

Economic Performance Analysis of the Australian Property Sector in the 1990s Using the Input-output Tables

Mr. Yu Song and Dr. Chunlu Liu

School of Architecture and Building, Geelong Waterfront Campus, Deakin University, 1
Gheringhap Street, Geelong, Vic 3217, Australia

Abstract

The property sector has played an important role with its growing contribution in the national income and employment in Australian economy. There is an increasing research need in measuring and analysing the economic performance at a country level and the input-output tables are considered as an appropriate tool. This paper aims to analyse and measure the performance and sectoral linkages of the Australian property sector using five latest input-output tables compiled by the Australian Bureau of Statistics. The weight of the property sector in the economy is measured. The direct and total backward and forward indicators are investigated respectively. Accordingly, the direct and total input and output of the property agent sector are discussed. Moreover, the Spearman Rank Correlations are tested to decide if there are any notable changes in rankings of the efficiencies of the property agent sector between the property sector and others over the study period. Results describe the structural characteristics and development trend of the property sector in Australia. Findings can aid policy makers, property agencies and researchers in evaluating the competitive ability of property agents in Australia. They can also be used to carry out comparisons with other countries.

Introduction

The property capital stock has formed a significant portion of the national wealth in most developed economies. The property service refers to the flow of services yielded during any period of time by property stock and also plays an important role in the entire economy as well as the growing influence in property capital stock (Tse 1994). Improved country studies are needed in order to gain a better comprehension of the specificities of the property service and its role in economic development, and then the structural characteristics and development trend of the property sector in Australia can be describe, which is in turn important to formulating industry policies. However, the consistent studies in the importance of Australian property sector are hindered due to the lack of usable input-output tables after the 1980s. Over the 1990s, Australia experienced a recession at the beginning of 1990s and a boom at the end of 1990s due to the Sydney 2000 Olympic Game. According to the Australian Bureau of Statistics, Australian Gross Domestic Product (GDP) growth increased from \$5,753 to \$8,121 per capita at the current price during the same period. The Australian property sector

accounted for average 12.47% of GNP, and employed average 1.3% of the work forces in the 1990s. Given the important role in Australian economy, it is necessary to explore the new development of the property sector and understand the new relationship of the sector with other economic sectors during the 1990s.

The input-output analysis focuses on how inter-sector trading influences the overall demand for labor and capital within an economy (Leontief 1966). By displaying all flows of goods and services within an economy, the input-output technology may describe the relationship between the property service sector and other industries, and reflect the importance of the property sector in the national economy. Australian Bureau of Statistics (2004) has recently released the 1998-99 input-output table. Combined with previous publications, five input-output tables are investigated over the 1990s: 1992-93, 1993-94, 1994-95, 1996-97, 1998-99 in this paper. The tables compiled according to the Australian input-output methodology reflected the structure of the Australian economy for the years in respect of which they were compiled. The paper structure first provides a review of the input-output analysis for the property sector. The property sector is then examined in terms of their shares in gross national product (GNP), gross national income (GNI) and GDP. Furthermore, the compositions and nature of linkages of the property sector including pull and push effect are analysed and tested respectively. Finally, a concluding comment summarises the paper.

Input-output analyses for the property sector

The input-output tables provide detailed information about the supply and disposition of products in an economy and about the structure and inter-relationships between sectors. The rows of an input-output table illustrate the distribution of a producer's output throughout the economy, while the columns describe the composition of inputs required by a particular sector to produce its output. The input-output analysis breaks the economy into sectors and focuses on how inter-sector trading influences the overall demand for labor and capital within an economy.

