup>Communications figure is the sum of telecommunications and postal services. Figure here is for the whole industry and as such its figure is higher than Table 2 because Table 2 only covers the actual activity. <sup>d</sup>Operating receipts. <sup>e</sup>Postal services estimates were derived by deducting transport, and information and communications (excludes postal) from transport, information and communications (includes postal). From the Economic Survey Series, the survey on 'Information and Communications 2004' excludes postal services while the survey 'The Services sector 2004,' which covers transport, information and communications, covers all forms of transport and communications including postal services. By taking their differences, an estimate for postal services was thus derived. <sup>f</sup>Includes storage and warehousing. <sup>g</sup>Coverage of land transport in the Economic Survey series, Transport Services reference year 2004 excludes the number of taxi drivers. In order to include them in the number of persons engaged, the number of total valid vocational licenses issued added (73 081) for 2004 is to the land transport number of persons engaged from the above source. <sup>h</sup>Manpower Research and Statistics Department. Refers to Dec 2004. <sup>i</sup>Manpower Research and Statistics Department. Data based on SSIC 2000. Refers to Dec 2004. NA, not available; PCT, port container throughput.

Source: Manpower Research and Statistics Department (MRSD), 2005 and 2006. (<http://www.mom.gov.sg/publish/momportal/en/communities/others/mrds.html>) ILO, 2005. Singapore Department of Statistics (2004a, 2004b, 2004c).

Value added for Singapore is at factor cost but the value added data for Hong Kong does not specify whether it is at market prices or factor cost. The output data in Tables 3 and 4 are also much higher than those shown in Table 2. The difference reflects the fact that the output figures in Table 2 account only for the mode of transport and communications directly identified in the table.

Table 3 shows that the number of persons engaged in transport and communications in Hong Kong in 2004 was 244 159, which is approximately 70 percent of the national accounts figure of 350 700 persons. As discussed in the notes in Table 3, the difference is explained by the less extensive coverage in the *Annual Survey of Transport and Related Services, 2004*, which excludes non-owner operators of taxis, public light buses and individual transport laborers. For Singapore, in the Economic Survey series *Transport Services Reference Year 2004*, the operation by persons not registered with the Accounting and Corporate Regulatory Authority or Registry of Societies, such as taxi drivers, was excluded. Therefore, to account for the number of taxi drivers, the number of valid vocational licenses issued for 2004 (73 081) was included in the estimate of the number of persons employed in the transport and communications sector in Singapore.

In terms of size, the gross value of output in transport and communications in Hong Kong (expressed in Singapore dollars at the PPP rate: S\$1.00 = HK\$4.02, shown in Table 5) was S\$109 582m, and for Singapore, S\$60 069m. Therefore, gross output in the sector in Hong Kong was approximately 82 percent greater than Singapore's output. Using national accounts figures, transport and communications gross value added was S\$31 557m in Hong Kong and S\$21 489m in Singapore. On these estimates, gross value added in Hong Kong's transport and communications sector was approximately 47 percent greater than the Singapore level. However, gross value added was 29 percent of transport and communication's gross output in Hong Kong, compared with a greater 36 percent for Singapore. This suggests that Hong Kong uses relatively more intermediate inputs in producing gross value added in the transport and communications sector. Indeed, using national accounts estimates (in Tables 3 and 4), in 2004, the number of persons engaged in this sector in Hong Kong was 1.65 times that in Singapore. Overall, the sectors in both countries made a similar contribution to total GDP and total employment: 11.2 percent of GDP and 10.6 percent of employment in Hong Kong and 12 and 10.3 percent in Singapore, respectively.<sup>5</sup>

In terms of structure, Tables 3 and 4 show that land transport and air transport were the main gross value added contributors to the transport and communications sector in Hong Kong and that sea transport and air transport were the main contributors in Singapore.

5. Data are expressed in national currencies and are drawn from each country's statistical year books; Singapore from the Singapore Department of Statistics (2004b, c, 2005) and Hong Kong from the Census and Statistics Department (2004a, b, 2005).

**Table 5 Paasche, Laspeyres and Fisher PPPs for transport and communications, Singapore and Hong Kong, 2004**

	<i>At Hong Kong quantity weights (Paasche PPP)</i>	<i>At Singapore quantity weights (Laspeyres PPP)</i>	<i>Geometric average (Fisher PPP)</i>	<i>Comparative price level (Singapore = 100)</i>
Transport	4.19	4.62	4.40	95.48
Land	9.41	9.41	9.41	204.18
Sea and PCT	4.51	5.22	4.85	105.35
Air	3.04	3.05	3.04	66.07
Communications	2.77	2.73	2.75	59.69
Telecommunications	2.59	2.52	2.56	55.48
Telephone subscriptions	2.73	2.73	2.73	59.22
Mobile phone subscriptions	2.67	2.67	2.67	58.02
Internet subscriptions	1.77	1.77	1.77	38.33
Mail handled	7.92	7.92	7.92	171.78
Transport and communications	3.78	4.28	4.02	87.22
Exchange rate	—	—	4.61	

Notes: PCT, port container throughput. Paasche and Laspeyres PPP for overall transport and communications were derived by weighting the PPP of separate branches using value output as weights. Comparative price level is calculated by dividing PPP by the exchange rate. Exchange rate is period average.

