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DISCUSSION PAPERS IN ECONOMICS, FINANCE AND INTERNATIONAL COMPETITIVENESS

Output and Productivity Comparisons of the Wholesale and Retail Trade Sector: US and Australia, 1991 to 1999

Boon Lee

Discussion Paper No. 125, November 2002

All correspondance to:

Associate Professor Andrew Worthington
Editor, *Discussion Papers in Economic, Finance and International Competitiveness*
School of Economics and Finance
Queensland University of Technology
GPO Box 2434, BRISBANE QLD 4001, Australia

Telephone: 61 7 3864 2658
Facsimilie: 61 7 3864 1500
Email: a.worthington@qut.edu.au

**Series edited by
Associate Professor Andrew Worthington**

School of Economics and Finance

"Output and Productivity Comparisons of the Wholesale and Retail Trade Sector: US and Australia, 1991 to 1999"

Boon Lee[‡]
School of Economics and Finance,
Queensland University of Technology,
2 George St, GPO Box 2434
Brisbane, Q4001, Australia

Australia's value added contribution of the Wholesale and Retail trade has strengthened against sectors such as agriculture, mining and manufacturing. At 1997-98 prices, its value added contribution to GDP during the 1990s was around 10-11%. Agriculture was 3% and mining 7-8%. Manufacturing's value added contribution fell from 15% to 12%. While performance at the domestic level may seem significant, there is still need to compare this performance with other countries. Hence, this paper will examine the output and productivity performance of the Australian Wholesale and Retail Trade sector with the leading economy, the United States, from 1991 to 1999. The aim of the paper is two-fold. First, the paper is a pioneer in a series which compares the performance of various industries within the service sector between the US and Australia. Second, it introduces a method for derivation of appropriate currency converters or purchasing power parities (PPPs) for quantification of output and productivity at various disaggregated levels. This method is based on the industry-of-origin approach as refined by the International Comparisons of Output and Productivity (ICOP) project based at the University of Groningen.

JEL Classification: C43, L81, O47, O57

1. Introduction

The Wholesale and Retail trade industry, also identified as the Distribution industry, plays a significant role in an economy since it transfers goods, via the transport industry, to both producers and consumers. Wholesalers are intermediaries between manufacturers and retailers, while retailers sell goods directly to consumers. In Australia, the distribution industry has contributed between 10 and 11 percent[1] of gross domestic product for the period 1991 to 1999. This is larger than the combined proportion of value added contributed by both agriculture and mining, of 7 to 8

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percent during the 1990s. As for the GDP contribution of manufacturing, this has fallen from 15 percent to 12 percent in the same decade. This is indication that there is a changing emphasis in GDP contribution, from manufacturing to services in Australia. This trend towards growth in the service sector implies that goods need to be readily available and accessible in order to meet the demands of retailers and consumers. However, there is also a need to compare Australia's performance with other countries. While performance across time may indicate Australia's time-series record, there is still a need to know how well it performs against other countries in order to gauge Australia's relative level of domestic trade performance since international trade in producer services is increasing rapidly[2] (Van Ark, Monnikhof and Mulder, 1999). Results from Johnston, Porter, Cobbold and Dolamore (2000) show moderate productivity growth in Retail trade and robust productivity growth in Wholesale trade from 1993 to 1998. This information however does not reveal much about how Australia is performing relative to other countries.

In order to assess Australia's performance at the inter-temporal level, this paper uses the US as base country since the latter is considered the international productivity leader. This paper is the first in a series of Australia-US comparisons intended to cover major

parts of the service sector, namely Finance, Health, Transportation, and Education. In any comparative analysis such as the one undertaken, two major problems are encountered. Firstly, the measurement of output, as noted by Van Ark, Monnikhof and Mulder (1999), Mulder (1999), and Johnston, et al, (2000). In essence, the

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[1] Estimate derived using industry value added at 1997-98 prices drawn from ABS, *Australian System of National Accounts 1998-1999*, Cat. No. 5204.0.

quantity and quality aspects are difficult to capture. Unlike agriculture or manufacturing, where physical output can be distinguished, distribution has no actual physical output. Hill (1977) argued that 'quantity' of a service is difficult to distinguish since it often represents a process by which a user (consumer) or the user's good is changed. Hence, conceptually it is the transfer of property rights of final goods through the distribution chain (See Oi 1998). With regard to quality of services, unlike goods where their tangible qualities can be recognised, distinguishing quality in services is extremely difficult due to the degree of heterogeneity of the product/service-content (Mulder, 1999). Gilbert and Kravis (1954) identified three types of services: firstly, identical services across countries; secondly, services with identical names but characteristically different; and lastly, services that are unique and exist only in that country. In most cases, services fall under the latter two. This makes the aggregation of services all the more complex. This paper assumes that the quality of services in distribution between the US and Australia are identical based on the relative level of economic performance, industrialised nature, and GDP per capita of both countries. The second problem encountered in the study is the derivation of meaningful real output and productivity comparisons. This arises because it is difficult to do comparisons since each country's output and productivity are expressed in its own currency unit. This indicates that a common currency converter has to be derived. The use of exchange rates is not suitable as they are heavily influenced by capital movements and policy induced exchange rate adjustments and do not reflect real price differences between countries.

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2   Wholesale and Retail trade involves both domestic and international demand (ie. Exports). Improved performance in Distribution may be contributed due to increased demand for producer services internationally (ie. rising export levels) which affects the trade balance.

The aim of the paper is twofold. Firstly, the paper adopts the methodology developed by Mulder and Maddison (1993) which is part of the International Comparisons of Output and Productivity (ICOP) project of the Groningen Growth and Development Centre (GGDC). Secondly, the paper aims to compare the output and labour productivity[3] levels of Australia's distribution industry with the US, from 1991 to 1999, and, consequently, to analyse factors which might explain productivity differentials such as establishment size.

The rest of the paper is divided into three sections. Section 2 describes the sources and methodology used in the paper. Section 3 presents the results of real output and productivity comparisons for the benchmark year and productivity trends from 1991 to 1999. The paper concludes with some brief remarks.

