Getting Out There: Overseas Direct Investment and Exporting in New Zealand Firms

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Abstract

New Zealand has low levels of both exporting and outward foreign direct investment (ODI). In this paper we examine firm's internationalisation, in the context of their broader outward international strategy (e.g. the decision to service a foreign market through ODI or exporting). We use data from the prototype Longitudinal Business Database, and in particular the Business Operations Survey, to examine firms' propensity to conduct ODI and exporting using qualitative limited dependent variable models.

JEL Classification: D24; F14; F23

Keywords: Foreign Direct Investment, ODI, FDI, exporting

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Getting Out There: Overseas Direct Investment and Exporting in New Zealand Firms

1. Introduction

There is no doubt that we live in a global world. The huge amounts of trade and foreign investment have been a major part of the fantastic increases in economic welfare enjoyed by both developed and developing economies. All developed economies both import and export sizable proportions of their GDP. Likewise, with capital flows: the stock of inward Foreign Direct Investment (FDI) is equivalent on average to around half of GDP for OECD economies as a whole and the stock of Outward FDI (ODI) a little higher. New Zealand, however, has a rather different story than other OECD economies. First, its trade/GDP is very low for a small economy. Second, whilst the stock of inward FDI is fairly high compared with many other countries, its stock of ODI is much lower.

Exporting and ODI are not done by countries, but by firms. Firms can service foreign markets in three ways. First, they can export their output directly from their domestic sites to foreign markets. Second, they can invest in firms located in foreign markets (outward foreign direct investment). Third, they can licence their IP to firms located in international markets. Recent developments in trade theory that are based on heterogeneous firms suggest that firms which export are more productive than those which do not, and those that undertake ODI are more productive still (theory is rather more silent about licensing). There is emerging evidence supports this thesis, particularly the exporting productivity premium. ODI is not, however, only about servicing foreign markets. Because of different factor endowments, firms may spread their production vertically across different countries.

In this paper we use data from the prototype Longitudinal Business Database (LBD) to examine firms' propensity to conduct ODI and to export. Our analysis is based on the Business Operations Survey (BOS). The BOS collects information from a panel of New Zealand private-for-profit businesses with six or more employees. It was designed to build a better understanding of a range of business practices and behaviours that may have some impact on business performance. The BOS collects annual information on firm performance and operations. Crucially, the survey contains information on whether the business holds any ownership interest or shareholding in an overseas located business. It also asks questions whether any individual or business located overseas holds an ownership interest or shareholding in the New Zealand business. Finally, it also asks what percentage of the business' sales of goods and services come from exports.

The BOS data are matched to other data obtained from Statistics New Zealand's prototype Longitudinal Business Database (LBD). The LBD contains, among other things, Goods and Services Tax (GST) returns, financial accounts (IR10) and aggregated Pay-As-You-Earn (PAYE) returns, all provided by Inland Revenue (IR).

In this paper we investigate firms' propensity to conduct ODI and exporting using qualitative limited dependent variable models. Specifically, we use Multinomial Logit (MNL) and ordered probit models. The downside of the MNL is that it requires the assumption of the Independence from Irrelevant Alternatives (IIA) – i.e. that the firms choice between any two outcomes is independent of the other potential choices. Because of this, we test the IIA assumption using the tests of Hausman and McFadden (1984) and Small and Hsiao's (1985). We also test the theoretical prediction that firms which export are more productive than non-exporters and that firms which undertake ODI are more productive still.

2. Background

Developed economies both import and export sizable proportions of their GDP; the average of trade (total exports plus imports) to GDP in the OECD was almost 100% in 2008 (MED, 2011). This story is similar for capital flows: the stock of inward Foreign Direct Investment (FDI) is on average around 55% for OECD economies and

the stock of Outward FDI (ODI) a little higher (*ibid.*)[1]. In this globalised world, flows of goods and services and of capital are commonplace. However, whilst costs of transportation continue to fall and the rise of the internet has reduced the costs of data transfer and communication, distance still matters. Flows of both trade and FDI fall with distance (Anderson and van Wincopp, 2004).