Source: Exchange rate from IMF, *International Finance Statistics*, 2005, Washington DC. PPP from Appendix Table 1.

In Hong Kong, although land transport lagged behind air transport in terms of gross value of output, it was the main contributor to value added, at 24.6 percent, and employment, at 204 103. In contrast, land transport in Singapore was a much smaller contributor to value added at 9.4 percent, and employment, at 102 258. The bulk of employment in land transport in Singapore consisted of 37.5 percent as taxi operators and 14.6 percent as bus operators, lorry operators and those operating the Mass Rapid Transit (MRT) system. Moreover, although Hong Kong had a lower recorded level of road and rail kilometrage per capita, at 0.31 km/1000 inhabitants, against 0.78 km/1000 inhabitants in Singapore, the number of private cars per thousand population, of 96 in Singapore was almost twice that of 49.8 in Hong Kong.<sup>6</sup> This implies that the rate of use of public transport is greater in Hong Kong than in Singapore, thereby helping to explain the significant proportion of value added in land transport in Hong Kong. This concurs with a study by Luk and Olszewski

6. Singapore's population was 4.273 million in 2004. The number of private cars in Singapore was 412 015. Population data are drawn from ILO (2005); and the data for the number of private cars in Singapore is drawn from the Singapore Department of Statistics (2005). For Hong Kong, private cars per thousand population is directly drawn from the Transport Department (2005).

(2003), which also shows Hong Kong has a higher rate of use of public transport than Singapore.

The contribution of air transport, at approximately 24 percent of value added, was significant in both city–state economies. This reflects award recognition of the new Hong Kong International Airport, in operation since 1998, and Singapore’s Changi Airport, as well as the excellence of facilities and services provided by the national airline carriers, Cathay Pacific and Singapore International Airlines, for Hong Kong and Singapore, respectively. In Singapore, the largest contributor to gross output and value added in the transport and communications sector, sea transport, reflects its 24 h/day operational port facilities catering for large volumes of entrepot trade. Finally, the value-added contributions of telecommunications alone in Hong Kong and Singapore, at 14.2 and 17.4 percent, respectively, illustrate not only the importance of the branch contributions in their own right, but also the important role new information technology, telephony and internet services play in facilitating the growth of service industries in economies facing a paucity of natural resources but abundant supplies of skilled and unskilled labor (see below).

### *III.2 Purchasing power parities and comparative price levels*

Table 5 displays comparative price levels and Paasche, Laspeyres and Fisher PPP, using branches in the transport and communications sector for the 2004 benchmark year. The similarities in the PPP at each country’s quantity weight emanate from the closeness of the benchmark comparisons, the similarity in their transport and communications structures, the types of services provided and the standards of living.

In 2004, the geometric average PPP for transport and communications was HK\$4.02 to the Singapore dollar compared to an exchange rate of HK\$4.61 to the Singapore dollar. The ratio of the geometric average PPP to the exchange rate produces a relative or comparative price level for each branch and sector. Using Singapore as the base country, a comparative price level greater (lower) than 100 indicates that prices in that particular branch or sector in Hong Kong are higher (lower) than their counterparts in Singapore.

The comparative price levels for air transport and telecommunications were lower in Hong Kong than in Singapore in 2004. The lower air transport price level in Hong Kong reflects lower costs stemming from less labor duplication. This is explained more fully in the next section of the paper. The lower telecommunications price level reflects lower fixed line and mobile phone subscription prices arising from Hong Kong’s larger number of fixed telecommunications network services (FTNS) and mobile phone service providers relative to Singapore. In 2004, Singapore had only two FTNS, Singtel and StarHub, and three mobile service providers, Singtel, Starhub and M1, compared with ten and six different providers in each category, respectively, in Hong Kong.<sup>7</sup>

7. The 2004 data were not available. In 2005, there were 10 wireline-based FTNS operators in Hong Kong.

Clearly, as economic theory suggests, greater competition in fixed line telecommunications and mobile phone subscriptions lowered the comparative price level for these branches in Hong Kong. No doubt, the greater level of competition in Hong Kong's telecommunications sector reflects the country's traditional self-reliant, market-orientated structure and active policy approach to the deregulation of the sector, which commenced in 1995, with full liberalization being achieved by 2000. In contrast, Singapore lagged behind and did not commence the liberalization of the statutory authority dominance of the telecommunications sector until 2000.