Using an input-output approach, the role of the property sector in national economies has been explored widely by several writers and the relationship between the construction sectors and the economic maturity has been studied for Australia, Finland, Italy, Japan, Turkey, UK and USA, from the 1960s to 1980s (Bon, 2000, Liu et al., 2003, Lopes, 2003, Su et al., 2003). The findings revealed that the more developed an economy, the smaller the construction

sector, namely, so-called inverted U-shaped relationship. In the area of property service, it is argued that the property service is a consumption concept whereas the property capital stock is an investment concept and different ways to measure service consumption will give different interpretations and results (Tse 1994). Roulac (1996) examined the property financial input-output relationships in his paper, and Pagliari et al. (1997) compared commercial property output in Australia, Canada, the United Kingdom and the United States over the period 1985-1995 by analysing separately office, retail and warehouse sectors. Furthermore, Roulac (1999) addressed the application of the value chain concept to how property facilitates the connection of inputs to the value creation process to deliver goods and services to consumers. In the context of the input-output tables, Li et al. (2003) analysed the property sector based on the Chinese input-output table. Liu et al. (2004) performed a multinational input-output analysis on the property sector based on the Organisation for Economic Co-operation and Development (OECD) input-output database before the reference year 1990. Using the same input-output table, Song et al (2004) described the linkage differences between the property and construction sector for Australia and the others six OECD countries. However, due to the date limitation, the role of property sector is not explored sufficiently using the input-output tables in the 1990s.

Australian input-output tables

With the release of tables for 1998–1999 on June 29, 2004, the ABS has published 18 input-output tables for Australia. Previous tables are for reference years 1958–59, 1962–63, 1968–69, 1974–75, for each year from 1977–78 to 1983–84, 1986–87, 1989–90, 1992–93, 1993–94, 1994–95 and 1996–97. This paper uses five Australian input-output tables in the 1990s. The five tables include input by sector and output by product group; sector-by-sector flow matrices; direct and total requirement coefficients matrices, margins matrices and employment by sector. Selected tables are available at the 35 and 106-industry level. These tables have been compiled using the input-output methodology introduced for the compilation of the 1974-1975 tables. It includes estimating from basic data sources the summary aggregates (sector output, primary inputs and final uses) and then estimating intermediate inputs from the preceding tables in the series using a mathematical estimation technique to satisfy optimally the accounting constraints imposed by the summary aggregates (for details see ABS, 2004).

This paper adopts the 106-sector indirect-allocation-of-imports input-output tables based on the basic prices. The property sector is divided into two sub-sectors in the 106-sector table, namely ownership of dwelling and other property. The former represents the residential property services. The latter mainly represents the commercial property services. The indirect-allocation-of-imports method records all imports as adding to the supply of the sector to which they are primary and then allocating this supply along the corresponding row of the table to using sectors. According to ABS, this method better reflects the technological input structure of the sector and better reflects the product composition of final use (ABS, 2004). Moreover, the basic price is chosen because it is the most common valuation conventions. The basic price means that the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, on that unit as a consequence of its production or sale (ABS, 2004).

This paper analyses seven indicators. The share of general property sector in gross national product (GNP), share of property sector in gross national income (GNI) and share of property sector in GDP are adopted to explore the weight of the property sector in the economy. The backward indicators, and direct property sector inputs from other sectors indicators are used to analyse the pull effect. What is more, the forward indicators and direct property sector outputs to other sectors indicators are chosen to investigate the push effect. Brief definitions about these indicators will be presented and the reader may refer to Bon (2000) for the mathematical foundations of the indicators used in this paper.

The weight of the property sector in the economy

The shares of the general property in GNP, GNI and GDP can measure the importance of the property sector in the entire economy. In terms of national product and income accounting conventions, total final demand represents GNP, total value added represents GNI, and GDP records the value created through the process of production and is the sum of the total value added by sectors plus taxes less subsidies on products. A higher value implies larger contributions of the property sector to the national economy. Table 1 shows the shares of Australian property sector in GNP, GNI and GDP respectively. The different values of the indicators represent the different developing levels of the real estate sector and the higher shares in GNP and GDP report a higher developing level. Moreover, a higher share in GNI indicates a higher proportion of the sectoral value added in total value added, and reflects the importance of the real estate sector from an output point of view.