2. Sources and Methodology

The paper employs the ICOP approach which essentially uses disaggregated or detailed data from relevant census publications or survey reports. These data refer to the four-digit level of the international standard industrial classification (ISIC) for Australia and three-digit level for the United States in their respective wholesale and retail trade industries. Australian data were taken from the 1991-92 ABS census reports of wholesale and retail trade. Data on US distribution were taken from the 1992 Census of Wholesale Trade and the 1992 Census of Retail Trade. Appendix Tables 1 though 4 presents the basic data necessary for the use of the ICOP approach for the benchmark year 1992. For the time-series (1991-1999), value added figures

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[3] It would have been ideal to attempt a multi-factor productivity (MFP) analysis, but due to data limitations (ie. 1992 PPP for the gross capital stock between US and Australia), only partial productivity was adopted in the paper.

were drawn from each country's national accounts. The number of persons engaged in Australia was drawn from the ABS, Australian Economic Indicators and for the US, from the US Department of Commerce, Bureau of Economic Statistics. It is important to note that 'average annual working hours per worker' would have been a better choice over 'number of persons engaged' for labour productivity. However, the current paper excludes this adoption due to data unavailability.

The method adopted in this study to derive appropriate currency converters or PPPs follows that of the ICOP single-deflation approach. This approach also used in Hall, Knapp and Winsten (1961) and Smith and Hitchens (1985), simply converts the value added using expenditure ICP PPPs[4]. Some ICOP studies, such as Van Ark (1993), Pilat (1994) and Mulder (1999) attempted to use the double-deflation[5] approach, but results derived were rather erratic due largely to differences in ICP and ICOP commodity specification. Despite such issues, it would have been novel to adopt both approaches to test for any discrepancies in results. Unfortunately, due to data limitations, only the traditional single-deflation approach is used.

Purchasing power parities (PPPs) for the benchmark year 1992 are derived for different levels of aggregation, for specific group of trades and for the overall industry. Using data from Appendix Tables 1 to 4, aggregating the four-digit levels, a three-digit level PPP can be derived and eventually a PPP to represent the Wholesale trade industry, the Retail trade industry and the Distribution industry. At the most disaggregated level, either at three-digit level or four-digit level, depending on data availability, an implicit approach using ICP expenditure PPPs is adopted to derive the

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[4] International Comparisons Program.
[5] See Mulder (1999) for detailed explanation on the double-deflation approach.

first set of PPPs. From this, two sets of expenditure weights (based on value added) can be used: Australian value added weights, which derives the Paasche PPPs as:

$$PPP^{XU(X)} = \frac{Value\ Added_{j}^{X(X)}}{\sum_{i=1}^{R}\left[Value\ Added_{ij}^{X(X)} / ICP\ PPP_{ij}^{XU}\right]} \tag{1}$$

or US value added weights, which derives the Laspeyres PPPs as:

$$PPP^{XU(U)} = \frac{\sum_{i=1}^{R}\left[Value\ Added_{ij}^{U(U)} \times ICP\ PPP_{ij}^{XU}\right]}{Value\ Added_{j}^{U(U)}} \tag{2}$$

where $ICP\ PPP_{ij}^{XU}$ refers to the ICP expenditure purchasing power parities for good i in industry j between Australia (X) and the US (U), with the latter as the base country. For the final comparisons of the wholesale and retail trade output and productivity time-series analysis, the Fisher PPP is derived, which is a geometric average of expressions (1) and (2), as shown below.

$$PPP^{Fisher} = \sqrt{PPP^{XU(X)} \times PPP^{XU(U)}} \tag{3}$$

3. Results

3.1 Relative Size and Structure of the Wholesale and Retail Trade Industry in Australia and the US

Tables 1 and 2 present some characteristics of the structure of the US and Australia's distribution industry, namely sales, value added, density of establishments and number of persons engaged, for the benchmark year 1992[6]. Australian sales and value added were converted into US dollars using the appropriate expenditure group PPPs from Appendix Tables 1 to 4. In Australia, wholesale trade sales of durable goods were 46 percent of total wholesale sales while non-durable goods was 54 percent. In the US, the percentage sales for durables in terms of total wholesale was 40 percent

while non-durables was 60 percent. As for retail trade, Australia had more or less equal percentages between durable and non-durables while in the US, it had a higher sales proportion in non-durables.

Table 1
Sales, Value Added and Number of Persons Engaged in Wholesale
and Retail Trade, Australia and the US, 1992

	Sales (mill. 1992 US$)		Value Added (mill. 1992 US$)		Number of Persons Engaged (000s)	
	Australia (a)	US	Australia (a)	US	Australia	US
Wholesale Trade:						
Durables	40,568	908,917	5,465	217,060	209.6	3,446.0
Nondurables	46,980	940,881	4,524	145,167	140.8	2,552.0
Food (b)	6,482	329,614	577	50,444	24.7	994.5
Total (All branches)	87,548	1,849,798	9,989	362,227	350.4	5,998.0
Retail Trade:						
Durables	22,746	700,067 d	3,215	182,865 d	181.1	6,860.6
Nondurables	33,495	1,233,716 d	7,307.0	406,081 d	650.2	15,451.0
Food (b)	4,472 c	398,797	846 c	93,151	53.0	3,179.8
Total (All branches)	56,242	1,933,783 d	10,522	588,946 d	831.3	22,311.6
Distribution	143,789	3,783,581	20,511	951,173	1,181.7	28,309.6

Notes: (a) Values converted using Table 4 PPPs.
(b) Includes all foods and liquor, but excludes tobacco and food retailing.
(c) Converted using supermarket and grocery stores ICP PPP.
(d) Data based on specification from Appendix Table 2, and not
based on US Census estimate. Although estimates differ to the US census
estimates, the discrepancies are insignificant.

Source: Appendix Tables 1 to 4. US employment from Bureau of Labor Statistics.

In terms of value added, wholesale trade in Australia contributed 49 percent of total distribution which was higher than the US of 38 percent. This is the opposite for the retail trade, where the US had a greater proportion in non-durables (62%) than in Australia (51%). In absolute size, Australia was only 2 percent of the US level. In employment terms, Australia and US had similar proportions in durables (60%) and non-durables (40%). As for the retail industry, Australia had a higher employment percentage in non-durables (78 percent) over the US (69 percent). Both countries

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[6] Census year for the US was 1992, whereas for Australia, this was 1991-92.

show retail trade having most of the employment in distribution, with Australia accounting for 70 percent, and the US for 79 percent of employment in distribution.