Along with initiatives in fixed line and mobile telephony, both countries had similar strategic objectives (but with different approaches and time frames) of developing their telecommunications systems into significant international telecommunications branches, particularly through internet facilities and access.

Hong Kong's Telecommunications Authority introduced the Digital 21 IT Strategy in 1998. This was reviewed in 2001 and significantly updated in 2004. By 2003–2004 Hong Kong had 186 internet service providers (ISP) compared to 3 ISP in Singapore. This high level of competition enabled the International Telecommunications Union to rank Hong Kong as the world's foremost economy in terms of affordability of internet access.<sup>8</sup> This is demonstrated by Hong Kong having a lower price level in internet subscriptions than Singapore.

In contrast, the pace of innovation was slower in Singapore. Chia et al. (1998) review the Singapore experience prior to the late 1990s and highlight the importance of initiatives such as IT2000, I-Hub and Singapore One as government sponsored agencies for developing information technology and internet services. The main initiatives since then have been the establishment of the Singapore Infocomm Development Authority (IDA) and the launching of the Infocomm 21 strategy aimed at harnessing infocomm technologies to improve Singapore's national competitiveness and to provide reliable, efficient and cost-effective connectivity to the rest of the world.<sup>9</sup> This progressively improved Singapore's standing in the provision of information technology.<sup>10</sup>

Nevertheless, despite following broadly similar strategies, it appears that Hong Kong's more market-based deregulation of telecommunications management was more effective in facilitating ease of entry and the creation of a more competitive market structure.

8. Information is drawn from the International Telecommunications Union (2002). Although the report focuses on 2002, the current study confirms the results showing Hong Kong's better performance in mobile communications and internet provision relative to Singapore.

9. The IDA was formed by merging the Telecommunication Authority of Singapore and the National Computer Board in December 1999.

10. The report *The Global Information Technology Report 2002–2003: Readiness for the Networked World* by Lanvin et al. (2003) rates Singapore as one of the world's leading information technology countries.

Moving to land transport, it is clear that the relative price of land transport in Hong Kong in 2004 was twice that in Singapore.<sup>11</sup> This concurs with a study by UBS that demonstrates that in 2003 the average rate of taxi charges in Hong Kong and Singapore were US\$4.78 and US\$0.83, respectively.<sup>12</sup> The higher Hong Kong taxi costs also reflect a range of additional surcharges, for items such as additional passengers' luggage, surcharges that do not occur in Singapore. Moreover, Hong Kong's main public transport system, the Mass Transit Railway (MTR), although partially privatized in 2000, with the Hong Kong SAR Government retaining 76 percent of the MTR, remained independently managed on commercial principles. Its financial independence means that it does not depend on government subsidies, which enables it to act more like a privatized organization.

In contrast, the lower prices in private and public transport in Singapore reflect greater government involvement in the areas. Lam and Toan (2006) show that in Singapore capital investment in infrastructure, rolling stock and equipment is the responsibility of the government. In this vein, Tan and Phang (2005) show that Singapore's main public transport system, the MRT, is completely subsidized by the Singapore Government. These arguments infer that government subsidies lower production costs, particularly with respect to the mass public transport system. This also implies higher production costs in Hong Kong and a higher price level for land-based transport than in Singapore. The more heavily subsidized system in Singapore reflects the traditional government sponsored approach to the provision of land transport services.

Apart from their levels in the benchmark year 2004, trends in their PPP, exchange rates and comparative price levels offer further perspective on the transport and communications sectors in the two countries. Table 6 shows trends in the PPP, exchange rate and relative price level, as well as other trends such as output and labor productivity, over the period 1990 to 2005.

The transport and communications sectors' PPP lay below the exchange rate between the two countries from 1990 to 1997. Reflecting the onset of the Asian financial crisis, the PPP rose above the exchange rate from 1998 to 2002. The countries' exchange rate regimes influenced these trends. As Lu and Yu (1999) point out, the Hong Kong dollar's peg to the US dollar prevented it from managing its exchange rate to help stabilize domestic prices. Singapore, in contrast, could influence the domestic price level by use of its managed floating regime. Table 6 thus shows an appreciation of the Hong Kong dollar against the Singaporean dollar, but with Hong Kong's higher domestic inflation producing a declining PPP against the Singaporean currency. Therefore, in 1997–1998, the Hong Kong dollar experienced a 7-percent decline in its purchasing power as

11. It is important to note that land transport as used here only covers train services and train passenger services. There was no data available for land freight transport in Singapore; hence, this part of the land transport industry was excluded in the derivation of PPP and comparative price levels. In addition, private car ownership was not included as this activity is not part of the transport industry as defined by each country's SIC codes.