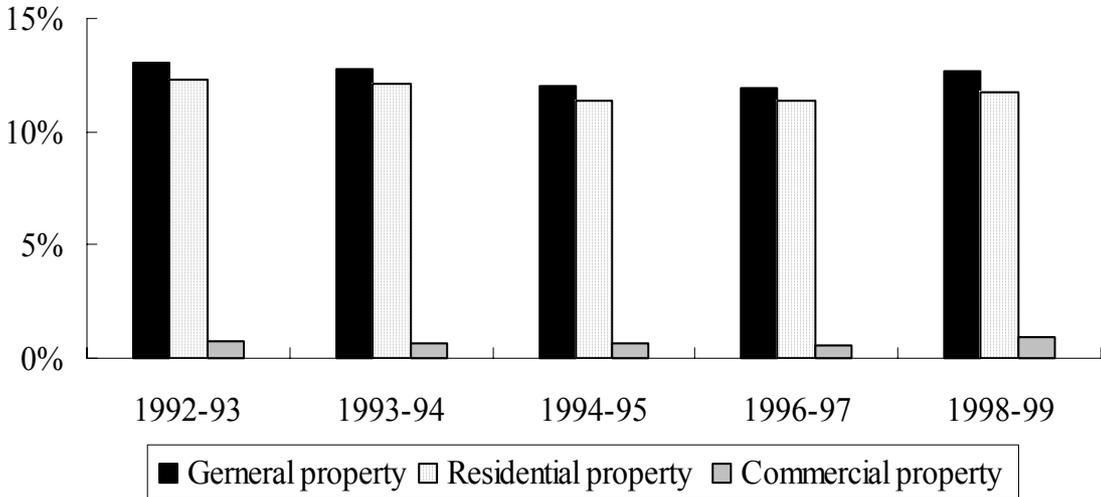
Table 1: The weight of the general property sector in the economy

	1992-93	1993-94	1994-95	1996-97	1998-99
Share in GNP	13.01%	12.76%	11.99%	11.93%	12.65%
Share in GNI	11.07%	11.00%	12.41%	12.69%	13.63%
Share in GDP	12.20%	11.91%	11.09%	11.06%	11.60%

The development pattern of property sector shares in GNP and GDP can be divided into two stages, one is from the reference year 1992-93 to 1996-97, and another is 1998-99. The decrease in the first stage may result from the recession at the beginning of 1990s in Australia (Bodman and Crosby, 2002). The increase in 1998-99 was mainly due to the income increase of the private sector businesses in the property services industry. Over the study period, the share in GNI increased from 11.07% to 13.63%. According to the 1998-99 real estate services industry survey (2000), during 1998-99, private sector businesses in the property services industry generated \$3903 million in income, which was a 19% increase on the industry income generated in 1996-97 and 64% income was generated from property sales and leasing commissions, a marginal increase from the 61% recorded in 1996-97. Interestingly, the share of GDP was roughly constant over the decade studied while the share of GNI increased steadily, one main reason was the increasing on the labor cost during the late of 1990s.

The residential and commercial property services are two main sub-sector of the property sector in the Australian input-output industry classification. Fig. 1 presents the shares of general property, residential and commercial property sectors in GNP.

