WORKING PAPERS IN ECONOMICS

THE INTERNATIONALISATION OF AUSTRALIAN BUSINESS: TECHNOLOGY TRANSFER AND AUSTRALIAN MANUFACTURING IN THE 1980s

by

Diane Hutchinson* and Stephen Nicholas**

No. 152 NOVEMBER 1990

DEPARTMENT OF ECONOMICS

The University of Sydney
Australia 2006

THE INTERNATIONALISATION OF AUSTRALIAN BUSINESS: TECHNOLOGY TRANSFER AND AUSTRALIAN MANUFACTURING IN THE 1980s

by

Diane Hutchinson* and Stephen Nicholas**

No. 152 NOVEMBER 1990

Economic History, University of Sydney

* Australia-Japan Research Centre and
** Economics/Economic History,
Australian National University

his paper was an invited contribution to a conference on
he Internationalisation of Australian Business held at
he University of Melbourne, August 1990. The paper presents
reliminary results from a project funded by the ARC. The
uthors would like to thank Peter Carter, Chris Collimore,
ob de Lepervanche, David Dix, Paul Edwards, Murray Smith, and
aron Stowe for their valuable research assistance.

ational Library of Australia Card Number and ISBN 0 86758 396 7.

CONTENTS

INTRODUCTION

This paper presents descriptive statistics on the transfer of overseas technology to the Australian manufacturing sector over the last decade. These statistics are derived from a survey of manufacturing enterprises and constitute the preliminary results of a broader project on technology transfer. The main aim of this project is to analyse the cost of alternative contractual arrangements for transferring technology to Australia, although the project will also provide an insight into the level and type of technology imported by Australian manufacturers and the organisation of the technology acquisition function.

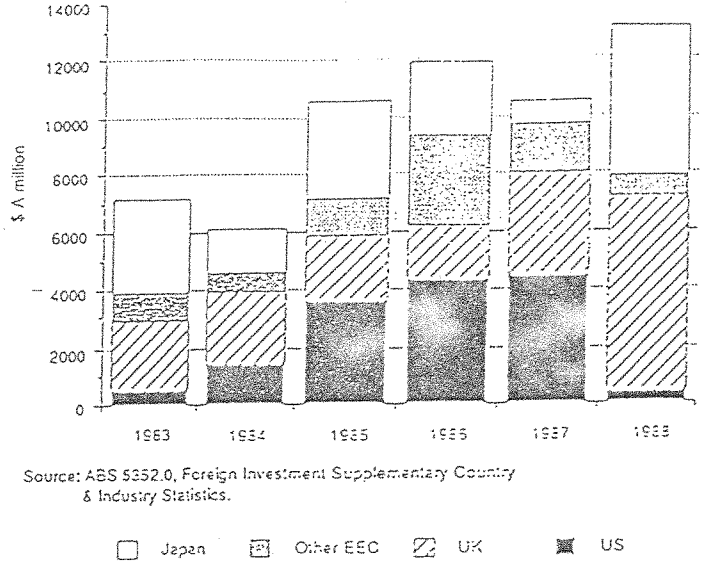
The paper first identifies technology transfer as an important dimension in the internationalisation of Australian business. Before proceeding to the descriptive statistics on technology transfer, the paper outlines the principal-agent model as the theoretical framework employed in the project. This framework determined the type of questions which were asked in the survey in addition to those on the levels, nature and organisation of technology transfer.

Since white settlement, Australian economic development has depended on inflows of human, financial and physical capital. Australia experienced 'waves' of overseas investment and immigration, with peaks during the gold rushes, the 1880s, the decade before world war 1 and the 1920s, and troughs during the depressions of the 1890s and the 1930s. Wage and income differences between Britain and Australia (which impacted on

migration rates) and domestic factors, especially public sector railroad and infrastructure investment and private investment in pastoral and residential construction, determined the timing and magnitude of labour and capital inflow. [Pope, 1990] Analysing Australia's economic growth largely within the small open economy model, economists and historians depict Australia as an integrated part of the international economy both as a supplier of raw materials and a recipient of 'men and money'.

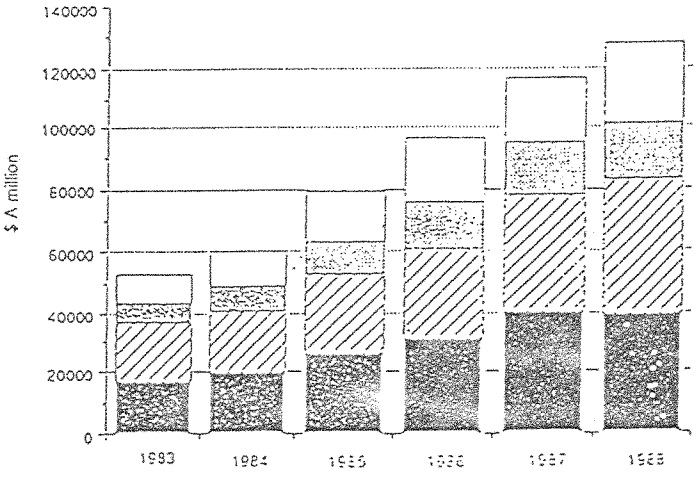
Besides attracting portfolio investment, pre-world war two Australia was also a major destination for British foreign direct investment (FDI), with over 50 British manufacturers establishing production and sales branches by 1914 and nearly three times that many by 1939. [Nicholas, 1989] After 1945 foreign investment in Australia became predominantly direct. Whether measured by stocks or flows of FDI, Britain is the largest foreign investor in Australia, followed by the U.S. and Japan (see Figure 1 and 2). British, American and now Japanese FDI raises economic and political issues surrounding the net costs or benefits of overseas involvement in the economy. Implicitly the FDI issue raises the question of the internationalisation of Australian business. FDI is defined as ownership and control of sales and production facilities by firms or individuals in a foreign country. Australian business with its high level of foreign ownership and control is clearly internationalised. But Australia manufacturing is internationalised in a dependent relationship, since foreign

Figure 1 Flow of Total Investment into Australia from Major Investing Countries (at 30 June)



Source: ABS 5352.0, Foreign Investment Supplementary Country & Industry Statistics.

Figure 2 Stock of Total Investment into Australia from Major Investing Countries (at 30 June)



Source: As for figure 1

Note: Source of Figures 1 and 2: Garnaut, R., 1989. Australia and the Northeast Asian Ascendancy, (AGPS, Canberra).

firms in Australia are part of the globalisation of foreign multinationals (MNEs).

Measured by the share of exports and manufactured exports in GDP, Australian business ranks below other small OECD countries such as Canada, Sweden and Austria. [DITEC, 1990, pp.2-4] Pappas, Carter, Evans & Koop, in a report prepared for the Australian Manufacturing Council, found that few big companies were significantly involved in exporting. The report identified the weak export performance as the 'key structural weakness of Australian manufacturing'.

Although our sample of 399 manufacturers excluded smaller enterprises (those with less than 50 employees), only 52 per cent or a little over half of the Australian-owned enterprises exported, and the average value of their exports was $10.2 million. Of the enterprises in our sample which had foreign shareholders, seventy per cent exported, and the value of their exports in 1989-90 was twice the level of the Australian-owned firms. Table 1 shows the international investment of the Australian-owned enterprises in our sample of manufacturers. The most common destinations for overseas investment are South East Asia and New Zealand, but only a small proportion of Australian-owned firms are internationalised in terms of overseas investment relative to Canada or Sweden. Australian business is not highly internationalised, although foreign business established through FDI is more internationalised than Australian-owned firms.

Table 1. International Operations of Australian-owned Enterprises.