12. See UBS (2003).

**Table 6 PPP, Exchange rates, comparative price levels, output and labour productivity (Singapore = 100)**

	<i>PPP</i>	<i>Exchange rates</i>	<i>CPL</i>	<i>Comparative Output</i>	<i>GVA per hour</i>	<i>GVA per person</i>
1990	3.08	4.30	72	191	108	105
1991	3.16	4.50	70	184	106	103
1992	3.62	4.75	76	186	105	100
1993	3.86	4.79	81	172	94	91
1994	4.04	5.06	80	171	90	88
1995	4.16	5.46	76	168	99	94
1996	4.57	5.49	83	161	96	93
1997	4.93	5.21	95	144	92	88
1998	5.28	4.63	114	129	80	77
1999	5.01	4.58	109	129	80	79
2000	4.63	4.52	102	139	79	78
2001	4.78	4.35	110	138	90	90
2002	4.93	4.36	113	138	87	89
2003	4.37	4.47	98	140	89	90
2004	4.02	4.61	87	147	86	89
2005	3.88	4.67	83	160	98	100

Note: Comparative price level (CPL) derived by dividing PPP by the exchange rate. Time-series PPP derived by first calculating the ratio of Hong Kong transport and communications GDP deflator by the Singapore transport and communications GDP deflator. Note that the deflators are derived by taking the ratio of current over constant (at 2004 prices) transport and communications GDP. Finally, these values are multiplied to the 2004 geometric average PPP from Table 5. Exchange rates are in period averages and drawn from various issues of IMF.

Source: For Hong Kong: National Income Section, Census and Statistics Department via <http://www.censtatd.gov.hk/> (accessed on 5 October 2006). Census and Statistics Department, *2005 Gross Domestic Product*. For Singapore: Singapore Department of Statistics, *Yearbook of Statistics Singapore* (various issues). Singapore Department of Statistics, *Statistical Highlights 2006*. Singapore Department of Statistics, *Economic Survey of Singapore 2003*. IMF, *International Financial Statistics Yearbook 1995, 2000 and 2005*.

the Hong Kong dollar fell from HK\$4.93 to HK\$5.28 against the Singapore dollar. This ensured a rise in Hong Kong's comparative price level for 1998 to the early 2000s. However, Singapore's recovery from the financial crisis from the early 2000s progressively raised its comparative price level for the sector. The influences of these trends on output and productivity in each country's transport and communications sector are also shown in Table 6, and are discussed in more detail below.

### *III.3 Output and labor productivity at branch level for the benchmark year, 2004*

Table 7 shows value added at branch level for each country's transport and communications sector, with Hong Kong data expressed in Singapore dollars.



**Table 7 Real output and labour productivity in transport and communications, Singapore and Hong Kong, 2004 (at \$S)**

	<i>Gross value added (\$Sm)</i>		<i>HK/Singapore (%)</i>	<i>Value added per person</i>		<i>HK/Singapore (%)</i>
	<i>Hong Kong</i>	<i>Singapore</i>		<i>Hong Kong</i>	<i>Singapore</i>	
Transport	22 779 <sup>a</sup>	16 508	138.0	71 187	95 007	74.9
Land	3153	1935	162.9	15 447	18 922	81.6
Sea and PCT	4971	7831	63.5	144 986	369 791	39.2
Air	9268	4811	192.6	316 440	221 879	142.6
Services allied to transport	4138 <sup>b</sup>	1931	241.3	79 105 <sup>b</sup>	67 428	117.3
Communications	7403 <sup>a</sup>	4066	182.1	241 080	190 458	126.6
Telecommunications	6709	3574	187.7	375 060	237 234	158.1
Postal services	405	491	82.5	31 614	78 232	40.4
Transport and communications						
Current table <sup>c</sup>	30 003	20 573	145.8	85 550	105 451	81.1
National accounts <sup>d</sup>	31 557	21 489	146.9	89 982	101 124	89.0

Notes: PCT, port container throughput. <sup>a</sup>Sum of disaggregated figures do not tally with table aggregated figures due to the use of PPP. <sup>b</sup>Value added converted into Singapore dollars using transport PPP. <sup>c</sup>Value added based on transport and Communications PPP thus differs to the sum of value added of transport and value added of communications. Value added per person engaged derived using Tables 3 and 4 value added (converted into the 2004 Singapore dollars) and number of persons engaged. <sup>d</sup>Value added per person engaged derived using national accounts' value added and ILO employment figures.