2.1. New Zealand's internationalisation

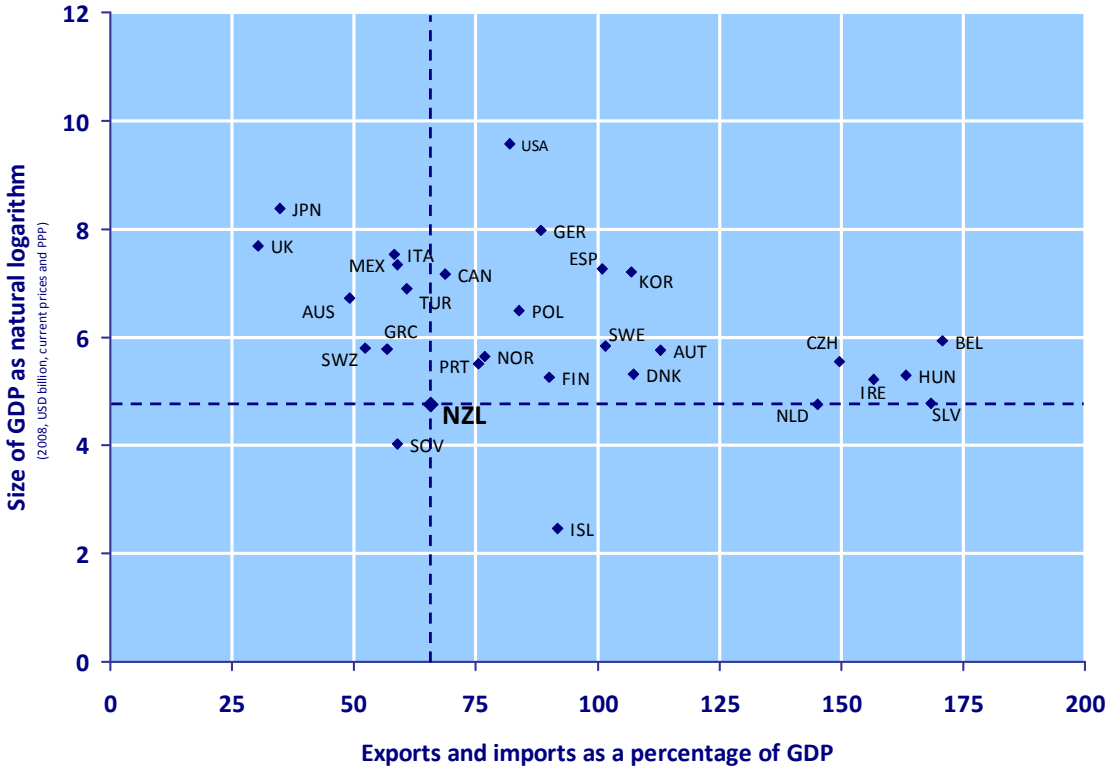
New Zealand is rather an outlier with respect to the internationalisation of its economy, by comparison with other OECD economies. The ratio of New Zealand's trade to GDP is only 60% (MED, 2011). Furthermore, whilst the stock of inward FDI to New Zealand is high compared with countries such as Australia, the US or Korea, its stock of ODI is much lower (12%, compared with the OECD mean of 58%).

This story may be even worse than it seems at first blush. Figure 1 shows the relationship between country size (measured as the natural logarithm of GDP) and trade as a percentage of GDP. This shows a clear, negative relationship; larger economies trade less as a proportion of GDP. This could be for a number of reasons, such as the greater diversification of the home market. Smaller economies have a greater reliance on trade, with trade to GDP ratios of over 100%.

Given the size of the New Zealand economy, it would be expected to be trading at levels similar to that of The Netherlands, Ireland and the Slovak Republic. However, in 2008, New Zealand traded less than all of the OECD economies, with the exception of Slovenia and Iceland. New Zealand's trade-to-GDP has averaged 60% over the last three decades (IMF 2005; Devine, 2010).

[1] Note that the focus of this paper is New Zealand. Therefore, we use the acronym 'FDI' generally to refer to *inward* foreign direct investment, particularly into New Zealand. We use the term ODI to refer to *outward* foreign direct investment from New Zealand. We shall occasionally use the term FDI to refer to cross-boarder investments more generally, for brevity.

Figure 1 Trade as a percentage of GDP, and country size[2]