	Manuf	Sales Branches
United States	7	15
Japan	0	3
United Kingdom	4	14
Asia	25	49
New Zealand	20	45
Other	11	17
Pacific	8	13

FDI involves a "bundle" of advantages, including new technology and products, market access, R&D, marketing and distribution know-how and human capital skills. These advantages of FDI are an important source of productivity advance, and productivity advance has underwritten much of Australia's post-war growth. Using a 'Solow' output per unit of input approach, Edwards and Drane [1963, p. 270] estimated that 70 per cent of Australia's post-war growth of output per head was due to productivity advances. While remaining the most important single factor accounting for the growth of income per capita, the rate of productivity increase in Australia is low by international standards and varies across industries in the manufacturing sector. [Haig and Cain, 1983; Lydall, 1968; Kaspura and Ho-Trieu, 1980].

The poor productivity record of Australian manufacturing constrains manufacturing exports, compounding our foreign debt and current account problems and limiting the internationalisation of Australian business. This concern over slow productivity growth has been evidenced in the various

Australian Science and Technology Council [1983, 1986, 1987, 1988] reports which provide a number of policy prescriptions for increasing Australia's international competitiveness by increasing our stock of knowledge, including new products, processes, technical and managerial skills, brand names, trade marks and marketing techniques. Similarly, the Garnaut Report's [1989, p. 12] prescription that domestic microeconomic reform and an open economy will raise the competitiveness and efficiency of Australian manufacturing explicitly recommends a 'liberal and non-discriminatory approach to direct investment'.

Overseas transfers of technology, including FDI, have augmented Australia's indigenous sources of new knowledge, but has this overseas know-how increased the international competitiveness of Australian business? Considerable research has been directed towards measuring the magnitude of the inflow of technology from abroad. In 1986 an ASTEC report argued that Australia's dependence on overseas technology was 'high', confirming earlier studies by Parry and Watson [1979], OECD [1986], EPAC [1986] and the Working Party on Technology [1985]. Recently, a Bureau of Industry Economics report [1988] challenged this view, concluding that Australia's dependence on overseas technology had been overestimated, downgrading our technological dependence from 'high' to 'significant'. Whatever the exact dependence of the manufacturing sector on overseas technology, it is one important source of new technology and a major component in the productivity growth of Australian manufacturing. This paper examines technology

transfer to Australian manufacturers and its implications for the internationalisation of Australian business by drawing on data obtained from a survey of manufacturing enterprises. First, however, we outline the theoretical framework on which the survey was based.

Modelling Technology Transfer: The Economics of Information and the Theory of Contract

Models of FDI into Australian manufacturing have focused largely on locational factors which attract investment in sales and production facilities by MNEs. Policy prescriptions focusing on foreign ownership and control, market structure impact and balance of payments and current account effects have dominated much of the discussion of FDI. [Parry, 1979] FDI via the multinational enterprise (MNE) is also identified as a major mechanism for transferring overseas technology to Australia. However, other arrangements such as joint ventures, franchises, management agreements and licenses offer important alternatives to MNEs as devices for importing overseas know-how [Casson, 1979]. These inter-firm arrangements "unbundle" the advantages of product and process technology, management techniques, skilled labour input, brand name and marketing and distribution expertise. A theoretical framework for understanding technology transfer must incorporate these inter-firm technology flows, as well as intra-firm technology transfers which occur within the MNE.

The theory of the MNE explained why vertically or horizontally integrated firms controlled sales and production facilities in two or more countries. Drawing on Coase [1937, p. 395], the MNE would exist and 'tend to expand [across country boundaries] until the costs of organising and extra transaction within the firm becomes equal to carrying out the same transaction by means of exchange in the open [international] market'. The Cosean analysis assumed that there were costs of transacting in the market related to gathering and assessing information, finding a party with whom to transact, negotiating and drawing a contract and finally monitoring and enforcing the contractual agreement. The firm is an institutional alternative to the market, where resources are allocated by hierarchical fiat rather than relative prices. The boundary between allocating resources through the hierarchical firm and the market is the vertical integration issue. Understanding where the boundary is drawn explains the growth and expansion of the multinational firm. [McManus, 1972; Buckley and Casson, 1976; Casson, 1979; Rugman, 1981; Hennart, 1982]

The basic Coasean framework was augmented by firm-specific advantages and country-specific location factors to provide a fuller explanation of FDI. Stephen Hymer [1960, 1976] identified firm-specific advantages, which gave rise to monopolistic advantages, as prerequisites for domestic firms making successful FDIs. These firm-specific advantages were identified as technology, marketing and distribution skills,

brand name and product differentiation attributes which had strong public good characteristics. [Caves, 1971] The public good characteristics of such advantages yield quasi-rents which are dissipated via market exchange. [Johnson, 1970] By attenuating the costs of transacting internationally, the MNE was an institutional device for appropriating the quasi-rents from firm-specific knowledge. Locational factors, including differences in wage rates, resource and energy costs, factor endowments, political risks and psychic distance, were grafted onto the model to explain the geographical distribution of American and British FDI in particular regions and countries.

The theory of FDI assumed a simple choice between the market and the firm as institutions for transferring technology internationally, and, secondly, that it was costless to transfer knowledge within the firm. The firm-market dichotomy was an essentially static concept which restricted the generality of the FDI model by obscuring two separate facts of the MNE, its multinationalism and the rise of multinational hierarchies. [Calvert, 1981] In 1972 Alchian and Demsetz [1972] and Richardson [1972] broke the firm-market dichotomy by noting that coordinated activities might take the form of markets, direction (management in the firm) and cooperation. In the case of cooperation, information was passed between separate firms and there were assurances of future transacting. Such cooperative arrangements were dubbed intermediate modes by Williamson [1981] and include franchising, agents, licenses, long-term contracts, joint-ventures and management contracts,

all of which can be clearly differentiated from either the market or the firm. These intermediate modes may involve a long-term on-going arrangement. Contractor [1980, p. 47] captured this idea when he treated technology transfer as a relationship and not an act.

The costs of organising economic activities within the firm were recognised analytically by McManus [1972] and Alchian and Demsetz [1972] and empirically by Chandler [1962] in his historical studies of the shift from U-form to M-form or multidivisional structure by American firms in the 1930s. The resource costs of transferring technology within the firms were analysed by Teece [1977]. The costs of transferring technology are defined as the costs of transmitting and absorbing all the relevant unembodied knowledge, including pre-engineering costs associated with the product design or process engineering, R&D costs, and the pre-start-up training and manufacturing costs. It is costly, then, to transfer technology both within and across alternative institutional arrangements.

A general theory of technology transfer identifies explicit or implicit contracts between the owner or supplier of technology - the principal - and the buyer or user of technology - the agent. The principal-agent framework for analysing technology transfer includes as specific forms outright sale, licensing and franchising, joint venture agreements and mother-daughter intra-firm transfers, of which FDI is a special case. Technology transfer occurs in an uncertain world, where the parties to the transfer have

imperfect information. Asymmetries in information mean that the information between the principal and the agent are unequal. The owners of technology have more and different information about the attributes of the technology while the agents have more market-specific information about the use of the technology in a particular country. Uncertainty and asymmetric information give rise to hidden action (moral hazard) where inputs cannot be linked invariably with outcomes and hidden information (adverse selection) where observations are available to the agent but not the principal. The technology user employs information on the market as well as the product and the production flow in its plant to make decisions on the use of the principal's technology, but the principal cannot determine whether the agent uses its information in the way best calculated to serve the principal's interests. Due to hidden action and hidden information, behaviour by the agent can harm the principal. Action by the agent which harms the principal is labelled opportunistic. [Williamson, 1985; Macneil, 1974; Macauley, 1963]

Opportunism poses additional risks to the principal when the principal makes transaction-specific (idiosyncratic) investments - investments in tangible and intangible assets such as specialised buildings, equipment and components, human capital or marketing and distributing investments in brand name, advertising and product promotion. Such investments are related to the frequency of transacting and the nature of the product. For transactions which are once-off or infrequent,

principals and agents do not invest in highly specific capital; if transactions are recurrent or frequent, then parties to the contract are more likely to invest in capital which is specific to the transactions. Some goods, such as perishable products or complicated machinery require physical and human capital for transportation, display, demonstration and repair. Both the principal and the agent (but not necessarily equally) make investments in tangible and intangible assets. Opportunistic agents can 'hold-up' the principal by reneging or cheating on contract obligations to appropriate the difference between the value of the assets to the principal and their value in their next highest use. [Klein, Crawford and Alchian, 1978; Klein, 1980] The principal selects contractual arrangements which attenuate the problems of hidden action, hidden information and opportunism, especially when the principal has invested in idiosyncratic investments.