Source: Tables 3 and 4. PPP from Table 5.

The value-added shares of each branch confirm the earlier analysis that Hong Kong's air transport and services, given the continuous expansion and innovation from its new Hong Kong International Airport (HKIA), contributes the largest proportion. Also confirmed is Singapore's largest value-added share from sea transport and port container throughput from its superior port facilities and innovations flowing from its objective of becoming a premier logistics, sea transport hub.

In 2004, based on national accounts, value added per person in Hong Kong's transport and communications was only 89 percent of that in Singapore; value added in the transport sector was 74.9 percent, but for communications it was much better, at 126.6 percent of the Singapore level. This higher labor productivity in Hong Kong communications and telecommunications in particular is consistent with the analysis in Table 5 which shows a lower comparative price level for the sector in Hong Kong. Correspondingly, Singapore's stronger labor productivity in sea transport and land transport is reflected in a lower comparative price level for the branches in Singapore. At branch level, labor productivity in Hong Kong exceeded the Singapore level in three out of six branches: air

transport was 142.6 percent, services allied to transport was 117.3 percent and telecommunications was 158.1 percent. Clearly, the main differences are in air transport and telecommunications.

Some understanding of the higher labor productivity in Hong Kong's air transport services might be gleaned from a comparison of the two countries' arrival and departure fixed inputs. In 2004, Hong Kong's single passenger terminal had a total floor area of 570 000m<sup>2</sup> and 49 frontal aircraft gates.<sup>13</sup> In contrast, Singapore's Changi airport had two passenger terminals with a total floor area of 638 020m<sup>2</sup> and 64 aerobridge gates.<sup>14</sup> Therefore, HKIA had slightly less infrastructure but was able to handle more passengers (see Table 2). This infers, as indicated previously, that a large terminal like HKIA can cut costs by reducing the amount of labor duplication. HKIA has two airfreight terminals operated by ground handling agents, whereas Changi airport has nine airfreight terminals operated by three ground handling agents. Because both airfreight terminals are designed to handle approximately three million tons of cargo, this also infers that more capital and, therefore, more labor, are being employed in the Changi air freight terminal.<sup>15</sup> With HKIA handling more passengers and freight it also implies that HKIA uses less labor to work with capital in the provision of airline services. Doubtless, as stated earlier, a more accurate productivity analysis could be achieved if a multifactor productivity approach could be adopted.

It can also be seen from Table 7 that sea transport and port container throughput play a major role in both countries, although more so for Singapore, because both are linked with entrepot trade. However, gross value added and labor productivity per person in Hong Kong in these branches relative to Singapore in 2004 was 63.5 and 39.2 percent, respectively.

Caution should be exercised when interpreting these results as the PPPs within the sea transport and port container throughput branch vary significantly, as shown in Appendix Table 1. Considering port container throughput (PCT) alone, Hong Kong's output and labor productivity are 70 and 73 percent of Singapore levels, respectively. (For PCT relative output, Hong Kong/Singapore, Hong Kong's PCT value added of HK\$5097.5m is converted into Singapore dollars by dividing its value added by the PCT PPP 1.82 HK/SG from Appendix Table 2, which gives SG\$2805m. Relative output is the ratio of SG\$2805m and SG\$4006.6m, which is 70 percent (SG\$4006.6m is drawn from the Singapore Department of Statistics (2004c).

Relative labor productivity uses the same figures as above divided by the number of persons engaged in PCT.

13. The handling capacity for Hong Kong is drawn from its official airport website: [http://www.hongkongairport.com/eng/aboutus/wtome6\\_factsheet.html](http://www.hongkongairport.com/eng/aboutus/wtome6_factsheet.html).

14. The handling capacity for Singapore is drawn from its official airport website: [http://www.changiairport.com/changi/en/about\\_us/fact\\_sheets/facts\\_changi\\_ap.html](http://www.changiairport.com/changi/en/about_us/fact_sheets/facts_changi_ap.html).

15. Data drawn from sources indicated in footnotes 13 and 14.

Adding back sea transport, passenger and freight reduced Hong Kong's relative output by 10–63.5 percent. Relative labor productivity is reduced even more, to 39.2 percent of Singapore's level. (Value added for Hong Kong's 'Sea and PCT' is SG\$4971m (Table 5). This value divided by Singapore's value added of 'Sea and PCT' of SG\$7831m (Table 5) gives the relative output between these two countries, which is 63.5 percent (Table 5). Labor productivity is derived by taking these figures divided by their respective employment figures: HK\$4971m/34 288 = SG\$144 986 (employment figure of 34 288 from Table 2); whereas for Singapore this is SG\$7831m/21 177 = SG\$369 791 (employment figure of 21 177 from Table 3). Relative productivity is the ratio of SG\$144 986/SG\$369 791 = 39.2 percent.