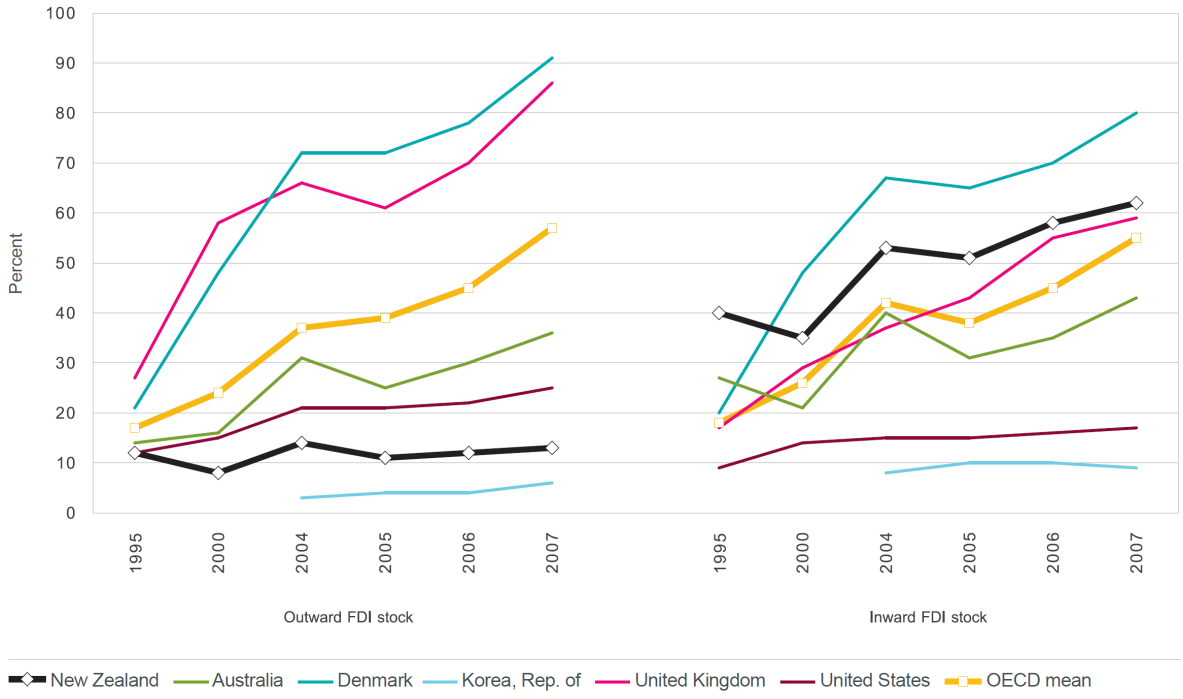


- *Source: Devine (2010)*

This low level of trade for New Zealand is consistent with the evidence that 'distance is not dead' (Anderson and van Wincopp, 2004). Despite falls in transport costs and the rise of telecommunications technology, distance remains a significant factor for trade. A recent OECD study estimated that New Zealand and Australia's distance from major trading centres reduces their per capita income by up to 11% (Boulhol, and de Serres, 2008). This is in contrast to the benefits of a 6-7% increase in per capita GDP enjoyed by Belgium and The Netherlands because of their proximity to trading centres. There is also a cost to being on the fringe as well as being a long way away; when one is on the edge of the world, one is not really on the way to anywhere (except Antarctica).

[2] OECD economies; Luxembourg has been excluded given its size and significant percentage of trade to GDP.

Figure 2 Inward and outward FDI stock as a percentage of nominal GDP



- *Source: MED (2011)*

One way to overcome the physical costs of distance is to export *ideas* via capital. New Zealand's relative ODI performance, however, is even lower than its export performance (Figure 2). Whereas the OECD average, and that of countries such as Denmark and the UK, has increased considerably over the past decade, the stock of ODI in New Zealand was low in 1995 and remained low in 2007.

Perhaps the costs of conducting ODI are high as well, possibly even higher than those for exporting goods and services? ODI may require more-involved interactions, entailing human capital and tacit knowledge? One way to get a feel for this is to look at flows of foreign investment in the other direction. As can be seen from the second panel in Figure 2, the distance does not appear to be a disincentive to foreign firms investing in New Zealand; New Zealand has a stock of inward FDI that has been consistently higher than the OECD mean for the last decade. This is consistent with, for example, inward FDI acting as a substitute for trade that has a high elasticity with respect to distance.

FDI can happen for a number of reasons. As we have noted, it may be as a substitute for direct trade in goods and services. It may also be resource-seeking. New Zealand may have economically valuable resources that attract foreign

multinationals and capital. These could be natural resources like oil or minerals, logs or good pasture; they could also be intangible resources such as businesses with innovative products or services. However, the low level of exports from New Zealand is not consistent with the idea that all FDI into New Zealand is resource-seeking. From this aggregate data, multinational enterprises do not appear to be using New Zealand as an export base in the way that Ireland and Denmark appear to have been. We consider this in more detail, using firm-level data, below.

The case of Ireland highlights another reason for FDI: market-seeking FDI. FDI may be a means to access large domestic markets or, as appears to be the case for Ireland, effective domestic markets in trade blocks or single markets.

One objection to the interpretation of the evidence for resource-based FDI above may be that in the second group of potential recipients of FDI – innovative firms – hollowing-out may occur. That is, capital rich foreign firms may be acquiring innovative New Zealand firms and shifting their IP abroad. However, we must be clear that Figure 2 depicts the *stock* of FDI in New Zealand, not the flow. It is difficult to see how asset-stripping foreign capital can be a substantive part of the picture portrayed in Figure 2, unless the stock depicted is turning over extremely rapidly. That is, that New Zealand is producing a phenomenal conveyer-belt of new-to-the-world innovative firms that are flowing out of the country at a rate that is a sizeable proportion of our national output. This story is certainly not consistent with international comparisons of innovation indicators (e.g. Med, 2011).