Figure 1: The shares of property sector in GNP

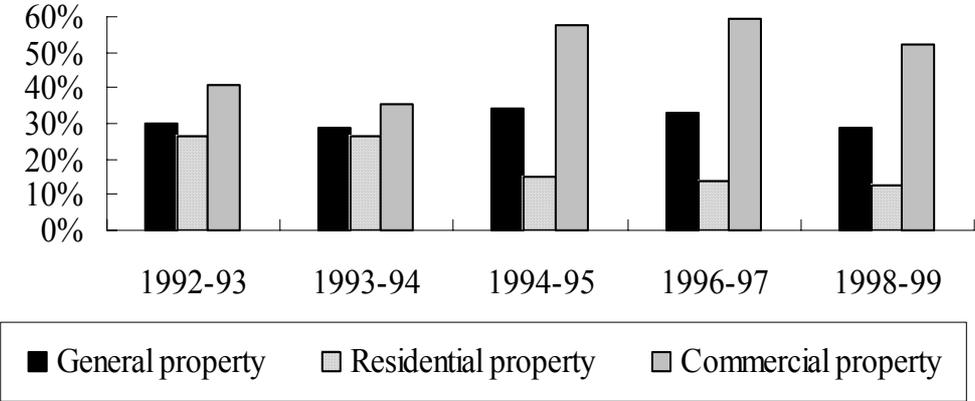


Similarly, a decreasing tendency can be found in the share of residential and commercial property services, which was a consequence of the recession at the beginning of 1990s. The boom at the end of 1990s resulted in an increasing share in 1998-99. In Australia, the share of the residential property sector in the GNP was larger than that of the commercial property sector. It implies that the residential property sector has played a more important role than the commercial sector in the economy.

The pull effect of the property sector

The backward indicator shows the proportion of the property sector’s inputs that comes from other sectors, rather than from primary inputs—land, labour, capital, etc. It indicates the degree of the industrialisation and technical level of the property service process. More importantly, it represents the strength of the property sector’s economic pull. The larger is the value, the higher is the national technologies level of the intermediate inputs and the stronger is the pull of the property sector. Fig. 2 shows the backward linkage indicators of the general property, residential property and commercial property sectors in Australia over the 1990s.

Figure 2: Backward linkage indicators



The value of the general property backward linkage was stabilising at a value between 28% and 35%. Compared with the backward linkage indicator of the construction sector, the value suggests a relatively lower industrialisation level of the property sector than the construction sector (Pietroforte and Gregori 2003). In other words, the property sector’s ability to pull the rest of the economy was weaker than is the construction sector’s. Due to the fact that property plays a fundamental connecting role in the value chain (Roulac 1999), the relatively lower technologies level is reasonable. Interestingly, while the backward linkage of residential property sector showed a downward trend, that of commercial property presented an upward trend. This pattern derived from a dramatically decline in the demand of banking and

residential building sectors and a considerable growth in the demand of commercial property itself. The recession in the Australian economy in the 1990s resulted in the decline in the private demand, whereas the coming Olympic Game stimulated the commercial property market.

In order to investigate the input compositions of the property sector, the inputs from other sectors to the property sector are ranked as shown in Table 2. Averagely, the property and business service, manufacturing, finance and insurance and electricity, gas and water service were ranked top five in all sectors over the 1990s.

Table 2: Rank of direct inputs from the other sectors to property agent sector

	1992-93	1993-94	1994-95	1996-97	1998-99
Agriculture, Forestry and Fishing	17	17	14	15	15
Mining	14	14	15	14	16
Manufacturing	3	3	2	2	2
Electricity, Gas and Water Supply	4	4	6	7	7
Construction	8	7	7	8	10
Wholesale Trade	9	9	9	9	8
Retail Trade	13	13	16	16	14
Accommodation, Cafes and Restaurants	12	12	8	6	6
Transport and Storage	7	6	5	4	4
Communication Services	5	5	4	5	5
Finance and Insurance	2	2	3	3	3
Property and Business Services	1	1	1	1	1
Government Administration and Defence	11	11	12	11	11
Education	16	16	13	13	12
Health and Community Services	15	15	17	17	17
Cultural and Recreational Services	6	8	10	10	9
Personal and Other Services	10	10	11	12	13