Some understanding of these lower output and productivity estimates for Hong Kong may be taken from analysis of labor and infrastructure inputs. The labor input in ocean, coastal and inland water transport in Hong Kong is 18 543, and in Singapore is 4649 persons. (Hong Kong's figure is the sum of ocean and coastal water transport, 13 588, plus inland water transport, 4955, drawn from the Census and Statistics Department (2004b)). For Singapore, this is drawn from the Singapore Department of Statistics (2004c). This is four times that of Singapore's employment in these activities. Hong Kong also had twice the number of establishments than Singapore: 980 to 491.<sup>16</sup> (Data for each country were drawn from the same source as stated above; Hong Kong data for the respective activities are 333 and 647 establishments.) Therefore, based on the amount of cargo throughput, port container throughput and passengers in Hong Kong in 2004 relative to Singapore, Hong Kong's capital stock may be substantially less than that of Singapore. This seems probable because the approximate number of container berths for Hong Kong totaled 17, with quay length of 6125 m, 63 quay cranes, and covering 186.2 ha in 2005–2006. In contrast, Singapore figures are 41 container berths and quay length of 11 754 m, with 131 quay cranes in an area of 389 ha.<sup>17</sup> Hence, inclusion of capital stock in productivity measurement should help to improve Hong Kong's productivity level relative to Singapore's.

In the communications branch, output and productivity levels in Hong Kong exceeded Singapore's levels largely as a result of the previously discussed performance of the telecommunications branch. Gross value added in Hong Kong was 187.7 percent and labor productivity was 158.1 percent of the telecommunications levels in Singapore. Interestingly, as also discussed above, the progressive liberalization of Singapore's telecommunications created competition and helped to provide more service providers and innovative services. However, this does not seem to have translated into better labor

16. The enumeration or reporting unit used in the survey was the establishment. An establishment is defined as a business or organisation unit engaged in one activity operating in a single location.

17. Data for container berths, quay length, number of quay cranes, and area for both Singapore and Hong Kong are drawn from PSA International (2005).

productivity in Singapore relative to Hong Kong over the last 2 years of the review period (see below). It may well be that the simultaneous liberalization of telecommunications in Hong Kong, given its market orientation, has kept labor productivity performance in Hong Kong ahead of that in Singapore. Easier access to the Hong Kong telecommunications market, arguably, is being reflected in more competitive provision of fixed line, mobile phone subscriptions and internet services in Hong Kong relative to Singapore.

In 2004, the postal services branches in Singapore and Hong Kong had similar levels of reliability and levels of efficiency in terms of mail delivery standards. In both countries, in excess of 99 percent of mail was delivered within 1 working day.<sup>18</sup> However, in terms of output and productivity, Hong Kong lagged behind Singapore; output in Hong Kong's postal service was only 82.5 percent and productivity was only 40.4 percent of the Singapore levels.

The difference in output and labor productivity performances can be explained by examination of the number of persons employed and the relevant infrastructure available in each country's postal services. The number of persons employed in Hong Kong is twice that in Singapore. In terms of infrastructure, Hong Kong had 133 post offices and nearly 1000 post boxes.<sup>19</sup> In contrast, SingPost (Singapore Post) had approximately 60 post offices, 80 authorized postal agencies and over 800 post boxes. The fact that there are more post offices and post boxes in Hong Kong implies heavy use of labor. Additionally, the higher labor productivity in Singapore arises from the use of unstaffed services, such as Self-service Automated Machines, some 200 of which allow individuals to use postal services, including weighing parcels, buying stamps and paying bills, 24 h/day. These services are still performed by employees in Hong Kong's post offices. Clearly, in 2004, higher levels of labor productivity in postal services existed in Singapore than in Hong Kong.

#### *III.4 Trends in real output and labor productivity, 1990–2005*

Table 6 shows trends in comparative real output and labor productivity in the transport and communications sectors in Hong Kong and Singapore from 1990 to 2005. This table reflects the relative progressive developments in each country's sector as they have pushed forward with new projects and innovations in air, sea and land transport and communications, particularly telecommunications, plus the influence of the Asian financial crisis from 1998, a global economic downturn in the early 2000s and the outbreak of Severe Acute Respiratory Syndrome (SARS) in 2003.

18. Information is drawn from each country's postal annual reports; Singapore data is drawn from Singpost (2004/2005); Hong Kong data is drawn from the Hong Kong Post (2004/2005).