Table 2 presents information on the accessibility of location and assurance of product delivery between the two countries. As noted by Betancourt (1993), the density of the number of outlets is an indicator of the accessibility of location, while the ratio of inventories to sales is an indicator of the assurance of product delivery.

Table 2
Density of Establishments, Inventories/Sales and Input Costs/Sales
Australia and the US, 1992 (values in national currencies)

	Number of Establishments (a) per 100,000 inhabitants			Inventories/Sales (%)			Ratio of Input Costs/Sales (d) (%)		Ratio of Gross Margin/Sales (%)	
	Australia (a)	US		Australia (a)	US		Australia	US	Australia	US
Wholesale Trade:										
Durables	102	123		16.7	14.1		10.8	1.1	23.6	25.0
Nondurables	69	71		11.1	8.3		10.4	0.9	21.0	16.3
Food (b)	20	19	c	10.6	4.6		9.6	0.8	18.5	16.2
Total (All branches)	171	194		13.9	11.1		10.6	1.0	22.3	20.6
Retail Trade:										
Durables	150	226	c	8.9	17.4		11.1	1.8	25.4	27.9
Nondurables	327	371	c	9.4	9.9		12.6	2.3	29.1	35.2
Food (b)	32	71	c	6.1	7.3		9.1	2.1	23.3	25.4
Total (All branches)	477	597		9.2	12.6		12.1	2.1	27.9	32.5
Distribution	648	791		11.8	11.9		19.2	2.2	24.8	26.7

Note: Percentages based on national values. Inventories is the average value of stock
(where average stock is opening stock plus closing stock and divided by 2).
Input costs is the difference between gross margin and value added. Gross margin is sales less
cost of goods sold.
(a) Australian census terms this as management units which is the
legal entity owning the business.
(b) Includes all foods and liquor, but excludes tobacco.
(c) Due to overlapping of estimates as a result of categorisation, these
figures are approximations.
(d) Input costs is equal to gross margin minus value added.

Source: Bureau of the Census, *1992 Census of Wholesale Trade*, Economics
and Statistics Administration, US Department of Commerce, Washington D.C.
Bureau of the Census, *1992 Census of Retail Trade*, Economics and Statistics
Administration, US Department of Commerce, Washington D.C.
ABS, *Wholesale Industry, Australia 1991-1992*, Cat. No. 8638.0, Canberra.
ABS, *Retail Industry, Australia 1991-1992*, Cat. No. 8622.0, Canberra.
Australian and US population in 1992 was from Maddison, 1995.

In 1992, there were more establishments per capita in the US than in Australia, indicating a relatively better accessibility in the US than in Australia. Both countries

have more retail than wholesale establishments, which indicates better accessibility in retail trade than in wholesale trade. As for assurance of product delivery, this was greater in wholesale trade in Australia than in the US. This is however the opposite in retail trade. The ratio of Australian input costs to sales was 5 to 10 times the US ratio,

Table 3
Average Size of Establishment in Wholesale and Retail Trade
measured by Sales and Number of Persons Engaged per Estalishment,
Australia and the US, 1992

	Sales per Establishment (thousand 1992 US$)			Persons Engaged per Establishment		
	Australia	US	Aus/US	Australia	US	Aus/US
Wholesale Trade:						
Durables	2,268	2,900	78.2	11.7	11.0	106.6
Nondurables	3,888	5,170	75.2	11.6	14.0	83.1
Food	1,866	6,848	27.2	7.1	20.7	34.4
Total (All branches)	2,921	3,734	78.2	11.7	12.1	96.6
Retail Trade:						
Durables	867	1,210	71.6	6.9	11.9	58.2
Nondurables	584	1,302	44.9	11.3	16.3	69.5
Food	798	2,209	36.1	9.5	17.6	53.7
Total (All branches)	673	1,267	53.1	9.9	14.6	68.0
Distribution	1,266	1,872	67.7	10.4	14.0	74.3

Source: Table 1, 2 and 4.

indicating higher relative costs in Australia. The ratio of input costs to sales in retail trade were only slightly higher than wholesale trade in Australia, whereas in the US, relative costs in retail trade was twice that of wholesale trade. If we compare the ratios of gross margin to sales and input cost to sales (see Table 2), and the size of establishment (measured by sales – see Table 3), there is strong indication that the realisation of economies of scale leads to lower margins and input cost (Mulder, 1994).

Wholesale margins (input cost) were lower than retail margins (input cost) in both countries and US margins (input cost) were lower than Australian margins (input cost). This corresponds to the observation that wholesale establishments were larger than retail establishments in both countries, and that US establishments were larger than Australian establishments. It is also noted that the largest establishment in wholesale and retail trade in the US were outlets selling food products. This is the same for Australia in wholesale trade. These establishments also had the lowest ratios of gross margins to sales and input cost to sales.

3.2 Purchasing Power Parities, Relative Price Levels and Labour Productivity, 1992

Table 4 shows the Paasche, Laspeyres and Fisher PPPs by type of expenditure category, industry and overall distribution for the benchmark year 1992. Comparative price levels for each heading are also presented.

Table 4
ICP Reweighted Laspeyres, Paasche and Fisher PPPs for
Gross Value Added, Wholesale and Retail Trade,
Australia / US, 1992

	At US expenditure weights (Laspeyres PPP)	At Australian expenditure weights (Paasche PPP)	Geometric Average (Fisher PPP)	Relative Price Level (US=100)
Wholesale Trade:				
Durables	2.30	1.65	1.95	143
Nondurables	1.23	1.69	1.44	106
Food	1.41	1.63	1.51	111
Total (All branches)	1.87	1.67	1.77	130
Retail Trade:				
Durables	1.54	1.60	1.57	115
Nondurables	1.58	1.51	1.55	114
Food	1.41	1.41	1.41	103
Total (All branches)	1.57	1.54	1.55	114
Distribution	1.68	1.60	1.64	121
Exchange Rate	1.36	1.36	1.36	100

Source: Appendix Table 1 to 4. Exchange rate from IMF, International
Financial Statistics Yearbook 1994.

The PPP for wholesale trade was higher than the PPP for retail trade. PPPs for durable goods were above the PPPs for non-durables and food product PPPs in both wholesale and retail trade. This indicates that prices for durables were relatively higher than non-durables, and that wholesale prices were relatively higher than retail prices. Fisher PPP for distribution was AUD$1.64 per US$, which is above the exchange rate of AUD$1.36 per US$.