The principal-agent problem applies to all contractual modes - firms, markets and intermediate arrangements. Market contracts usually specify behaviour and performance for once-off transactions between principal and agent. The firm and most intermediate arrangements are relational contracts - dynamic continuing economic and social relationships modified for unforeseen events according to the relative bargaining power of the parties. Relational contracts economise on the cost of drawing, monitoring and enforcing contracts because such contracts specify only a narrow range of performance and behaviour, leaving the details to the mutual cooperation of the

parties. Hierarchy mediates opportunistic performance and behaviour when technology is transferred within the firm. Recently, cooperation, trust and commitment have been identified as important behavioural imperatives which facilitate monitoring and mediation of transactions within the firm. Cooperation and trust are also created within on-going intermediate relationships for inter-firm technology transfer. Cooperation and trust reduce the costs of governance - drawing, monitoring and enforcing contracts - so that long-term technology transfer relationships and intra-firm transfers of know-how frequently involve only a general and vague explicit contract but a complex, yet flexible, implicit contract.

The choice of contractual arrangement to transfer technology involves a complex calculus including the degree of idiosyncratic investment, the nature and frequency of transacting and the costs of governance. A study of the contractual modes used to transfer technology can only be analysed within a general agent-principal framework briefly outlined above. The model has important implications for the researcher: it directs the researcher to ask particular questions concerning the formal terms and informal workings of contracts. Second, the model has practical implications for the optimal design of contracts for transferring technology. Finally, the model has public policy implications for the type of regulations and incentives which government can implement to optimise technology transfer to Australia.

Our project addresses these issues using two major sets of data on technology transfer to Australia. The first is derived from a survey of a sample of Australian enterprises. Each enterprise was asked to complete a survey booklet comprising approximately 100 questions. It includes general questions on the enterprise and questions on the level and nature of its technology imports, as well as questions which stem from the theoretical framework outlined above concerning the way the enterprise found out about the technology and the way the search and negotiation functions are organised, as well as questions on the nature of the contractual relationship with the supplier. The second data set used in the project will be derived from more detailed interviews with senior management about the contractual arrangements and performance of a sample of licenses, a sample of joint ventures and a sample of inter-firm technology transfer 'packages'. This paper draws on the preliminary results of the first data set, the survey of Australian manufacturers, to present descriptive statistics on technology transfer into Australian manufacturing in the context of the internationalisation of Australian business.

THE SAMPLE

The sample of manufacturers was derived from a trade directory, *Kompass Australia*. Our aim was to carry out the survey at the enterprise, subsidiary or division level rather than the group level to generate more disaggregated information about technology transfer by larger firms. Kompass attempts to

provide information about the subsidiary or division. It also provides a product listing and, where possible, employee numbers for each enterprise, enabling us to compare the characteristics of our sample with the ABS *Integrated Register Counts of Operating Enterprises by ASIC Group by Employee Size*.

The sample was restricted to enterprises with 50 or more employees, using *Kompass Australia Volume 2: Company Information*. Non-manufacturers were eliminated using *Kompass Australia Volume 1: Product Information*. This provided a mailing list of 2023 manufacturing enterprises with 50 or more employees. A number of enterprises remained for which *Kompass Australia* did not provide employee numbers. Of these cases, enterprises which were obviously large and a random sample of those of unknown size were added to the mailing list, giving a total sample of 2659 manufacturing enterprises. The product listing given by *Kompass Australia* for each of these enterprises was converted to an ASIC Group.

In response to the survey mailing and a follow-up letter, 349 enterprises were eliminated from the sample due to advice that the enterprise was not (or is no longer) a manufacturer, that it has been taken over by another enterprise already included in the sample, that it has been liquidated or that our correspondence has been returned to sender marked address unknown. The ASIC group and size distribution of the remaining 2313 enterprises surveyed is compared with the *ABS Integrated Register* count for February 1989 in Table 2.

Table 2. Sample Characteristics Enterprises with >49 Employees

	ABS register Feb 89	Our sample
Employee size		
50-99	46.9	39.9
100-199	24.5	25.0
200-499	17.2	20.9
500-999	6.0	7.2
>1000	5.5	7.0
	100.1	100.0
ASIC Industry[1]		
21	16.5	12.6
23	4.0	2.4
24	10.3	2.9[2]
25	8.7	3.1
26	9.9	13.8
27	6.5	8.5
28	3.5	4.2
29	3.2	2.1
31	9.5	12.4
32	5.6	4.0
33	15.2	29.[42]
34	7.1	4.5
	100.0	99.9

1. Where the most frequent industry group in a respondent's list of products did not dominate by a ratio of at least 3 to 1, the enterprise was excluded from our ASIC distribution and treated as unclassifiable or diverse.

2. The unclassifiable firms may be biased against ASIC 33 because ASIC 33 is relatively specialised and thus easily classifiable. Also Kompass may be biased towards producer goods industries. This seems consistent with our sample's under-representation in ASIC 21 (food/drink) and ASIC 24 (footwear).

The preliminary data drawn from the first 399 responses are discussed here. Forty three per cent of these respondents were independent firms, with subsidiaries (37 per cent) and branches or divisions of another firm (20 per cent) making up the remainder of the respondents. Just over 50 per cent were totally Australian-owned, while 40 per cent had overseas shareholders (the remaining firms were joint ventures between an Australian and an overseas firm). The respondent enterprises' internal organisational structures were overwhelmingly M-form (46 per cent) and U-form or central functional (16 per cent), while 14 per cent of the firms retained the older H-form, or holding company structure.

The respondents nominated some form of overseas involvement (either exporting via an agent or sales office or overseas production) (29 per cent), cost leadership (28 per cent) and diversification (20 per cent) as their most important strategies. Australian-owned enterprises and those with an overseas shareholder both nominated overseas involvement as their major strategy. Internationalisation is the major agenda item for Australian business, and its success will depend, in part, on the nature of the technology transfer process.

Of course internationalisation will also depend on other factors. For example, the success both of overseas involvement and diversification as strategies are related to internal decentralised structures. Therefore the respondents with M-form structures were well-suited to pursue their dominant growth strategies. The success of the growth strategies and the

ability to maximise the use of imported technology is also related to R&D expenditures. It is difficult to be sanguine about R&D expenditures since 58 per cent of the enterprises spent between zero and $100 thousand on R&D and only 19 per cent spent $501 thousand or more on R&D in 1988-9. The low levels of R&D expenditure were biased downward by the smaller enterprises in the sample, since 43 per cent of the 146 large enterprises made R&D expenditures of $501 thousand or more. The relationship between technology acquisition and R&D expenditures is investigated in more detail below.