19. Note that mobile post offices are excluded from the number of post offices as their hours of operation do not exceed 80 min/day and do not open every work day. These data are drawn from the Hong Kong Post (2004/2005).

There was some mild catch-up in Singapore's real output levels relative to Hong Kong throughout 1990 to 1998. As Singapore moved to accelerate deregulation, as outlined above, the transport and communications sector maintained 6-percent growth in 1998–1999, despite a decline in GDP and overall service sector output following the Asian financial crisis. Singapore's services relating to tourism, especially in the transport and communications sector, were severely affected by the outbreak of SARS in 2003. In contrast, over the period from 2001 to 2005, Hong Kong slowly increased its transport and communications output relative to that in Singapore, largely because of the strong performance of its communications branch.

Labor productivity trends measured by value added per person or per hour worked show variation over the review period. From 1990 to 1998, Hong Kong's labor productivity in terms of persons employed fell from 104.5 to 77.4 percent of Singapore's level, as real output in the Hong Kong sector declined. In the same period, in terms of hours worked, Hong Kong's labor productivity declined from 108.4 to 80.5 percent of the Singapore level. From 2000, Hong Kong's productivity began to improve as output in the sector again increased, up in 2005 from 77.4 to 100.3 percent of the Singapore level for persons employed, and from 80.5 to 98 percent for hours worked. Hence, productivity estimates were broadly comparable for the two counties by 2005.

Over the review period, Singapore recorded a steadier growth of real output and higher levels of labor productivity, using both measures, for all but 2–3 opening years of the period. In contrast, Hong Kong experienced initial declines in both real output and labor productivity then mild catch-up of real output and labor productivity in the transport and communications sector over the review period.

#### **IV. Conclusions**

In terms of the first question posited for the present study, the preceding analysis successfully sheds light on the relative performance of real output and labor productivity in the transport and communications sectors in Singapore and Hong Kong, at branch level for the benchmark year 2004 and at the sectoral level for the benchmark year and the review period 1990–2005.

At branch level for 2004, in terms of value added, sea transport, air transport and telecommunications, in that order, were the main contributors for Singapore, whereas air transport, telecommunication and sea transport, in that order, were the major contributors for Hong Kong. In terms of labor productivity, telecommunications became the second largest contributor behind sea transport for Singapore, and telecommunications overtook air transport as the main branch contributor for Hong Kong. At the sectoral level, value added in Hong Kong was stronger, at approximately 147 percent, but labor productivity was weaker, at only 89 percent of Singapore's levels. On average over the review period, Singapore recorded marginally higher levels of labor productivity. In contrast,

Hong Kong experienced greater variability in labor productivity, with an initial decline through to the late 1990s, then a marginally stronger performance, or catch-up, in the last 5 years of the study, 2000–2005.

There is also some, but variable, indication that the different political structures and policy management emphases with respect to deregulation influenced sectoral real output and labor productivity outcomes in the two countries. Additionally, although retaining a regulatory role through its range of statutory boards, it is clear that Singapore is in the process of placing emphasis on commercial management practices with respect to developments in the transport and communications sector.

Given its extensive port facilities, 24 h/day service and its geographical location within the world's leading trade routes, sea transport maintained its principal contribution to sectoral real output and labor productivity in Singapore, significantly outranking Hong Kong in this area. With respect to air transport, the single, large terminal at Hong Kong International Airport recorded higher levels of labor productivity than Changi Airport in Singapore. Nevertheless, both airports have modern, sophisticated infrastructure and are experiencing continuous expansion and innovation, not only via passenger and air freight services but increasingly through a wide range of commercial activities, such as retail, restaurant and personal entertainment facilities designed to attract the general public as well as the travelling populace. Hong Kong opened its second terminal in February 2007, while Singapore opened its budget terminal in October 2006 and a third terminal (named Terminal 3) in January 2008. In addition, Singapore Airlines began using the latest Airbus A380, which carries more passengers than any other aircraft, thus increasing its total number of air passengers. In each country, it is clear that the provision of air transport services is increasingly focused on more liberalized, commercial strategies operating through two of the world's largest international airports.

Land transport and telecommunications are the branches in which the different political structures and sectoral deregulation approaches are most evident. With respect to land transport, Singapore has maintained a system of government subsidies to the public transport system, particularly with respect to the MRT system, as a means of controlling cost structures and price levels for the branch. In direct contrast, the absence of government subsidies in Hong Kong's transport system and widespread use of commercial, financial and management practices, again particularly with respect to the MTR, has ensured a higher cost and price structure for land transport than that in Singapore. Therefore, government subsidies play a strong role in enhancing productivity performance. Singapore has also gradually accelerated the liberalization of the statutory authority dominance of telecommunications, predominantly by encouraging new providers of enhanced infrastructure. This has greatly increased labor productivity in this branch. Nevertheless, the evidence provided above suggests that Hong Kong's more market-based management and liberalization of telecommunications has been more effective in facilitating infrastructural developments, through

ease of entry, a more competitive market structure and lower price levels for telecommunication services.