Table 5
Gross Value Added per Person Engaged in
Wholesale and Retail Trade, Australia/US, 1992
(in 1992 US$)

	Value Added per person		Australia/ US
	Australia	US	(%)
Wholesale Trade:			
Durables	26,070	62,989	41.4
Nondurables	32,136	56,884	56.5
Food	23,393	50,723	46.1
Total (All branches)	28,507	60,391	47.2
Retail Trade:			
Durables	17,749	26,654	66.6
Nondurables	11,238	26,282	42.8
Food	15,970	29,295	54.5
Total (All branches)	12,657	25,272	50.1
Distribution	17,357	32,712	53.1

Source: Table 1.

The Fisher PPPs in Table 4 were used to convert value added of Australia into US currency. Labour productivity based on a numeraire currency was then derived, which is simply the ratio of value added over the number of persons engaged. Table 5 shows labour productivity in Australia relative to the US for the benchmark year 1992. In 1992 the level of labour productivity in Australian distribution was 53 percent of that in the US. Labour productivity in wholesale trade in Australia was 47 percent of the

US level and retail trade was 50 percent of that in the US. Low relative productivity performance of the Australian distribution sector was largely due to the intensive use of labour in branches characterised by low output performance. Low productivity levels in wholesale trade relative to retail trade is also an indication of the poor output performance in Australia's manufacturing sector largely from the recession in the early 1990s.

Differences in labour productivity can also be explained from the size of establishments, measured in terms of sales per establishment, as well as number of persons engaged per establishment. These are presented in Table 3. Australian sales were converted to US dollars using the Fisher PPPs of Table 4. Table 3 shows that US establishments were bigger in all trades. Firms can reduce their average costs through economies of scale since the cost of fixed factors can be spread over more persons and more sales. As noted by Nooteboom (1982), economies of scale are crucial in wholesale and retail trade, since reduction in their average costs will, in turn, increase profit return.

3.3 Real Output and Labour Productivity, 1991 – 1999

Real output and productivity levels for the period 1991-99 are derived by extrapolating the time series of gross value added in constant 1992 prices using the Fisher PPP for 'Distribution' in Table 4. Subsequently, value added for both Wholesale and Retail Trade industry from 1991 to 1999 can be derived using the Fisher PPPs for their respective industries. These series are shown in Figures 1, 2 and 3.
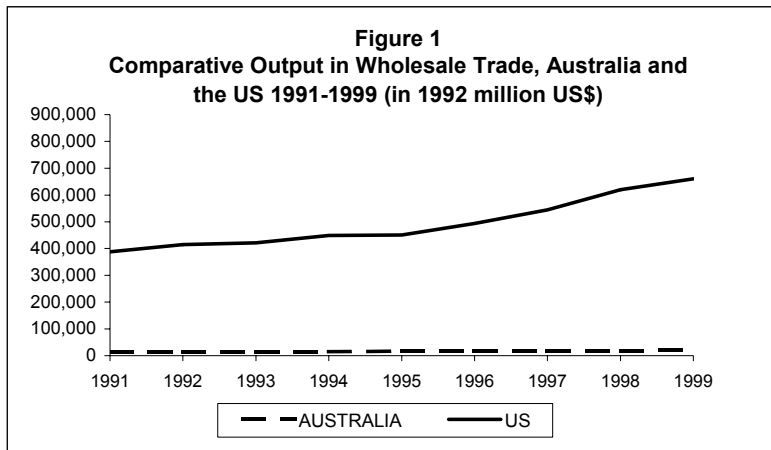
Figure 1
Comparative Output in Wholesale Trade, Australia and the US 1991-1999 (in 1992 million US$)

Note: Value added figures coneverted into 1992 US dollars using Fisher PPP from Table 4.

Source: Appendix 2 and Table 4

Figure 2
Comparative Output in Retail Trade, Australia and the US 1991-1999 (in 1992 million US$)

Note: Value added figures coneverted into 1992 US dollars using Fisher PPP from Table 4.
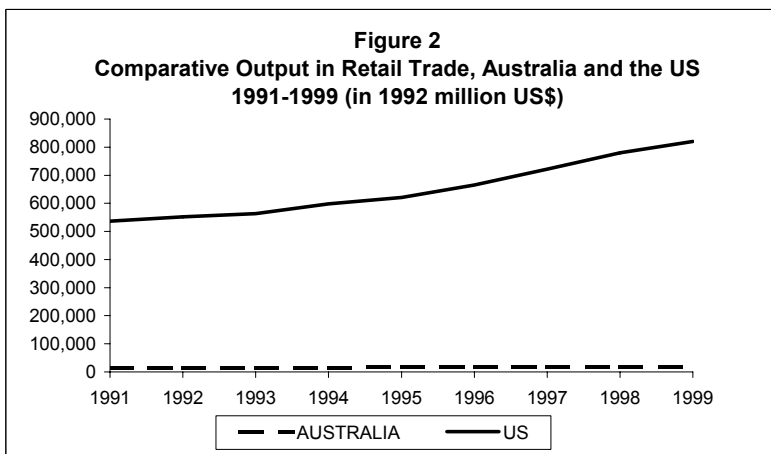
Source: Appendix 2 and Table 4

Figure 3
Comparative Output in Distribution, Australia and the US 1991-1999 (in 1992 million US$)

Note: Value added figures coneverted into 1992 US dollars using Fisher PPP from Table 4.

Source: Appendix 2 and Table 4

From Figures 1 and 2, the gap between the US Wholesale and Retail Trade industries and Australia's has been diverging since 1991. From 1991 to 1999, Australia's wholesale trade outpu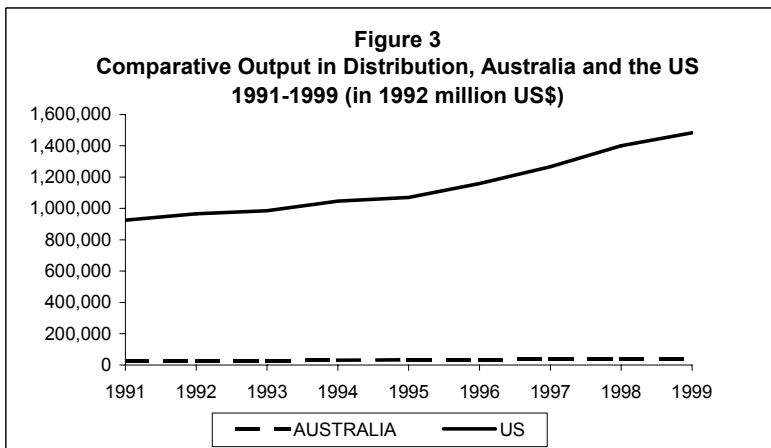t relative to the US fell from 3.4 percent to 3.1 percent. In retail trade, this fell from 2.6 percent to 2.3 percent. Overall Distribution had fallen from 2.9 percent to 2.6 percent.