The final category of FDI is rent-seeking FDI. New Zealand is a small, open economy. Smaller economies are more subject to a lack of competition as their markets cannot sustain as many 'big players'. An answer to this question is not provided here, and left to other work (e.g. Devine *et al.*, 2011a, 2011b and 2011c).

2.2. Models of internationalisation

Why do firms conduct Overseas Direct Investment? We have outlined some of the reasons above as of course one country's FDI is another's ODI[3]. It is also useful to consider the *nature* of ODI. There are two broad types of ODI: horizontal and vertical.

[3] See footnote 1 on terminology

Horizontal ODI

Horizontal ODI relates to how firms choose to service a foreign market. They have at least two approaches for doing so[4]. The first is to export goods (or services) directly from New Zealand to the foreign market. The second is to set up multiple production plants in different foreign markets. If it is more profitable to do the latter, a multinational enterprise (MNE) will emerge (Markusen, 1984; Greenaway and Kneller. 2007). Other models of horizontal ODI/FDI include Horstmann and Markusen (1987, 1992) and Markusen and Venables (1998, 2000).

Vertical ODI

Vertical ODI refers to the internal fragmentation of the production process or supply chain. This is a specific example of the more general issues about vertical integration considered at least since Ronald Coase considered the *Nature of the Firm* in the 1930s. In this case, firms may find it more profitable to conduct different parts of its process in different countries (Helpman, 1984; Helpman and Krugman, 1985).

2.2.1. Trade theory and ODI

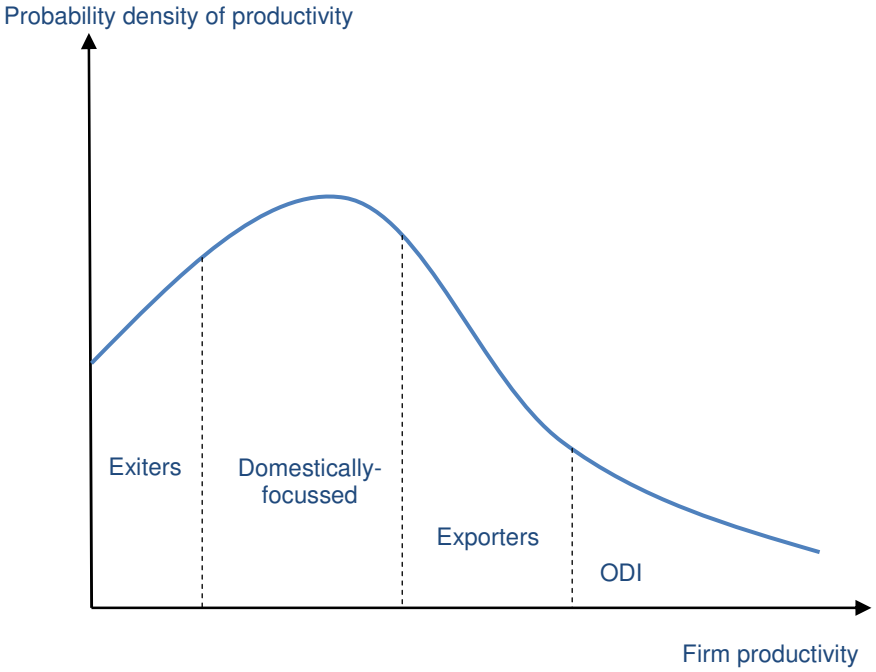
Our current understanding of firms' choice between exporting and ODI (or both) comes out of the 'New, New Trade Theory'. Whereas the New Trade Theory of Krugman *et alia* brought firms explicitly into theories of international trade, via monopolistic competition models of Dixit and Stiglitz (1977), the New, New Trade Theory (NNTT) adds firm heterogeneity (with respect to productivity, in particular). This was driven by theoretical breakthroughs associated with Melitz (2003), Helpman, Melitz and Yeaple (2004) and Bernard, Eaton, Jensen, and Kortum (2003).

At the heart of models of firms choice of mode of internationalisation (choices about exporting and Horizontal ODI) is the combination of this firm heterogeneity and the assumption that there are different costs associated with exporting and ODI. Specifically, that exporting involves sunk costs in terms of research into product compliance, distribution networks, advertising and the like and additional variable

[4] As we have noted above, there is also a *third* approach to servicing a foreign market: licencing. In some ways it is the export of an *idea*. It is the sale – or rent – of intellectual property. It transfers the risk of entering the market to the foreign firm. It also reduces the costs of exporting in terms of setting-up local production and/or distribution, learning about local market conditions, consumer preferences, cultural and institutional information etc. Because the theory and data are rather less developed (or integrated) on licencing, we will focus our discussion and analysis on the choice between ODI and exporting.

costs related to transporting over longer distances, and that ODI involves similar sunk costs combined with those associated with establishing domestic production facilities (Greenaway and Kneller, 2007).