Technology Transfer: General Empirical Evidence

The enterprises in our sample have a long historical tradition of importing overseas technology, especially since the 1960s (see Table 3). Two-thirds of the sample have acquired overseas technology in the postwar period and a slightly smaller proportion (62 per cent) have acquired overseas technology in the last decade. The technology importers were asked to evaluate the importance of their overseas technology. On a scale from 1 (low) to 9 (high), 41 per cent rated the importance of their overseas technology as 9, 38 per cent as 5 or 7 and only 10 per cent 1 or 3. As Table 3 shows, the technology imported was predominantly product and process technology, with trade mark, patent, marketing know-how and personnel of secondary importance.

Table 3. Type and Timing of Technology Acquisition

	Type (%)
Product	74
Process	76
Marketing	20
Personnel	17
Trademark	23
Patent	23
Other	4
No response	>1

	Timing (Nos.)
Pre-1940	27
1940s	30
1950s	69
1960s	117
1970s	174
1980s	232
No response	4

The type of technology imported was the same for small and large enterprises. However, the organisation of technology transfers varied by enterprise size: large enterprises had more personnel involved in search and negotiation full-time (but fewer part-time) than small enterprises; large enterprises spread the technology transfer function evenly across an executive, central office and division while small enterprises depended much more on a single executive; and large enterprises had more departments (especially R&D) in contact with the overseas suppliers of technology than small enterprises.

While small enterprises may be constrained in the personnel they can allocate to technology transfer, we hypothesize that

small enterprises can improve their overseas technology acquisition potential by integrating their search and negotiation team across a wider number of departments. This could allow small enterprises to gain synergies which off-set the relatively smaller size of their teams, allowing them to expand the range of source countries and the pool of technology available.

Yet is difficult to judge at this stage how far organisational arrangements substitute for team size. Our data show that when there are high psychic costs to technology transfer, then search and negotiation teams are large. For example, our data indicate that enterprises transferring Japanese technology had one third more full-time negotiators than enterprises transferring non-Japanese technology. There are two factors at work, and cause and effect are difficult to identify: the size of the search and negotiation team is country specific but enterprises transferring Japanese technology acquired more technology also packages.

Almost 70 per cent of the enterprises vest the responsibility for the transfer of technology in an executive with a production or technological background; few lawyers, economists or accountants are in charge of technology transfer. This 'production-based' orientation of technology transfer within Australian enterprises reflects the heavy dependence on product and process technology inflow, and the relative neglect of marketing, personnel, patent and trade mark technology. As long as technology inflow concentrates on product and process

technology, then planning a production orientated executive in charge of technology transfer offers obvious advantages. However, a production orientation may limit the search for overseas technology to product and process know-how, perpetuating the relative neglect of other types of overseas technology. Australian manufacturing enterprises should be encouraged to re-assess their technology transfer function periodically, not only in terms of the types of technology required, but also the best internal organisational arrangement for the transfer process.

Thirty-nine per cent of the sample enterprises acquired technology from an independent overseas firm, 25 per cent transferred technology from an overseas shareholder while 8 per cent of enterprises acquired technology by setting up a joint venture with an overseas firm in the last 10 years. Other forms of technology transfer accounted for the remaining 9 per cent. More enterprises engaged in inter-firm licensing of overseas technology than intra-firm technology flows via FDI, and some firms which relied on intra-firm flows also acquired technology from independent firms, confirming our approach in the theory section above that an understanding of technology acquisition by Australian firms requires a general contractual model of technology transfer.

Here we focus on the two most frequent forms of technology transfer, acquisition from independent firms or inter-firm flows and acquisition from an overseas shareholder or intra-firm flows. Disaggregating Table 3 into enterprises relying on

inter-firm and intra-firm technology acquisitions did not change the type of technology acquired or the timing of the acquisitions. Our data show that inter-firm technology imports have always been numerically greater than intra-firm (FDI) imports, yet inter-firm imports have not attracted the research attention or critical concern voiced over FDI. The "unbundling" of the FDI package through inter-firm licensing agreements avoids ownership and control issues of FDI. Moreover, inter-firm licensing agreements are likely to be much more easily influenced by government incentives and controls, offering a wider arena for public policy prescriptions than intra-firm mediated technology transfers.

Inter-firm Technology Transfer

Independent overseas firm technology was acquired in the last 10 years by 157 enterprises in our sample. The U.S., U.K., Germany, Japan, and Switzerland were the major source countries (see Table 4), with transfers from the U.S., Germany and the U.K. more likely to involve multiple transfers. Measured by assets, employment or sales, the overseas supplier was evenly distributed across the large and medium size category, and 60 per cent of suppliers were from a different product group than the Australian enterprise. For 75 per cent of the Australian enterprises acquiring overseas independent firm technology, psychic distance - different language, culture, social, economic and legal system - was ranked low. Psychic distance is country-specific; Australian enterprises

transferring technology from Japan had significantly higher psychic costs than enterprises transferring non-Japanese technology.

Table 4. Source Countries of Inter-firm Technology Transfer

	Number				
Country	**1**	**2**	**3**	**4**	**5+**
United States	36	15	7	6	8
United Kingdom	28	9	4	0	5
Germany	27	12	9	1	3
Japan	22	7	2	2	2
Switzerland	15	2	2	0	0
Italy	9	3	1	1	2
France	8	2	0	0	1
Netherlands	2	2	0	0	0
Other (Total 24)					

Besides psychic costs, there were also 'real' costs of technology transfer. The enterprises' perceptions of these costs are shown in Table 5. Except for costs related to marketing and contract enforcement, the real costs of technology transfer were evenly split between low and high. It is difficult to sort out the relative costs of transferring different types of technology at this stage because enterprises which transferred product and process technology also transferred personnel, marketing, trade mark and patent know-how. Clearly the connection between the real costs of technology transfer and the type of technology transferred is influenced by product group and enterprise size factors which our quantitative analysis will uncover.

Table 5. 'Real' Cost of Inter-firm Technology Transfer

	(%)		
	N/A	Low	High
Managerial Time in Search/Negotiation	8	34	36
Actual Transfer Costs	10	34	36
Adaptation Costs(including R&D)	9	37	33
Production Costs	16	32	39
Marketing Costs	23	52	12
Contract Enforcement Costs	21	69	4

Note: The residual is comprised of those who ranked the cost mid-way on the scale.

However, Table 6 indicates that we need to re-evaluate the importance of our reliance on product and process technology: the importance to the enterprise of product or process technology was ranked 'low' by over 70 per cent of the respondents, while the importance of marketing, manpower, trade mark and patent technology was ranked 'high'.

Table 6. Importance of Inter-firm Technology Transfers

	Ranking (%)	
Type	High	Low
Product	29	71
Process	25	75
Marketing	76	24
Personnel	67	33
Trademark	78	22
Patent	69	31
Other	96	4

The great majority of inter-firm technology importers (85 per cent) spent less than 30 per cent of their R&D budget on adaptation of overseas technology. Adaptation costs did not dominate R&D budgets, but R&D budgets were small. Further, the

transfer of overseas independent firm technology stimulated only 41 per cent to make complementary investments in R&D, but 85 per cent made complementary investments in capital equipment. While complementary investments were not sensitive to the type of technology transferred, they did depend on the country of origin of the technology. Enterprises acquiring some of their technology from Japan were twice as likely as those not acquiring any Japanese technology to make complementary investments in personnel.

Table 7. Ranking of the Motivation for Inter-firm Technology Transfers (Percentages)

	Low	Medium	High
Expand Existing Products	9	11	72
Closely Related Diversification	22	10	53
Unrelated Diversification	62	3	11
Export	56	12	8
Overseas Sales Office	71	2	2
Overseas Production	68	5	2
Solve Production Problem	34	11	42
Solve Marketing Problem	37	19	22
Forestall New Entry	37	17	24
Protect Existing Market	25	14	47

Note: The residual is comprised of those who indicated that the motivation was not applicable.