The huge difference in Wholesale and Retail Trade industry output was largely due to the greater US population which indicates a greater market thus resulting in greater consumption levels on goods and services. The average growth rate of Distribution from 1991 to 1999 for Australia was 4.5 percent, whereas for the US, this was 5.9 percent[7].

The average annual growth rate for Distribution labour productivity in Australia was 4.4 percent[8]. Wholesale industry labour productivity was 5 percent whereas retail industry was 3.5 percent. These figures differ slightly when converted into 1992 US dollars, which are 5 percent, 1.2 percent and 2.7 percent respectively. However, the current paper's results differ from those of Johnston et al. (2000). Their findings reveal that wholesale trade labour productivity growth rate was 3.0 percent for the period 1989-90 to 1998-99, while for retail trade (1991-92 to 1998-99) this was 1.8 percent[9]. The significant difference of the wholesale and retail trade labour productivity growth rate between these two studies could be due to the selection of the time-period as well as the choice of calendar year and financial year estimates.

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[7] Percentages based in 1992 US dollars.
[8] Percentages based in 1992 Australian dollars.
[9] Results based on trend data.

Nonetheless, the more significant issue of this paper is to provide a comparative analysis of Australia's productivity performance with the US. Relative to the US, Australia's wholesale trade, retail trade and distribution labour productivity trends are shown in Figures 4, 5 and 6 respectively. From 1991 to 1999, Australian Wholesale labour productivity hovered just above 40 percent of the US labour productivity level. As for the retail trade industry, Australia's performance fell from 41.8 to 36.6 percent of US levels. On average, the distribution levels have been gradually falling behind US levels, from 42.6 percent in 1991 to 43.2 percent in 1999 with a high of 48.6 percent in 1995. In other words, US labour productivity growth rate has been outperforming Australia since 1991.

Figure 4
Trends in Labour Productivity in Wholesale Trade, Value Added per person engaged, Australia/US 1991-1999 (US=100)

Source: Appendix 5 and Table 4.

Figure 5
Trends in Labour Productivity in Retail Trade, Value Added per person engaged, Australia/US 1991-1999 (US=100)

Source: Appendix 5 and Table 4.

Figure 6
Trends in Labour Productivity in Distribution, Value Added per person engaged, Australia/US 1991-1999 (US=100)

Source: Appendix 5 and Table 4.

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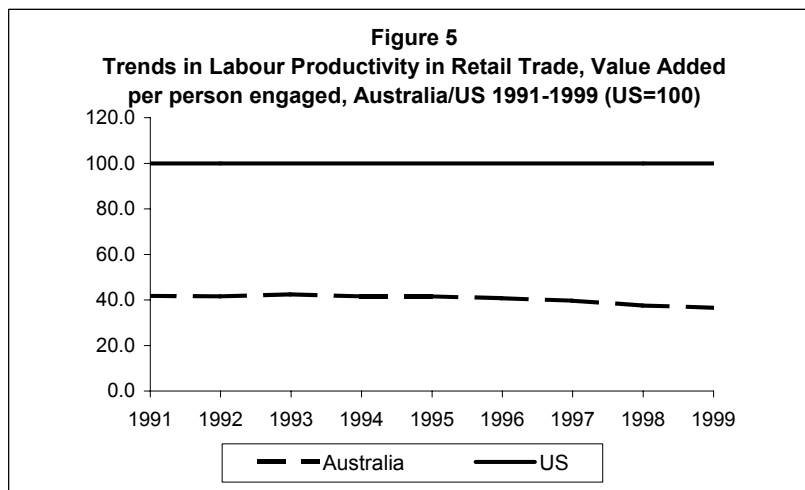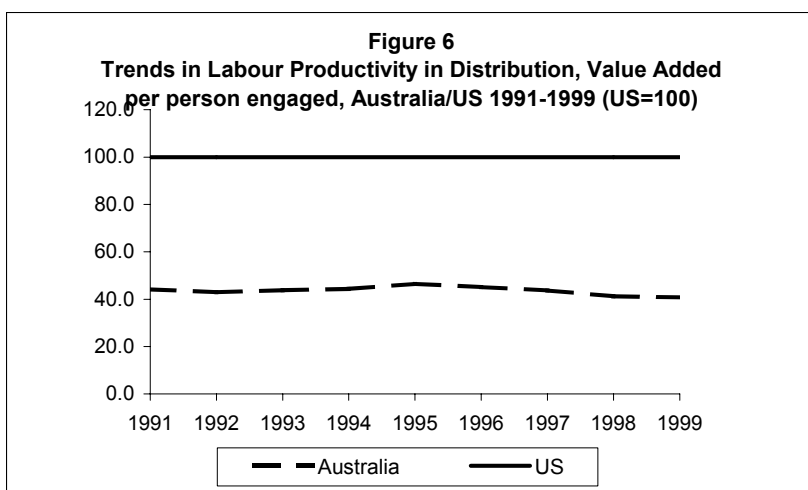
One possible reason as to why Australia's performance was below the US level is the effect of establishment size. As identified in Table 3, the number of persons engaged per establishment measures the establishment size. Table 3 illustrates that the average size of a US establishment is larger than an Australian establishment in both wholesale and retail trade industries. As such, it is most likely that the US establishments are experiencing greater economies of scale. Size differences are important since they explain differences in productivity levels in distribution, as discussed by Nooteboom (1982) and Smith and Hitchens (1985). It would be expected that a larger establishment would experience economies of scale for the following two reasons. Firstly, if a firm increases its size, its fixed costs can be distributed over more persons engaged (Nooteboom, 1982). Secondly, a larger establishment can easily change its labour utilisation, which is highly dependent on consumer's demand. This dependency on consumer's demand indicates an uncertainty in terms of how many persons to engage for a specific time period. As noted by Mulder (1994), this uncertainty per person engaged can be decreased with an increase in the scale of operation. The use of part-time labour thus allows for adjustments in labour capacity and thus for more efficient utilisation of labour.