Therefore, the analysis in this study indicates that there is some general, indicative evidence available to suggest that different political–economic structures and policy approaches to deregulation and liberalization have played a role in influencing labor productivity performance in the transport and communications sectors in Singapore and Hong Kong. It also suggests that Singapore moved to adopt a more market-based or commercial focus in encouraging developments within the sector, with this being most evident with the improved productivity outcomes from telecommunications. However, further work in this area would need to include a more detailed analysis of the policy processes in each country and to consider how these processes might have directly influenced structural changes and competitive forces flowing through to improved sectoral productivity outcomes. This type of analysis would be enhanced by moving from the partial productivity analysis underpinning the present study to one of total factor productivity, to reflect the importance of capacity utilization in conjunction with abundant labor in influencing productivity outcomes in the two countries.

**Appendix Table 1 Matching of product items, Hong Kong–Singapore, transport and communications, 2004**

<i>HSIC code</i>	<i>Hong Kong product item</i>	<i>Unit</i>	<i>Hong Kong quantity ('000)</i>	<i>Hong Kong gross value (HK\$m)</i>	<i>Hong Kong dollar unit value</i>	<i>Hong Kong quantity valued at Singapore unit value (S\$m)</i>	<i>UVR HK\$/S\$ Hong Kong quantity weights (Paasche)</i>
711	Land transport						
	Passenger traffic	Passengers	3 981 201	25 042	6.29	2662	9.41
	Total			25 042		2662	9.41
	Sea/coastal						
	Transport and PCT						
715	Passenger traffic	Passengers	21 407	2323	108.51	228	10.21
714	Freight traffic	Tonnes	220 879	52 050	235.65	7326	7.10
716	PCT	Tonnes	21 984	13 709	623.61	7543	1.82
	Total			68 083		15 096	4.51
	Air transport						
717	Passenger traffic	Passengers	36 287	31 813	876.70	10 311	3.09
718	Freight traffic	Tonnes	3090	17 795	5758.86	6006	2.96
	Total			49 607		16 317	3.04
	Communications						
7321	Telephone subscriptions	Number	3780	19 979	5285.34	7322	2.73
732901	Mobile phone subscriptions	Number	8214	11 970	1457.24	4477	2.67
732902	Internet subscriptions	Number	2488	2842	1142.36	1609	1.77
	(broadband and dial-up)						
	Telecommunications			34 791		13 408	2.59
	Mail handled	'000 Number	1 273 000	3567	2.80	451	7.92
	Total communications			38 357		13 859	2.77



Appendix Table 1 (continued)

<i>SSIC 2005 code</i>	<i>Singapore product item</i>	<i>Unit</i>	<i>Singapore quantity ('000)</i>	<i>Singapore gross value (\$m)</i>	<i>Singapore dollar unit value</i>	<i>Singapore quantity valued at HK unit value (HK\$m)</i>	<i>UVR HK\$/S\$ Singapore quantity weights (Laspeyres)</i>
5221	Land transport						
	Passenger traffic	Passengers	1 828 902	1223	0.67	11 504	9.41
	Total			1223		11 504	9.41
	Sea/coastal Transport and PCT						
53103+53202+53209	Passenger traffic	Passengers	7482	80	10.63	812	10.21
5310 (excluding 53103)	Freight traffic	Tonnes	2 393 418	13 049	33.17	92 709	7.10
5539	PCT	Tonnes	21 329	7318	343.10	13 301	1.82
	Total			20 446		106 822	5.22
	Air transport						
54002	Passenger traffic	Passengers	28 606	8129	284.15	25 079	3.09
54003	Freight traffic	Tonnes	1775	3450	1943.85	10 222	2.96
	Total			11 579		35 301	3.05
	Communications						
62011	Telephone subscriptions	Number	1864	3610	1936.91	9852	2.73
62012	Mobile phone subscriptions	Number	3861	2105	545.09	5626	2.67
62021	Internet subscriptions (broadband and dial-up)	Number	2226	1440	646.82	2543	1.77
	Telecommunications						
				7155		18 021	2.52
5601	Mail handled	'000 number	834 402	295	0.35	2338	7.92
	Total communications			7450		20 359	2.73

PCT, port container throughput; UVR, unit value ratio.

Source: Table 2.

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