Table 7 ranks the motivation for inter-firm technology acquisitions. Expansion of existing product lines and closely related diversification were the dominant motives for technology transfer. Unrelated diversification and

internationalisation (exports, sales offices and overseas production) were rated low. Technology transfer fulfils two of the major strategic aims nominated by Australian enterprises in the survey, cost leadership (28 per cent) and diversification (20 per cent). But overseas exporting/production was nominated as the single most important strategy (29 per cent of the respondents) and the data in Table 7 demonstrates that technology transfer does not satisfy this strategic aim. Not only does the technology inflow not increase the internationalisation of Australian business through exports and overseas production, but Table 8 shows that 48 per cent of all the imported technology had binding restrictions and 20 per cent non-binding restriction on exporting. Only for patent validity (40 per cent) and trade mark rights (35 per cent) did the frequency of binding restrictions approach those on exporting.

Table 8. Binding and Non-binding Restrictions on Licensed Technology (Percentages)

	Binding	Non-binding	Not Applicable
Export Limits	48	20	32
Domestic Limits	11	46	43
Production Limits	30	38	32
Managerial Services	7	42	51
Raw Material	11	46	43
Components	19	45	36
Capital Equipment	20	44	36
Trademark	35	22	43
Patent Validity	40	21	39
Buyback Output	3	38	59
Technology Improvement	29	31	40
Cross-licensing	13	31	57
Exchange Personnel from	5	38	57
Exchange Personnel to	3	38	58

Inter-firm technology imports were not directed to the internationalisation of Australian business, and the conditions on these technology transfers explicitly discouraged internationalisation. From Table 7, inter-firm technology imports tended to be defensive (forestalling new entry and protecting existing markets) and directed to solving particular problems. In the evolution or stages of enterprise growth, the historical evidence suggests that enterprises first expanded existing product lines and diversified into closely related product groups. This is the present stage of enterprise expansion for most Australian manufacturing business. Unrelated diversification and overseas expansion is the second stage in firm expansion. While Australian enterprises identify unrelated diversification and overseas expansion as strategic goals, our survey data suggests that technology transfer does not service these aims.

Respondents ranked the overall importance of inter-firm technology acquisitions as 'high' (63 per cent) and judged the success of those transfers as 'high' (72 per cent); few enterprises ranked the importance as low (14 per cent) or the success of the transfer as low (11 per cent). The importance of foreign technology can also be assessed by the alternatives to overseas know-how available to Australian enterprises. of the sample manufacturers who obtained independent firm technology, 134 did not consider alternatives while 6 enterprises examined joint ventures with other Australian firms, 8 considered their own R&D, 6 considered using parent

technology and 3 firms considered 'other' alternatives to overseas licensing. This data suggests a very high dependence on inter-firm acquisitions of overseas technology, yet this technology has played a limited role in furthering the internationalisation of Australian business.

Intra-firm Technology Transfer

Forty-seven per cent of respondents, or 197 enterprises had an overseas shareholder and 129 of these acquired technology from their overseas shareholder, although only 101 did so in the 1980s. These intra-firm inflows, shown in Table 9, were dominated by process and product technology, but marketing, patent and trade mark inflows were more likely for intra-firm as opposed to inter-firm transfers. The technology transferred from the parent was 'state of the art' (70 per cent), largely transferred without a formal contract (63 per cent), with nearly 40 per cent of the technology transferred without cost to the Australian subsidiary. More inter-firm transfers involved a formal contract and only 9 per cent were free.

Table 9. Type of Intra-Firm Technology Transfers

Type	%
Process	70
Product	64
Marketing	36
Personnel	12
Trademark	49
Patent	33
Other	7

The psychic costs of intra-firm technology transfer were low. Moreover, the real costs of intra-firm flows in Table 10 were substantially lower than the costs of inter-firm transfer in Table 5, with the exception of the costs of adaptation (including R&D). This implies that internal firm structures mediate the real costs of transfer of overseas technology more successfully than contracts between independent firms. Williamson [1975] has argued that firms establish rules and dispute procedures which attenuate the costs of transacting, and our data is consistent with this hypothesis. Lower costs of intra-firm technology transfer encouraged greater acquisition of personnel, marketing and trade mark technology which are difficult to specify in standard and formal contracts. Such non-production/process technology imports were likely to be biased towards know-how which improved market access, offering Australian subsidiaries the potential of overseas selling and production.

Table 10. 'Real' Cost of Intra-Firm Technology Transfer
(Percentages)

	Low	High
Managerial Time in Search/Negotiation	68	32
Actual Transfer Costs	67	33
Adaptation (including R&D) Costs	44	56
Production Costs	60	40
Marketing Costs	87	13
Contract Enforcement Costs	95	5

Investment in capital goods was the most common form of complementary investment made by enterprises engaged in both intra-firm and inter-firm transfers of technology. The proportions of both groups which made this type of investment were also much the same (82 per cent and 85 per cent respectively), as were the proportions making complementary investments in advertising (43 per cent and 30 per cent) and distribution facilities (16 per cent and 14 per cent). Generally, intra-firm transfers of technology were more likely than inter-firm flows to stimulate complementary investments only in the areas of personnel and R&D. Complementary investments in R&D were made by 53 per cent of intra-firm technology acquirers compared to 41 per cent of inter-firm acquirers; and for personnel, the proportions were 55 and 39 per cent respectively. If the greater likelihood of investment in R&D is due to the need to adapt parent company technology to the Australian environment [Parry, 1974], its effect on the Australian economy is difficult to evaluate, particularly as the great majority of those acquiring overseas shareholder technology (80 per cent) spent less than 30 per cent of their R&D budget on adaptation of their overseas technology. The greater likelihood of complementary investments in personnel, however, may generate important externalities for the Australian economy.

Expanding existing product lines, diversifying into closely related product groups and protecting existing markets were most frequently ranked as important motivations for acquiring

inter-firm technology. (see Table 11) The strategies for overseas technology transfer were essentially defensive and concentrated on the domestic market. However, a smaller proportion were motivated to acquire intra-firm technology by the need to forestall entry or solve a production problem than was the case with inter-firm transfers. Overseas involvement was not a common motive for either form of technology transfer but more intra-firm acquirers than inter-firm acquirers recorded exporting as a major motive. (Table 7 and Table 11) It is not surprising that establishing an overseas sales office and overseas production rank low for inter-firm acquirers since many are subsidiaries of MNEs and their parent firms make investment location decisions on sales and production facilities.

Table 11. Importance of the Motivation for Intra-Firm Technology Transfer (Percentages)

	Importance		
	Low	**Medium**	**High**
Expand Existing Products	5	11	74
Closely Related Diversification	18	8	50
Unrelated Diversification	50	1	10
Export	35	9	22
Overseas Sales Office	51	1	6
Overseas Production	49	3	6
Solve Production Problem	33	17	26
Solve Marketing Problem	37	10	19
Forestall New Entry	34	10	11
Protect Existing Market	11	11	46

Note: The residual is comprised of those that indicated that the motive was not applicable.