Another reason for the higher US labour productivity over Australia is the size of the domestic market. The larger US population indicates a larger level of consumption on both wholesale and retail goods. In addition, the average GDP per capita in 1991 for Australia was $16,911 whereas in the US, it was $22,856[10]. In 1999, these figures were $21,706 and $28,083, respectively. The figures imply greater purchasing power in the US over Australia during the 1990s.

4. Conclusion

This study provides a comparative analysis of real output and labour productivity in the wholesale and retail trade industries in Australia and the US from 1991 to 1999. The paper also introduced a methodology drawn on the ICOP industry-of-origin approach of international comparison, pioneered by Mulder (1994) and van Ark, Monnikhof and Mulder (1999), to provide the first in a series of papers concerning real output and productivity analysis in the service sectors in Australia and the US. In essence, the results over the period 1991 to 1999 show Australian distribution productivity operating just above 40 percent of the US level. This suggests that Australia not only lags behind US levels, it also failed to close the productivity gap between itself and the US. However, caution should be exercised in drawing strong conclusions from the current paper's productivity estimates based on the nature of the available data and the reliance on the ICP PPPs. Furthermore, the study only focused on a partial productivity analysis and used the number of persons engaged' rather than 'average annual working hours per worker'. A multi-factor productivity would have provided a better analysis and conclusion which will be adopted when such data become available.

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[10] GDP per capita drawn from University of Groningen and The Conference Board, GGDC Total Economy Database, 2002, http://www.eco.rug.nl/ggdc". Figures converted into 1990 US$ using GK PPPs.

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Wholesale Trade, US 1992   **Coverage of Value Added**

SIC code	Type of Business	Sales (million $)	Value Added (million $)	Value Added (million Aus$)	Value Added (million US$)	PPP Aus/US
50	*Durable goods*	908,917	217,060	499,650	217,060	2.30
501	Motor vehicles and automotive parts and supplies	170,849	31,911 a	53,112	31,911	
502	Furniture and home furnishings	33,200	11,114	16,196	11,114	
503	Lumber and other construction materials	63,765	14,335	20,890	14,335	
504	Professional and commercial equipment and supplies	139,629	41,273	257,652	41,273	
505	Metals and minerals, except petroleum	76,745	14,690	19,402	14,690	
506	Electrical goods	115,387	27,440	36,242	27,440	
507	Hardware, and plumbing and heating equipment and supplies	53,063	14,087	25,088	14,087	
508	Machinery, equipment and supplies	149,216	39,906	71,069	39,906	
509	Miscellaneous durable goods	107,063	22,304	39,721	22,304	
51	*Nondurable goods*	940,881	145,167	178,487	145,167	1.23
511	Paper and paper products	54,802	11,815	20,663	11,815	
512	Drugs, drug proprietaries, and druggists' sundries	67,069	7,207	10,847	7,207	
513	Apparel, piece goods, and notions	67,905	18,180	30,303	18,180	
514	Groceries and related products	279,217	38,737	54,439	38,737	1.41
515	Farm-product raw materials	106,224	9,459	13,293	9,459	
516	Chemicals and allied products	39,170	8,981	12,621	8,981	
517	Petroleum and petroleum products	142,651	12,259	17,228	12,259	
518	Beer, wine, and distilled alcoholic beverages	50,397	11,707	19,091	11,707	
519	Miscellaneous nondurable goods	133,446	26,822	37,694	26,822	
	WHOLESALE	**1,849,798**	**362,227**	678,138	362,227	1.87

Note: Discrepancies of figures between the US census and above for durable and non-durables due
to overlapping of products.
(a) Value added derived by taking the difference of total durable goods and sum of SIC codes 502 to 509.
Census showed no figures as the estimates either did not meet publication standards on the basis of either
response rate, associated relative standard error, or consistency review.

Source: Bureau of the Census, *1992 Census of the Wholesale Trade,* US Department of Commerce,
Washington DC, 1996.
Employment from 1992 Economic Census: Census of Wholesale Trade (via www).

Retail Trade, US 1992

SIC code	Type of Business	Sales (million $)	Value Added (million $)	Value Added (million Aus$)	Value Added (million US$)	PPP Aus/US
	Durable goods	**700,067**	**182,865**	280,839	182,865	1.54
	Building materials, hardware, garden supply,					
52	**and mobile home dealers**	**100,838**	**29,932**	43,618	29,932	1.46
521, 3	Building materials and supply stores	75,358	21,169			
525	Hardware stores	12,729	4,412			
526, 7	Lawn and garden stores and mobile home dealers	12,751	4,351			
55 excl. 554	**Automotive dealers**	**389,129**	**69,332**	115,394	69,332	1.66
551	Franchised motor vehicle dealers	333,801	52,520			
552	Used motor vehicles	25,511	5,806			
553	Auto and home supply	29,817	11,006			
55 excl. 551,2,3,4	Other automotive dealers	17,806	(s)			
57	**Furniture and homefurnishings and equipment stores**	**96,947**	**35,066**	51,100	35,066	1.46
571	Furniture and homefurnishings	52,348	21,858			
572	Household appliance stores	8,407	2,680			
573	Radio, television, computer, and music stores	36,192	10,528			
59 excl. 591,2,6,8	**Miscellaneous retail stores, except drug and liquor**	**113,153**	**48,535**	70,727	48,535	1.46
	Nondurable goods	**1,233,716**	**406,081**	641,291	406,081	1.58
53	**General merchandise stores**	**246,420**	**71,959**	101,128	71,959	1.41
54	**Food stores**	**377,099**	**88,269**	124,049	88,269	1.41
541	Grocery stores	358,148	80,111			
54 excl. 541	Other food stores	18,951	8,158			
56	**Apparel**	**104,212**	**42,455**	70,766	42,455	1.67
561	Men's and boy's clothing and furnishing stores	10,197	4,265			
562,3	Women's clothing specialty stores	35,750	14,967			
564,5,9	Other apparel	40,143	15,477			
566	Shoe stores	18,122	7,746			
58	**Eating and drinking places**	**200,164**	**120,489**	212,656	120,489	1.76
5812	Eating places	187,758	113,879			
5813	Drinking places	12,406	6,610			
591	**Drug stores and proprietary stores**	**77,788**	**19,994**	30,093	19,994	1.51
592	**Liquor stores**	**21,698**	**4,882**	7,961	4,882	1.63
596	**Nonstore retailers**	**55,183**	**27,790**	45,319	27,790	1.63
598	**Fuel dealers**	**14,202**	**5,146**	8,392	5,146	1.63
554	**Gasoline service stations**	**136,950**	**25,097**	40,927	25,097	1.63
	RETAIL	**1,933,783**	**588,946**	922,131	588,946	1.57
	DISTRIBUTION	**3,783,581**	**951,173**	1,600,269	951,173	1.68