Then, a nonparametric test is conducted. The test is conducted with the aid of the Statistical Package for Social Sciences (SPSS version.11). The Spearman correlation is selected to test whether the input structure change is considerable or not. The following post-hoc hypothesis is tested: There is no significant difference between the any two rankings. The significance level is 0.05 (2-tailed). If the Spearman Rank Correlation Coefficient is significant at the level of *probability*<0.05, the correlation between the two rankings being compared is evidenced. If insignificant, the two compared rankings are not associated. Table 3 presents Spearman rank correlation coefficient analysis results of property inputs. As expected, results accept the

hypothesis and suggest the rankings are significant to the 99% level (*probability*<0.01), namely, the change in the inputs compositions is not considerable. Over the 1990s, the inputs compositions to the property sector were kept stable relatively. The stable input structure on the one hand represented the relatively mature economy. On the other hand, it also describes the inactive Australian property sector especially on the technical progress aspect.

Table 3: Spearman rank correlation coefficient analysis results of the input of property agent sector

		1992-93	1993-94	1994-95	1996-97	1998-99
1992-1993	Correlation Coefficient	1.000	.993(*)	.904(*)	.875(*)	.868(*)
	Sig. (2-tailed)	.	.000	.000	.000	.000
	Sample Number	17	17	17	17	17
1993-1994	Correlation Coefficient	.993(*)	1.000	.924(*)	.895(*)	.877(*)
	Sig. (2-tailed)	.000	.	.000	.000	.000
	Sample Number	17	17	17	17	17
1994-1995	Correlation Coefficient	.904(*)	.924(*)	1.000	.985(*)	.963(*)
	Sig. (2-tailed)	.000	.000	.	.000	.000
	Sample Number	17	17	17	17	17
1996-1997	Correlation Coefficient	.875(*)	.895(*)	.985(*)	1.000	.980(*)
	Sig. (2-tailed)	.000	.000	.000	.	.000
	Sample Number	17	17	17	17	17
1998-1999	Correlation Coefficient	.868(*)	.877(*)	.963(*)	.980(*)	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	Sample Number	17	17	17	17	17

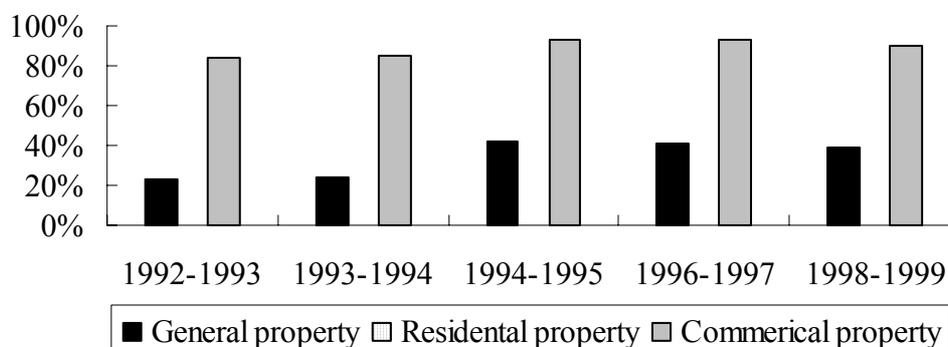
* Correlation is significant at the 0.01 level (2-tailed).

The push effect of the property sector

The direct forward linkage indicator shows the strength of the property sector's economic push. It represents the intermediate use to total output ratio of the property sector. A higher value implies that the push of the property sector is larger. Fig. 3 shows the forward linkage indicators of the general property, residential property and commercial property sectors in Australia over the 1990s. It can be noticed that direct forward linkage indicators of the general property have a medium value between 22 and 42 percent compared with the construction sector, which means the medium economic push strength. Also, the value of the indicator reflects that the proportion of final demand of the property sector is larger than its intermediate demand. In Australia, all residential property services and most of the commercial property services flew into the final demands, that is, private domestic consumption and government consumption. The forward linkage of the private property sector was zero. The forward linkage of the commercial property sector reflected the whole property sector's value with a higher value around 90%. The main reason seems to be that the

property sector has a major role in creating demand and attracting the buyer to the distribution system. Furthermore, it represents the medium push strength to the economic development.