Table 12. Binding and Non-binding Restrictions on Intra-firm Technology Transfers (Percentages)

	Binding	Non-binding	Not Applicable
Export Limits	56	27	17
Domestic Limits	14	34	52
Production Limits	32	25	44
Managerial Services	7	35	57
Raw Material	12	36	51
Components	10	40	49
Capital Equipment	9	42	48
Trademark	45	14	40
Patent Validity	45	14	41
Buyback Output	1	31	67
Technology Improvement	26	45	29
Cross-licensing	6	24	69
Exchange Personnel from	3	38	58
Exchange Personnel to	2	39	58

Intra-firm technology flows were less likely to have binding restrictions on the raw material use, components and capital equipment than inter-firm technology transfers (see Table 12 and Table 8). This suggests that intra-firm technology flows generate supply externalities for domestic firms which are at least as great as those flowing from inter-firm transfers.

Intra-firm technology flows were more likely to carry binding restrictions on trade mark validity and cross-licensing than inter-firm flows. Intra-firm technology flows were also more likely to carry binding restrictions on exporting than inter-firm-technology transfers. These restrictions are country specific and for intra-firm transfers, may allow the enterprise to export while avoiding competition with other

branches of the same MNE. However, the relatively high frequency of export restrictions on intra-firm technology transfers is also consistent with intra-firm technology transfers being less commonly motivated by a desire to increase access to export markets than inter-firm technology transfers. Interestingly, the majority of the enterprises who acquired both intra-firm and inter-firm technology concluded that the overall level of restrictions on their inter-firm transfers was greater. At this stage, we have not established the type of restrictions which led to this conclusion. All restrictions on intra-firm and inter-firm technology transfers are a cost of being reliant on overseas know-how although some restrictions clearly place important constraints on the internationalisation of Australian business.

CONCLUSION

The inter-firm or licensing-type contract was the most frequent method by which the sample acquired their technology although intra-firm contractual arrangements were far from uncommon among the sample. The data indicates that there are considerable differences in the motivation for inter-firm and intra-firm technology transfers. In addition, as our theoretical framework led us to expect, there are considerable differences in the contractual restrictions and perceived transfer costs of the two methods of technology transfer. The next stage of our research is to analyse these costs. However, even at this preliminary stage, our data provides some

important insights into the internationalisation of Australian business.

Technology inflows are confirmed as an important facet of the internationalisation of Australian business. Our sample manufacturers were active technology importers and the overwhelming majority rated their technology imports as moderately or highly important to their operations. Yet these manufacturers saw technology inflows as playing a limited role in increasing the outflow of Australian-made goods. Only a few nominated increased overseas involvement as a major motivation for acquiring their overseas technology. For some this may reflect the binding restrictions on exports in their technology transfer contracts. Yet approximately half the technology importers were not subject to these restrictions: they indicated that export restrictions were either not binding or not applicable. This proportion for whom exporting was relatively unrestricted is much larger than the proportion for whom exporting formed a motivation to acquire overseas technology. Either our sample manufacturers do not see increased overseas involvement as a feasible strategy or they do not see technology imports as an important way of implementing the strategy. Their answers to the question on strategy indicate that both factors may be operating. Increased overseas involvement was the most commonly nominated strategy, but less than one third of the sample nominated it despite the freedom they had to nominate multiple strategies. Our sample is not highly oriented towards increasing the exports of Australian goods although it is a substantial importer of technology.

REFERENCES

Alchian, A. and H. Demsetz, 1972. 'Production, Information Costs and Economic Organisation', **American Economic Review**, 62: 777-95.

Australian Science and Technology Council, 1983. **Incentives for Innovation in Australian Industry**, (AGPS, Canberra).

Australian Science and Technology Council, 1987. **Improving Australia's Competitiveness Through Research and Development**, (AGPS, Canberra).

Australian Science and Technology Council, 1986. **Mechanisms for Technology Transfer into Australia**, (AGPS, Canberra).

Buckley, P., 1982. 'New Theories of International Business: Some Unresolved Issues', (mimeo).

Buckley, P. and M. Casson, 1976. **The Future of the Multinational Firm**, (Holmes & Meier, NY).

Bureau of Industry Economics, 1988. **Importing Technology**, (AGPS, Canberra).

Calvert, A. L., 1981. 'A Synthesis of Foreign Direct Investment Theories and Theories of the Multinational Firm', **Journal International Business Studies**, 12: 45-59.

Casson, M., 1979. **Alternatives to the Multinational Firm**, (Macmillan, London).

Casson, M., 1988. 'Economic Man', (University of Reading Discussion Papers).

Caves, R., 1971. 'International Corporations: The Industrial Economics of Foreign Investment', **Economica**, 38: 1-27.

Chandler, A. D., 1962. **Strategy and Structure**, (MIT Press, Cambridge, Mass).

Coase, R., 1937. 'The Nature of the Firm', **Economica**, 4: 386-405.

Contractor, F. D., 1980. 'The "Profitability" of Technology Licensing by U.S. Multinationals: A Framework for Analysis and Empirical Study', **Journal of International Business Studies**, 11: 40-63.

Department of Industry, Technology and Commerce, 1990. **Strategic Alliances in the Internationalisation of Australian Industry** (AGPS).

Denison, E., 1967. **Why Growth Rates Differ: Post-War Experiences in Nine Western Countries**, (Brookings Institute, Washington).

Edwards, H. R. and N. T. Drane, 1963. 'The Australian Economy, July 1963', **Economic Record**, 39: 259-81.

EPAC, 1986. **Technology and Innovation**, (Council Paper No. 19, Canberra).

Garnaut, R., 1989. **Australia and the Northeast Asian Ascendancy**, (AGPS, Canberra).

Glesecke, T. and A. Linacres and A. Kaspura, 1980. 'International Comparisons of Productivity 1950 to 1978', (Department of Productivity, Working Paper No. 11, Canberra).

Haig, B. and N. Cain, 1983. 'Growth and Productivity in Australian Manufacturing, 1920s and 1950s, **Explorations in Economic History**, 20: 183-89.

Hennart, J. F., 1982. **A Theory of Multinational Firm**, (University of Michigan Press, Ann Arbor).

Hymer, S., 1960. 'The International Operations of National Firms: A Study of Direct Foreign Investment', (Ph.D Dissertation, MIT) [published MIT Press, 1976].

Johnson, H., 1970. 'The Efficiency and Welfare Implications of the Multinational Corporation', in C.P. Kindleberger (ed.), **The International Corporation: A Symposium**, (MIT Press, Cambridge, Mass.).

Kaspura, A. and G. Weldon, 1980. 'Productivity Trends in the Australian Economy 1900-01 to 1978-79', (Department of Productivity, Working Paper No. 9, Canberra).

Kaspura, A. and Luan Ho-Trieu, 1980. 'Productivity and Technical Change in Australian 3-Digit Manufacturing Industries 1968-69 to 1977-78', (Department of Productivity, Working Paper No. 10, Canberra).

Kendrick, J., 1961. **Productivity Trends in the United States**, (NBER Princeton University Press, Princeton, NY).

Klein, B., 1980. 'Transaction Cost Determinants of "Unfair" Contractual Arrangements', **American Economic Review**, 70: 356-62.

Klein, B., and R. A. Crawford and A. A. Alchian, 1978. 'Vertical Integration, Appropriable Rents and the

Competitive Contracting Process', **Journal of Law and Economics**, 21: 297-326.

Klein, B. and K. B. Leffler, 1981. 'The Role of Market Forces in Assuring Contractual Performance', **Journal of Political Economy**, 89: 615-41.

Kompass Australia, 1988. (Peter Isaacson, Melbourne).

Lyndall, H. F., 1968, 'Technical Progress in Australian Manufacturing, **Economic Journal**, 78: 807-26.

Macaulay, S., 1963. 'Non-Contractual Relations in Business', **American Sociological Review**, 28: 55-70.

Magee, S. P., 1977. 'Information and the Multinational Corporations: An Appropriability Theory of Direct Foreign Investment' in J. Bhaguati (ed.), **The New International Economic Order**, (MIT Press, Cambridge, Mass), 317-40.