Note: Discrepancies of figures between the US census and above for durable and non-durables due
to overlapping of products and exclusion of specific data (see (s)).
(s) - Estimates withheld due to failure to meet publication standards.
Some expenditure groups do not have ICP PPPs. Hence, these groups have been assumed to have similar ICOP PPPs of specific expenditure groups.
These have been identified by a rectangular box.

Source: Bureau of the Census, *1992 Census of the Retail Trade,* US Department of Commerce,
Washington DC, 1996.
Employment from 1992 Economic Census: Census of Retail Trade (via www).

Appendix 3

Wholesale Trade, Aus 1991-92 | | | | | **Coverage of Value Added** |

SIC code	Description	Turnover	Value Added	Value Added	Value Added	PPP
		(million $)	(million $)	(million US$)	(million Aus$)	Aus/US
	Durable goods	70,136	8,999	5,465.0	8,998.7	1.65
4522	Metal and Mineral Wholesaling	13,626.5	405.6	278	405.6	1.46
4531	Timber Wholesaling	1,697.3	269.8			
4539	Building Supplies Wholesaling nec.	7,766.3	1,401.2			
453	*Builders Supplies Wholesaling*	9,463.6	1,671.0	1,147	1,671.0	1.46
4611	Farm and Construction Machinery Wholesaling	4,449.3	622.4			
4612	Professional Equipment Wholesaling	1,762.3	430.7			
4613	Computer Wholesaling	7,418.9	1,110.3			
4614	Business Machine Wholesaling nec.	1,871.0	390.2			
4615	Electrical and Electronic Equipment Wholesaling	5,179.8	860.4			
4619	Machinery and Equipment Wholesaling nec.	5,332.5	1,068.1			
461	*Machinery and Equipment Wholesaling*	26,013.8	4,482.1	2,516.7	4,482.1	1.78
4621	Car Wholesaling	7,486.3	509.4			
4622	Commercial Vehicle Wholesaling	4,351.0	306.9			
4623	Motor Vehicle New Part Dealing	3,935.2	816.0			
4624	Motor Vehicle Dismantling and Used Part Dealing	481.0	138.1			
462	*Motor Vehicle Wholesaling*	16,253.5	1,770.4	1,063.7	1,770.4	1.66
4731	Household Appliance Wholesaling	2,799.4	351.9			
4732	Furniture Wholesaling	591.7	101.8			
4733	Floor Covering Wholesaling	508.1	61.8			
4739	Household Good Wholesaling nec.	878.9	154.1			
473	*Household Good Wholesaling*	4,778.1	669.6	459.5	669.6	1.46
	Nondurable goods	71,815	7,653	4,524.0	7,652.5	1.69
4511	Wool Wholesaling	4,314.5	520.8			
4512	Cereal Grain Wholesaling	3,020.2	210.2			
4519	Farm Produce and Supplies Wholesaling nec.	4,412.3	569.5			
451	*Farm Produce Wholesaling*	11,747.0	1,300.5	797.5	1,300.5	1.63
4521	Petroleum Product Wholesaling	20,364.8	1,602.2	916.1	1,602.2	1.75
4523	Chemical Wholesaling	2,096.6	344.1	196.8	344.1	1.75
4711	Meat Wholesaling	2,867.5	163.5			
4712	Poultry and Smallgood Wholesaling	428.2	37.0			
4713	Dairy Produce Wholesaling	796.1	70.0			
4714	Fish Wholesaling	1,298.8	117.9			
4715	Fruit and Vegetable Wholesaling	3,044.2	354.5			
4716	Confectionery and Soft Drink Wholesaling	753.2	88.8			
4717	Liquor Wholesaling	1,383.2	108.9			
4718, 19	Grocery and Tobacco Product Wholesaling	10,864.3	820.4			
471	*Food, Drink and Tobacco Wholesaling*	21,435.5	1,761.0	1,079.9	1,761.0	1.63
4721	Textile Product Wholesaling	1,945.1	328.7			
4722	Clothing Wholesaling	2,125.0	348.0			
4723	Footwear Wholesaling	472.9	90.4			
472	*Textile, Clothing and Footwear Wholesaling*	4,543.0	767.1	460.2	767.1	1.67
4791	Photographic Equipment Wholesaling	552.2	88.4			
4792	Jewellery and Watch Wholesaling	567.5	93.4			
4793	Toy and Sporting Good Wholesaling	1,102.2	192.1			
4794	Book and Magazine Wholesaling	1,139.9	251.7			
4795	Paper Product Wholesaling	2,737.3	416.1	237.9	416.1	1.75
4796	Pharmaceutical and Toiletry Wholesaling	4,011.8	533.9	354.7	533.9	1.51
4799	Wholesaling nec.	1,516.9	302.0			
479	*Other Wholesaling*	11,627.8	1,877.6	1,073.6	1,877.6	1.75
	WHOLESALE TRADE	**141,950**	**16,651**	9,989.0	16,651.2	1.67

Note: Discrepancies of figures between the ABS (8638.0) publication and above due to rounding-off errors.