Figure 3: Forward linkage indicator



The outputs from the property sector to other sectors are ranked as shown in Table 4. Averagely, the outputs of the property contributed to the property and business service, manufacturing, wholesale trade, retail trade and construction sectors, which are ranked top five in all sectors. Similarly, in order to investigate the output compositions of the property sector, a nonparametric test is conducted.

Table 4: Ranks of the direct outputs of the property agent sector to the other sectors

	1992-93	1993-94	1994-95	1996-97	1998-99
Agriculture, Forestry and Fishing	13	14	15	16	16
Mining	10	9	11	11	11
Manufacturing	2	2	3	3	2
Electricity, Gas and Water Supply	15	15	13	15	15
Construction	8	5	6	6	5
Wholesale Trade	5	4	2	2	3
Retail Trade	3	3	4	4	4
Accommodation, Cafes and Restaurants	11	10	8	7	8
Transport and Storage	6	7	5	5	6
Communication Services	16	16	16	13	14
Finance and Insurance	7	11	10	9	7
Property and Business Services	1	1	1	1	1
Government Administration and Defence	4	6	7	8	9
Education	17	17	17	17	17
Health and Community Services	9	8	9	10	13
Cultural and Recreational Services	12	12	12	12	12
Personal and Other Services	14	13	14	14	10

Table 5 presents Spearman rank correlation coefficient analysis results of property outputs. As expected, results suggest the rankings are significant to the 99% level (*probability*<0.01), namely, the change in the outputs compositions are not sizeable. Over the 1990s, the outputs compositions of the property sector were stable. A stable output structure represent the Australian property sector had a steady propulsive role in the economy. However, a secular change in the construction rank can be found, which increased from number eight to number five.

Table 5: Spearman rank correlation coefficient analysis results of property agent sector outputs

		1992-93	1993-94	1994-95	1996-97	1998-99
1992-1993	Correlation Coefficient	1.000	.956(*)	.936(*)	.912(*)	.885(*)
	Sig. (2-tailed)	.	.000	.000	.000	.000
	Sample Number	17	17	17	17	17
1993-1994	Correlation Coefficient	.956(*)	1.000	.966(*)	.939(*)	.904(*)
	Sig. (2-tailed)	.000	.	.000	.000	.000
	Sample Number	17	17	17	17	17
1994-1995	Correlation Coefficient	.936(*)	.966(*)	1.000	.978(*)	.929(*)
	Sig. (2-tailed)	.000	.000	.	.000	.000
	Sample Number	17	17	17	17	17
1996-1997	Correlation Coefficient	.912(*)	.939(*)	.978(*)	1.000	.956(*)
	Sig. (2-tailed)	.000	.000	.000	.	.000
	Sample Number	17	17	17	17	17
1998-1999	Correlation Coefficient	.885(*)	.904(*)	.929(*)	.956(*)	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.
	Sample Number	17	17	17	17	17

* Correlation is significant at the 0.01 level (2-tailed).

Conclusions

This paper aims to analyse and measure the economic performance and sectoral linkages of the Australian construction sector in the 1990s. Findings suggest that the Australian residential property sector had played a more important role than the commercial sector in the economy. With a relatively lower technologies level, the property sector's ability to pull the rest of the economy was weaker than was the construction sector's. While the backward linkage of residential property sector showed a decreasing economic pull, that of commercial property presented an upward trend. The Australian property sector had the medium economic push strength because all residential property services and most of the commercial property services flew into the final demands, and the property sector had a major role in creating demand and attracting the buyer to the distribution system. Over the study period, the input and output compositions of the property sector kept stable. Findings can aid policy

makers, property agencies and researchers in evaluating the competitive ability of property agents in Australia. They can also be used to carry out comparisons with other countries.

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