McManus, J., 1972. 'The Theory of the International Firm' in G. Paquet (ed.), **The Multinational Firm and the Nation State**, (Collier-Macmillan, Toronto), 66-93.

Macneil, I. R., 1974. 'The Many Futures of Contracts, **Southern California Law Review**, 47: 691-816.

Macneil, I. R., 1978. 'Contracts: Adjustments to Long-Term Economic Relations Under Classical, Neoclassical Relational Contract Law', **Northwest University Law Review**, 72: 854-906.

Nicholas, S., 1989. 'Locational Choice, Performance and Re-Growth of British Multinational Firms', **Business History**, 31: 122-41.

OECD, 1986. 'International Investment and the Diffusion of Technology, (DS TI/IND/86.83/23, Paris).

Pappas, Carter, Evans & Koop, 1990. **Global Challenge: Australian Manufacturing in the 1990s**, (Australian Manufacturing Council).

Parry, T. and J. Watson, 1979. 'Technology Flows and Foreign Investment in the Australian Manufacturing Sector', **Australian Economic Papers** 18: 103-18

Parry, T., 1974. 'Plant Size, Capacity Utilisation and Economic Efficiency: Foreign Investment in the Chemical Industry', **Economic Record**, 50: 218-44.

Parry, T., 1988. 'The Multinational Enterprise and Restrictive Conditions in International Technology Transfer: some New Australian Evidence', **Journal of Industrial Economics**, XXXVI: 359-65.

Pope, D., 1990. 'Australia's Payments Adjustment and Capital Flows Under the International Gold Standard 1870-1913', (mimeo).

Richardson, G. B., 1972. 'The Organisation of Industry', **Economic Journal**, 82: 883-96.

Rugman, A. M., 1981. **Inside the Multinational: The Economics of Internal Markets**, (London).

Simon, H., 1957. **Models of Man**, (John Wiley & Sons, NY).

Teece, D. J., 1977. 'Technology Transfer by Multinational Firms: The Resource Cost of Transferring Technological Know-How', **Economic Journal**, 40: 242-61.

Working Party of Technology, 1985. **Private Sector R+D in Australia: A Report to the Australian Industry and Technology Council**, (Canberra).

Williamson, O., 1975. **Markets and Hierarchies: Analysis and Antitrust Implication**, (Free Press, NY).

Williamson, O., 1979. 'Transaction-Cost Economics: The Governance of Contractual Relations', **Journal of Law and Economics** 22, 3-61.

Williamson, O., 1981. 'The Modern Corporation: Origins, Evolution, Attributes', **Journal of Economic Literature** 19, 1537-68.

Williamson, O., 1983. 'Credible Commitments: Using Hostage to Support Exchange', **American Economic Review**, 73: 529-40.

Williamson, O., 1985. **The Economic Institutions of Capitalism**, (Free Press, NY)

Working Papers in Economics

104	P. Groenewegen	Taxation and Decentralisation: A Reconsideration of the Costs and Benefits of a Decentralised Tax System; March 1988
105	L. Ermini	Some New Evidence on the Timing of Consumption Decisions and on Their Generating Process; March 1988
106	G.Mills	Satially-Differentiated Trucking Markets: Equilibria under Price Regulation without Entry Restrictions; April 1988
107	B.W.Ross	Strategic Commitment, Unknowledge and the Nature of Entreprenuerial Activity; April 1988
108	S.S.Joson	Offsets and Development of Defence Support Industries in Small Economies; April 1988
109	B.W.Ross	The Conglomerate and the Focussed Agglomerate: Modern Forms of the Leader-Commanded Firm; July 1988
110	L Ermini	Inertial Behavior on Schedule and Hierarchical Decomposition; July 1988
111	L.Ermini	The Limits of Systems Control Theory in Economic Policy-Making; July-October 1988
112	P.Groenewegen	Neo-Classical Value and Distribution Theory: The English Speaking Pioneers;September 1988
113	V.B.Hall, T.P.Truong & V.A.Nguyen	An Australian Fuel Substitution Tax Model: ORANI-LFT; October 1988
114	V.B.Hall, T.P.Truong & V.A.Nyuyen	Responses to World Oil and Coal Shocks, in an Australian Short-Run Fuel Substitution Tax Model; October 1988
115	F.Gill	Social Justice and the Low-Paid Worker; October 1988
116	G.Kingston	Theoretical Foundations of Constant-Proportion Portfolio Insurance; October 1988
117	V.B.Hall & D.R.Mills	Is Medium Temperature Solar Thermal Process Steam Viable for Australia? Some Preliminary Results; November 1988
118	W.P.Hogan	Insider Information and Market Adjustment: November 1988
119	L.Ermini	Reinterpreting a Recent Temporally Aggregated Consumption-Cap Model; December 1988
120	P.Groenewegen	Progressive Personal Income Tax - A Historical Perspective; December 1988
121	M.C.Blad & N.Oulton	Rubinstein's Solution of the Bargaining Problem: Some Generalisations and Extensions; December 1988
122	W.P.Hogan & I.G.Sharpe	Prudential Regulation of Bank Ownership and Control; January 1989
123	G.Mills	The Reform of Australian Aviation; June 1989
124	L.Ermini	Transitory Consumption and Measurement Errors in the Permanent Income Hypothesis; June 1989
125	E.Kiernan	Is Austerity Necessary?; July 1989
126	F.Gill	Labour Market Flexibility - To What End?; August 1989

127	E.Kiernan	Financial Reform: A Perspective; September 1989
128	S.Lahiri & J.Sheen	On Optimal Dumping; September 1989
129	S.Hargreaves-Heap & Y.Varoufakis	Multiple Reputations in Finitely Repeated Games; October 1989
130	J.Sheen	International Monetary and Fiscal Policy Cooperation in the Presence of Wage Inflexibilities; October 1989
131	E.Jones	Was the Post-War Boom Keynesian?; October 1989
132	S.Lahiri & J.Sheen	A Risk Averse Price-Setting Monopolist in a Model of International Trade; October 1989
133	F.Gill	A Target-Wage Dilemma: Some Consequences of Incomplete Information; December 1989
134	W.P. Hogan	New Banks in Australia; December, 1989
135	Y. Varoufakis	Modelling Rational Conflict: The Limits of Game Theory; February 1990
136	L. Ermini	Shock Persistence in Australian Output and Consumption; March 1990
137	S. Ziss	Strategic Investment, Competition and the Independence Result; March 1990
138	D.J. Wright	International Technology Transfer with an Information Asymmetry and Endogenous Research and Development; April 1990
139	D.J. Wright	International Technology Transfer and Per Unit Royalties; April 1990
140	P. Ganguli & S. Nath	Optimal Mix of Urban Public Services: The Case of Three Indian Cities; May 1990
141	P.D. Groenewegen	Alfred Marshall's Principles of Economics: A Centenary Perspective from the Antipodes; June 1990
142	J. Sheen	Real Wages and the Business Cycle in Australia; June 1990
143	C.J. Karfakis	A Model of Exchange Rate Policy: Evidence for the US Dollar-Greek Drachma Rate 1975-1987; August 1990
144	C.J. Karfakis & D.M. Moschos	Interest Rate Linkages within the European Monetary System: A Time Series Analysis; August 1990
145	C.J. Karfakis & D.M. Moschos	Asymmetries in the European Monetary System: Evidence from Interest Rates; September 1990
146	W.P. Hogan	International Capital Adequacy Standards; October 1990
147	J. Yates	Shared Ownership: The Socialisation or Privatisation of Housing?; October 1990
148	G. Butler	Contracts in the Political Economy of a Nation; November 1990
149	B. Rao	Some Further Evidence on the Policy Ineffectiveness Proposition; November 1990
150	D.J. Wright	Hidden Action and Learning-By-Doing in Models of Monopoly Regulation and Infant Industry Protection; November 1990
151	C.I. Karfakis	Testing for Long Run Money Demand Functions in Greece Using Cointegration Techniques; November 1990
152	D. Hutchinson & S. Nicholas	The Internationalisation of Australian Business: Technology Transfer and Australian Manufacturing in the 1980s; November 1990

Copies are available upon request from:

Department of Economics,
The University of Sydney,
N.S.W. 2006, Australia.