SIC code	Description	Turnover	Value Added	Value Added	Value Added	PPP
		(million $)	(million $)	(million US$)	(million Aus$)	Aus/US
	Durable goods	36,807	5,284	3,214.7	5,156.0	1.60
5231	Furniture retailing	1,776	249			
5232	Floor covering retailing	871	130			
5233	Domestic hardware and houseware retailing	2,351	413			
5234	Domestic appliance retailing	4,200	529			
5235	Recorded music retailing	353	47			
523	*Furniture, houseware and appliance retailing*	9,551	1,368	938.8	1,368.0	1.46
526	*Household equipment repair services*	306	128			
5311	Car retailing	19,854	1,714			
5312	Motor cycle dealing	629	100			
5313	Trailer and caravan dealing	164	24			
531	*Motor vehicle retailing*	20,647	1,838			
5322	Automotive electrical services	398	158			
5323	Smash repairing	2,035	783			
5324	Tyre retailing	1,715	267			
5329	Automotive repair and services nec.	2,155	742			
532	*Motor vehicle services*	6,303	1,950			
531, 532	*Motor vehicle retailing and services*	26,950	3,788	2,275.9	3,788.0	1.66
	Nondurable goods	77,500	12,808	7,307.0	11,050.0	1.51
5110	Supermakets and grocery stores	25,280	3,283	2,336.1	3,283.0	1.41
5121	Fresh meat, fish and poultry retailing	2,121	451			
5122	Fruit & vegetable retailing	1,489	223			
5123	Liquor retailing	1,928	220	134.9	220.0	1.63
5124	Bread & cake retailing	747	295			
5125	Takeaway food retailing	3,971	1,068			
-	Milk vending and Specialised food retailing nec.	1,279	197			
512	*Specialised Food retailing*	11,535	2,454	1,504.8	2,454.0	1.63
5210	Department stores	9,830	1,930	1,373.3	1,930.0	1.41
5221	Clothing retailing	5,731	1,076			
5222	Footwear retailing	1,121	210			
5223	Fabrics and other soft good retailing	988	212			
522	*Clothing and soft good retailing*	7,840	1,498	898.7	1,498.0	1.67
5241	Sport & camping equipment retailing	1,024	189			
5242	Toy & game retailing	298	46			
5243	Newspaper, book and stationery retailing	3,202	575			
5244	Photographic equipment retailing	240	44			
5245	Marine equipment retailing	307	51			
524	*Recreational good retailing*	5,071	905	542.9	905.0	1.67
5251	Pharmaceutical, comestic and toiletry retailing	3,953	923	613.3	923.0	1.51
5252	Antique and used good retailing	297	74			
5253	Garden supplies retailing	372	94			
5254	Flower retailing	261	66			
5255	Watch & jewellery retailing	1,236	327			
5259	Retailing nec.	1,431	274			
525	*Other personal and household good retailing*	7,550	1,758			
5321	Automotive fuel retailing	10,394	980	651.1	980.0	1.51
	RETAIL TRADE	**114,307**	**18,092**	10,521.7	16,206.0	1.54
	DISTRIBUTION	**256,257**	**34,743**	20,510.6	32,857.2	1.60

Note: Discrepancies of figures between the ABS (8622.0) publication and above due to rounding-off errors.
Some expenditure groups do not have ICP PPPs. Hence, these groups have been assumed to have similar ICOP PPPs of specific expenditure groups.
These have been identified by a rectangular box.
Source: ABS, *Retail Industry, Australia 1991-1992*, Cat. No. 8622.0.

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Appendix 5
Value Added and Number of Persons Employed in
Australia and the United States, 1991-1999

AUSTRALIA

	Value Added in 1992 US $m				No. Employed persons ('000)		
	Wholesale	**Retail**	**Distrib.**	|	**Wholesale**	**Retail**	**Distrib.**
1991	11,845	13,789	25,634	|	500	1,094	1,594
1992	11,813	14,109	25,922	|	488	1,097	1,585
1993	12,318	14,438	26,756	|	499	1,109	1,608
1994	13,543	15,016	28,559	|	502	1,151	1,653
1995	14,723	15,905	30,627	|	497	1,207	1,704
1996	15,354	16,716	32,070	|	497	1,231	1,728
1997	16,043	17,405	33,448	|	497	1,240	1,736
1998	17,137	18,078	35,215	|	503	1,271	1,775
1999	18,051	18,615	36,666	|	501	1,312	1,812

UNITED STATES

1991	388,219	537,008	924,889	|	6,201	17,668	23,869
1992	414,611	551,707	966,318	|	6,205	17,697	23,902
1993	421,560	563,420	984,939	|	6,141	18,261	24,402
1994	448,751	597,690	1,046,432	|	6,324	18,898	25,222
1995	450,112	621,132	1,070,877	|	6,555	19,462	26,017
1996	493,468	665,349	1,158,673	|	6,587	19,851	26,438
1997	544,302	721,738	1,266,082	|	6,739	20,258	26,997
1998	619,927	780,033	1,400,703	|	6,922	20,417	27,339
1999	660,967	820,484	1,482,428	|	7,024	20,988	28,012

Distrib - Distribution.

Note: Value Added and no. of persons employed from the above sources differ to the census figures (Table 1) due to differences in concepts, coverage, methodological approach, classification and compilation. Hence, for time-series analysis, the converted national accounts figures based on PPPs are used. As for the analysis for the benchmark year, the census figures are used. Note that the sum of wholesale and retail does not tally with the total distribution. This is due to total distribution which is derived using the distribution PPP and not the sum of whoelsale and retail figures.

Source: Australian figures from ABS, *Australian System of National Accounts* (various issues), Cat. No. 5204.0. ABS, *Australian Economic Indicators* (various issues), Cat No. 1350.0. US figures from US Department of Commerce 2000, *Bureau of Economic Analysis*, (via internet) http://www.bea.doc.gov/bea/dn2/gpo.htm

Appendix 6

ICP PPPs, Australia/US, 1992

Buildings for market services (Grocery & stores)	1.41
Alcoholic beverages	1.63
Clothing and footwear	1.67
House furnishings, operations	1.46
Paper products for household	1.75
Personal transportation equipment	2.01
Other personal care goods	1.51
Machinery & non-electrical equipment	1.78
Office machinery & equipment	6.24
Metal & woodworking machinery	2.12
Tool, finished metal	1.09
Construction, mining & oil field	1.19
Electrical machinery & appliances	1.32
Motor vehicles, engines	1.66
Restaurants, cafes, etc.	1.76
Major household appliances	1.63

Note: PPPs updated from 1990 (World Bank figures) to 1992.
Procedure based on extrapolation of 1990 PPPs using respective
CPI and PPI's.

Source: World Bank (1993) STARS Diskette.