Figure 3 Productivity and internationalisation



- *Based on Greenway and Kneller (2007)*

3. Data

Our data come from the prototype Longitudinal Business Database (LBD) (Fabling, Grimes, Sanderson and Stevens, 2007; Fabling, 2009). The main source of our data is the Business Operations Survey. We supplement this with financial data from the Business Activity Indicator (BAI) database of GST returns and IR10 financial accounts, and employment data from the Linked Employer-Employee Database (LEED). More detail on the sources of our data is included in the data appendix to this document.

3.1. Business Operations Survey

At the core of our analysis is the Business Operations Survey (BOS). The BOS collects information from a wide cross-section of New Zealand private-for-profit

businesses with six or more employees[5]. It was designed to build a better understanding of a range of business practices and behaviours that may have some impact on business performance. It is also designed to provide a panel of firms. The BOS has a three-part modular design. Module A collecting annual information on firm performance and operations. Module B alternates between collecting information on innovation behaviour and outcomes (in odd years) and communication technology use (in even years). The third Module is open to competitive bidding between government agencies. This has been used to address general business practices (2005 and 2009); employment practices (2006); international engagement (2007 and 2011); business strategy and skills (2008); and price-setting and wage-bargaining (2010). Crucially, the survey contains information on whether the business holds 'any ownership interest or shareholding in an overseas located business (including its own branch, subsidiary or sales office)?' It also asks whether these were gained through joint venture, acquisition of existing overseas businesses or greenfield establishment of new overseas businesses. It also asks questions whether any individual or business located overseas holds an ownership interest or shareholding in the New Zealand business (and, if so the percentage) and the percentage of its sales of goods and services that came from exports.

The target population for the Business Operations Survey is live enterprise units on Statistics NZ's Business Frame that at the population selection date:

- were economically significant enterprises (those that have an annual GST turnover figure of greater than $30,000)
- had six or more employees
- had been operating for one year or more
- were classified to Australian and New Zealand Standard Industrial Classification codes listed as 'in scope' [6]
- were private enterprises as defined by New Zealand Institutional Sector 1996 Classification (NZISC96) [6]

[5]

[6] See technical reference in footnote 7

The BOS is conducted using two-way stratified sampling, with stratification on rolling-mean-employment (RME) and two-digit industry according to the ANZSIC system[7]. A summary of the number of usable responses, response rate and the size of the population represented by the survey is set out in Table 1. Note that the sampling frame changed between 2007 and 2008, with stratification in 2007 done using the 1996 ANZSIC industry classification and 2008 done using the 2006 ANZSIC.

Table 1 A Summary of the Business Operations Survey

	Usable responses	Response rate*	Population
2005	5,595	80.2%	34,760
2006	6,066	81.7%	35,436
2007	5,728	80.1%	35,004
2008	5,543	81.1%	36,075
2009	5,603	82.4%	36,347

** Adjusting for firm ceases*

3.2. BAI, IR10 and LEED

The BOS data are matched to data obtained from Statistics New Zealand's prototype Longitudinal Business Database (LBD) (Seyb, 2004). The LBD is built around the Longitudinal Business Frame (LBF). To this is attached, among other things, Goods and Services Tax (GST) returns, financial accounts (IR10) and aggregated Pay-As-You-Earn (PAYE) returns all provided by the Inland Revenue Department (IRD). We use the LBD as our source of information on firms' sales, purchases and employment.

More details on the data used in this paper is set out in the data appendix.

4. A picture of ODI and exporting in NZ firms

In this section we describe the patterns of internationalisation among New Zealand businesses, primarily based on the BOS. Table 2 sets out three measures of internationalisation: the percentage of firms that export, conduct ODI and receive FDI. Approximately 15% of New Zealand businesses in our sample export. This has stayed fairly constant over the past five years. Around three per cent conduct ODI and just under seven per cent receive FDI.

[7] Note that there was some minor additional stratification conducted at the three-digit level. For more details on this see the data appendix to this document and the technical information on the SNZ website (http://www.stats.govt.nz/browse_for_stats/businesses/business_growth_and_innovation/BusinessOperationsSurvey_HOTP08/Technical%20Notes.aspx).