Working Papers in Economics Published Elsewhere

2	I.G.Sharpe & R.G.Walker	Journal of Accounting Research, *13*(2), Autumn 1975
3	N.V.Lam	Journal of the Developing Economies, *17*(1), March 1979
4	V.B.Hall & M.L.King	New Zealand Economic Papers, *10*, 1976
5	A.J.Phipps	Economic Record, *53*(143), September 1977
6	N.V.Lam	Journal of Development Studies, *14*(1), October 1977
7	I.G.Sharpe	Australian Journal of Management, April 1976
9	W.P.Hogan	Economic Papers, 55, The Economic Society of Australia and New Zealand, October 1977
12	I.G.Sharpe & P.A.Volker	Economic Letters, 2, 1979
13	I.G.Sharpe & P.A.Volker	Kredit and Kapital, *12*(1), 1979
14	W.P.Hogan	Some Calculations in Stability and Inflation, A.R.Bergstrom et.al.(eds.),J.Wiley & Sons,1978
15	F.Gill	Australian Economic Papers, *19*(35),December 1980
18	I.G.Sharpe	Journal of Banking and Finance, *3*(1),April 1978
21	R.L Brown	Australian Journal of Management, *3*(1),April 1978
23	I.G.Sharpe & P.A.Volker	The Australian Monetary System in the 1970s, M.Porter(ed.),Supplement to Economic Board 1978
24	V.B.Hall	Economic Record, *56*(152), March 1980
25	I.G.Sharpe & P.A.Volker	Australian Journal of Management, October 1979
27	W.P.Hogan	Malayan Economic Review, *24*(1), April 1979
28	P.Saunders	Australian Economic Papers, *19*(34),June 1980
29	W.P.Hogan, I.G.Sharpe & P.A.Volker	Economic Letters, 6 (1980), 7 (1981)
30	W.P.Hogan	Australian Economic Papers, *18*(33),December 1979
32	R.W.Bailey, V.B.Hall & P.C.B.Phillips	Keynesian Theory, Planning Models, and Quantitative Economics, G. Gandolfo and F. Marzano (eds.), *2*, 703-767, 1987
38	U.R.Kohli	Australian Economic Papers, *21*(39),December 1982
39	G.Mills	Journal of the Operational Research Society(33)1982
41	U.R.Kohli	Canadian Journal of Economics, *15*(2),May 1982
42	W.J.Merrilees	Applied Economics, *15*, February 1983
43	P.Saunders	Australian Economic Papers, *20*(37),December 1981
45	W.J.Merrilees	Canadian Journal of Economics, *15*(3),August 1982
46	W.J.Merrilees	Journal of Industrial Economics, *31*,March 1983
49	U.R.Kohli	Review of Economic Studies, *50*(160),January 1983
50	P.Saunders	Economic Record, *57*(159), December 1981
53	J.Yates	AFSI, Commissioned Studies and Selected Papers, AGPS, IV 1982
54	J.Yates	Economic Record, *58*(161), June 1982
55	G.Mills	Seventh Australian Transport Research Forum-Papers, Hobart, 1982
56	V.B.Hall & P.Saunders	Economic Record. *60*(168), March 1984
57	P.Saunders	Economic Record, *59*(166), September 1983
58	F.Gill	Economie Appliquee, *37*(3-4), 1984
59	G.Mills & W.Coleman	Journal of Transport Economics and Policy, *16*(3), September 1982
60	J.Yates	Economic Papers, Special Edition, April 1983

61	S.S.Joson	Australian Economic Papers, *24*(44),June 1985
62	R.T.Ross	Australian Quarterly, *56*(3), Spring 1984
63	W.J.Merrilees	Economic Record, *59*(166), September 1983
65	A.J.Phipps	Australian Economic Papers,*22*(41),December 1983
67	V.B.Hall	Economics Letters, 12, 1983
69	V.B.Hall	Energy Economics, *8*(2), April 1986
70	F.Gill	Australian Quarterly, *59*(2), Winter 1987
71	W.J.Merrilees	Australian Economic Papers,*23*(43),December 1984
74	J.Yates	Australian Quarterly, *56*(2), Winter 1984
77	V.B.Hall	Economics Letters, 20, 1986
78	S.S.Joson	Journal of Policy Modeling, *8*(2), Summer 1986
79	R.T.Ross	Economic Record, *62*(178), September 1986
81	R.T.Ross	Australian Bulletin of Labour, *11*(4), Sept.1985
82	P.D.Groenewegen	History of Political Economy, *20*(4),Winter 1988 Scottish Journal of Political Economy,*37*(1)1990
84	E.M.A.Gross, W.P.Hogan & I.G.Sharpe	Australian Economic Papers, *27*(50), June 1988
94	W.P.Hogan	Company and Securities Law Journal, *6*(1), February 1988
95	J.Yates	Urban Studies, *26*, 419-433, 1989
96	B.W.Ross	The Economic and Social Review, *20*(3),April 1989
97	F.Gill	Australia's Greatest Asset: Human Resources in the Nineteenth and Twentieth Centuries, D.Pope(ed.), Federation Press, 1988
99	R.T.Ross	Australian Bulletin of Labour, *15*(1), December 1988
100	L.Haddad	Hetsa Bulletin, (11), Winter 1989
101	J.Piggott	Public Sector Economics - A Reader, P.Hare(ed.), Basil Blackwell, 1988
104	P.D.Groenewegen	Decentralization, Local Government and Markets: Towards a Post-Welfare Agenda, R.J. Bennet (ed.) Oxford University Press, *6*, 87-115, 1990
107	B.W.Ross	Prometheus, *6*(2), December 1988
108	S.S.Joson	Rivista Di Diritto Valutario e Di Economia Internazionale, *35*(2), June 1988
112	P.Groenewegen	NeoClassical Economic Theory 1870 to 1930 K.Hennings & W.Samuels (eds.), 13-51, 1990
113	V.B.Hall, T.P.Truong & V.A.Nguyen	Energy Economics, *12*(4) October 1990
114	V.B.Hall, T.P.Truong & V.A.Nguyen	Australian Economic Review, (87) 3'89
115	F.Gill	Australian Journal of Social Issues, *25*(2), May 1990
116	G.Kingston	Economics Letters, 15 (1989)
117	V.B.Hall & D.R.Mills	Pacific and Asian Journal of Energy, *2*(2), December 1988
118	W.P.Hogan	Abacus, *25*(2), September 1989.
120	P.Groenewegen	Flattening the Tax Rate Scale: Alternative Scenarios & Methodologies, (eds.) J.G. Head and R. Krever, *1*, 3-31, 1990
122	W.P.Hogan & I.G. Sharpe	Economic Analysis and Policy, *19*(1), March 1989
123	G.Mills	Journal of Transport Economics and Policy, *23*, May 1989
126	F.Gill	The Australian Quarterly, *61*(4), 1989
128	S.Lahiri & J.Sheen	The Economic Journal, *100*(400), 1990
144	C.J.Karfakis	Journal of Money, Credit, and Banking, *22*,(3),1990