Table 2 Internationalisation: The percentage of firms with exports, ODI and FDI

	% Export	*% ODI*	*% FDI*
2005	15.6	2.8	6.6
2006	14.5	2.8	6.8
2007	15.5	3.4	6.7
2008	13.7	2.7	6.8
2009	14.5	4.0	7.2
All years	**14.7**	**3.2**	**6.8**

Notes

- *Note that the figures in these tables will not match up with SNZ official releases because we use a slightly different sample of firms.*
- *Note that the sampling frame for the BOS has changed over this period.*
- *For more on these and other data issues, see the data appendix at the end of this document.*

The propensity to export is not constant across all firm types. This propensity increases with firm size (Table 3). Whereas around 12% of small firms export, around 30% of firms with 100 or more employees export. A similar story is true for businesses entering new export markets. Approximately four per cent of firms enter a new export market in any given year. This is just under one-third of all exporters. This highlights the intermittency of exporting relationships (when considered in terms of the number of firms, as opposed to the volume of exports) highlighted in Fabling and Sanderson (2008). Again, this propensity is much higher for larger firms. The recession appears to have hit the entrance to new export markets harder than the number of firms exporting *per se*.

There is also is considerable variation in exporting propensity by industry (Table 4). Exporting is highest in Manufacturing, Wholesale trade, and Agriculture, forestry and fishing. Exporting is much lower in services sectors (recall that this is export sales of both goods and services). However, there are not-insignificant numbers of firms exporting in the Property and business services sector, for example.

Table 3 Percentage of firms exporting, by firm size

	2005	*2006*	*2007*	*2008*	*2009*	*All years*
Businesses that export						
<20 employees	12.9	11.8	13.3	11.5	12.5	12.4
20-49 employees	18.8	17.6	17.4	15.5	15.9	17.0
50-99 employees	28.3	25.6	25.3	24.8	26.7	26.1
100+ employees	30.7	29.6	30.2	27.4	25.2	28.5
Overall	**15.6**	**14.5**	**15.5**	**13.7**	**14.5**	**14.7**
Businesses entering new export markets						
<20 employees	3.6	3.3	4.0	3.2	2.8	3.4
20-49 employees	7.3	4.4	5.5	4.0	4.1	5.0
50-99 employees	9.7	7.6	7.6	8.1	8.2	8.2
100+ employees	9.5	9.2	8.1	8.1	6.6	8.2
Overall	**4.9**	**4.0**	**4.6**	**3.8**	**3.5**	**4.2**

Notes

- *Note that the figures in these tables will not match up with SNZ official releases because: (a) we use a slightly different sample of firms; and (b) we use employment and industry at the time of the survey rather than at the time the sample was drawn.*
- *Note that the sampling frame for the BOS has changed over this period.*
- *For more on these and other data issues, see the data appendix at the end of this document.*

Table 4 Percentage of firms exporting, by industry

	2005	*2006*	*2007*	*2008*	*2009*	*All years*
Agriculture, Forestry and Fishing	29.6	25.4	26.5	27.2	27.1	27.2
Mining	13.0	11.7	10.2	17.4	13.3	13.3
Manufacturing	37.7	35.1	36.2	35.0	33.7	35.6
Electricity, Gas and Water Supply	.	.	.	.	.	.
Construction	1.1	2.7	1.4	0.8	1.4	1.5
Wholesale Trade	27.7	30.6	30.9	27.8	30.3	29.4
Retail Trade	5.5	5.9	6.8	3.9	4.3	5.3
Accommodation Cafes & Restaurants	2.9	2.9	6.2	0.7	2.9	3.0
Transport and Storage	9.4	8.5	8.7	11.5	11.3	9.9
Communication Services	4.2	10.4	5.9	6.8	4.6	6.3
Finance and Insurance	4.8	5.6	10.0	7.4	8.9	7.2
Property and Business Services	14.5	12.7	15.2	13.2	15.5	14.2
Education	10.8	4.9	6.8	7.1	9.0	7.7
Health and Community Services	.	.	.	.	2.1	0.5
Cultural & Recreational Services	5.0	7.6	3.1	5.6	5.1	5.3
Personal and Other Services	10.1	4.0	11.5	1.9	3.6	3.2
Overall	**15.6**	**14.5**	**15.5**	**13.7**	**14.5**	**14.7**

Notes

- *See notes to Table 3.*
- *We have excluded some of the figures because of small sample sizes*

Whilst manufacturing firms are the more likely to export than agricultural firms, exports tend to represent a smaller proportion of total sales (Table 5). Almost three-quarters of Agriculture, Forestry and Fishing firms export half or more of their sales. For manufacturing firms the figure is more like one-quarter to one-third.

Table 5 Firm exporting, by firm size and industry (all years)

%	Exporting	New exports	Exports as a % of total sales			
			<10%	10-50%	50-90%	90%+
Firm size						
<20 employees	12.4	3.4	4.5	3.1	2.1	2.8
20-49 employees	17.0	5.0	7.8	4.9	2.8	1.6
50-99 employees	26.1	8.2	9.1	8.9	5.2	2.9
100+ employees	28.5	8.2	10.2	9.0	6.2	3.1
Overall	**14.7**	**4.2**	**5.6**	**4**	**2.6**	**2.5**
Industry						
Agriculture, Forestry and Fishing	27.2	4.8	2.3	4.9	7.8	12.2
Mining	13.3	5.2	2.9	5.0	2.1	3.3
Manufacturing	35.6	11.8	13.0	12.5	7.2	2.9
Electricity, Gas and Water Supply	.	.	.	.	.	.
Construction	1.5	0.9	0.9	0.5	0.0	0.1
Wholesale Trade	29.4	7.0	17.3	6.8	1.5	3.8
Retail Trade	5.3	0.4	3.3	0.8	1.1	0.2
Accommodation Cafes & Restaurants	3.0	1.9	1.5	0.6	0.3	0.6
Transport and Storage	9.9	3.1	1.6	3.1	1.5	3.7
Communication Services	6.3	2.7	1.6	2.3	2.1	0.2
Finance and Insurance	7.2	1.4	2.3	2.7	1.1	1.2
Property and Business Services	14.2	4.1	6.2	3.9	2.1	2.1
Education	7.7	6.1	0.9	0.7	1.0	5.1
Health and Community Services	0.5	0.0	0.3	0.0	0.2	0.0
Cultural & Recreational Services	5.3	2.7	3.2	1.0	0.4	0.8
Personal and Other Services	3.2	1.2	0.8	0.5	1.8	0.2
Overall	**14.7**	**4.2**	**5.6**	**4**	**2.6**	**2.5**

Notes

- *See notes to Table 3.*
- *We have excluded some of the figures because of small sample sizes*

As with exporting, the proportion of firms undertaking ODI increases with firm size (Table 6). This is true both ways; larger firms are both more likely to be the source, but also the recipient of FDI (Table 7).

Almost one-third of firms with one hundred or more employees have overseas ownership. The four sectors with the largest proportion of firms with overseas ownership are the Finance and insurance and the Mining, the Wholesale trade and the Communication Services sectors.

Table 6 ODI: Overseas Holdings by New Zealand Businesses

	ODI	Method of acquiring overseas holdings			
		Joint venture	Acquisition	Greenfield	Other
Firm size					
<20 employees	2.3	0.9	0.8	1.1	1.1
20-49 employees	3.5	0.7	0.6	1.4	1.0
50-99 employees	7.4	1.0	1.1	2.7	1.1
100+ employees	11.2	1.4	2.6	3.2	1.8
Overall	**3.2**	**0.9**	**0.8**	**1.3**	**1.1**
Industry					
Agriculture, Forestry and Fishing	1.7	0.9	0.8	0.5	1.0
Mining	5.3	0.9	0.2	0.5	1.9
Manufacturing	5.6	1.1	1.1	2.3	1.3
Electricity, Gas and Water Supply	.	.	.	.	.
Construction	1.3	0.9	1.2	1.4	1.0
Wholesale Trade	6.0	0.9	0.8	1.8	1.1
Retail Trade	1.1	0.3	0.3	0.4	1.0
Accommodation Cafes & Restaurants	1.7	1.7	1.2	0.7	1.7
Transport and Storage	3.5	1.6	1.1	1.1	1.4
Communication Services	2.9	0.2	0.3	1.4	0.7
Finance and Insurance	7.8	0.9	1.7	2.5	1.1
Property and Business Services	4.8	0.5	0.6	2.2	1.0
Education	1.6	1.2	0.5	0.5	1.3
Health and Community Services	0.6	0.8	0.8	0.4	0.8
Cultural & Recreational Services	2.7	1.4	0.6	1.2	0.6
Personal and Other Services	1.2	0.4	0.4	0.5	0.5
Overall	**3.2**	**0.9**	**0.8**	**1.3**	**1.1**

Notes

- *See notes to Table 3.*
- *We have excluded some of the figures because of small sample sizes*

Given the numbers presented earlier on stocks of ODI and FDI earlier, it is no surprise to learn that half as many New Zealand firms have holdings in overseas companies as the other way around. Large firms are most likely to do ODI. This is consistent across type. Greenfield investment is the most popular method of gaining overseas ownership interest or shareholdings. Finance, Wholesale Trade and Mining are once more the most internationalised firms in terms of investment, along with Manufacturing.

Table 7 FDI: Overseas Ownership of New Zealand Businesses

	FDI	*Up to half*	*Over half*
Firm size			
<20 employees	4.6	1.2	2.9
20-49 employees	7.4	1.9	5.0
50-99 employees	16.6	2.6	13.0
100+ employees	31.1	4.2	25.0
Overall	**6.8**	1.5	4.8
Industry			
Agriculture, Forestry and Fishing	4.4	2.6	1.3
Mining	22.6	2.3	19.4
Manufacturing	8.8	2.0	6.1
Electricity, Gas and Water Supply	.	.	.
Construction	1.7	0.5	1.1
Wholesale Trade	19.8	1.8	17.2
Retail Trade	1.5	0.3	1.1
Accommodation Cafes & Restaurants	4.0	1.9	1.7
Transport and Storage	8.8	2.1	6.4
Communication Services	14.2	2.9	10.6
Finance and Insurance	24.2	4.3	18.7
Property and Business Services	9.1	2.1	6.0
Education	4.2	0.5	2.6
Health and Community Services	1.2	0.4	0.6
Cultural & Recreational Services	8.7	3.2	4.8
Personal and Other Services	4.0	0.6	3.0
Overall	**6.8**	1.5	4.8

Notes

- *See notes to Table 3.*
- *We have excluded some of the figures because of small sample sizes*

Table 8 ODI and exporting

	Neither ODI nor exports	*Exporter only*	*ODI & exporter*	*ODI only*
Firm size				
<20 employees	86.4	11.3	1.2	1.1
20-49 employees	81.5	15.0	2.0	1.6
50-99 employees	71.3	21.4	4.8	2.5
100+ employees	67.3	21.5	7.1	4.2
Overall	**83.8**	**13.0**	**1.8**	**1.4**
Industry				
Agriculture, Forestry and Fishing	71.3	27.0	0.4	1.4
Mining	82.5	12.1	1.1	4.3
Manufacturing	63.8	30.6	4.9	0.7
Electricity, Gas and Water Supply	72.3	0.0	0.0	27.7
Construction	97.4	1.3	0.2	1.1
Wholesale Trade	68.4	25.6	4.0	2.0
Retail Trade	93.6	5.3	0.1	1.1
Accommodation Cafes & Restaurants	95.8	2.5	0.5	1.1
Transport and Storage	87.6	8.9	0.9	2.6
Communication Services	91.2	5.9	0.5	2.4
Finance and Insurance	87.7	4.5	2.9	5.0
Property and Business Services	83.8	11.5	2.9	1.9
Education	91.0	7.4	0.4	1.3
Health and Community Services	98.9	0.5	0.0	0.6
Cultural & Recreational Services	92.9	4.4	1.0	1.7
Personal and Other Services	96.3	2.5	0.8	0.4
Overall	**83.8**	**13.0**	**1.8**	**1.4**

Notes

- *See notes to Table 3.*
- *We have excluded some of the figures because of small sample sizes*

Table 9 outlines the relationship of inward FDI with exporting and ODI. Clearly inward and outward internationalisation are related. International firms are not simply either foreign-owned or foreign-owning. Firms with some kind of outward internationalisation are much more likely to be the recipients of inward FDI. Most likely are those that conduct ODI only, next most likely are those that do both ODI and exporting, followed by exporters.

Table 9 The relationship of FDI with exporting and ODI

	Neither ODI nor exports	*Exporter only*	*ODI & exporter*	*ODI only*
Proportion of firms with FDI	4.5	16.3	22.1	36.1
Firms with FDI	56.0	31.2	5.7	7.2
Firms without FDI	85.9	11.7	1.5	0.9

Notes

- *See notes to Table 3.*

In Table 10 we turn to how the performance of firms with different modes of internationalisation differs. We divide firms' internationalisation into inward and outward internationalisation. In terms of outward internationalisation, firms can be entirely domestically focussed, that is neither undertaking ODI or exporting goods and services. Our data allow us to divide outwardly-internationalised firms into three groups: those that only export goods and services, those that only conduct ODI and those that do both.

Table 10 Firm performance, by mode of internationalisation

	Sales	*Employ-ment*	*Value added*	*Labour productivity*	*Exports* (% of sales)
Outward internationalisation					
Neither ODI nor exporter	6,419,395	27.6	1,578,182	53,649	.
Exporter only	14,565,725	39.6	3,961,867	77,621	34.9
ODI & exporter	41,009,579	126.6	12,134,364	184,931	46.8
ODI only	45,189,115	148.8	13,223,102	107,639	.
Inward internationalisation					
Domestic firm	6,067,829	26.6	1,517,377	53,649	4.7
Firms with overseas ownership	42,173,034	110.2	11,539,841	125,834	14.8
Up to half	50,282,876	32.0	2,259,475	58,430	5.1
Over half	6,067,829	108.5	6,875,282	61,821	20.7
Overall	**9,026,640**	**33.2**	**2,330,567**	**58,482**	**5.4**

Notes

- *See notes to Table 3.*
- *Note that the sample of firms is not the same for Table 10 and* ***Error! Reference source not found.****.*

In terms of inward internationalisation, we compare firms that do and do not have any overseas ownership. We also divide the former group into those of which overseas interests own up to one-half of the firm and those which more than half of the firm is foreign-owned.

Looking fist at outward internationalisation, we see that exporters are more than twice the size in terms of sales. They are also larger in terms of employment and value-added, and are more productive.

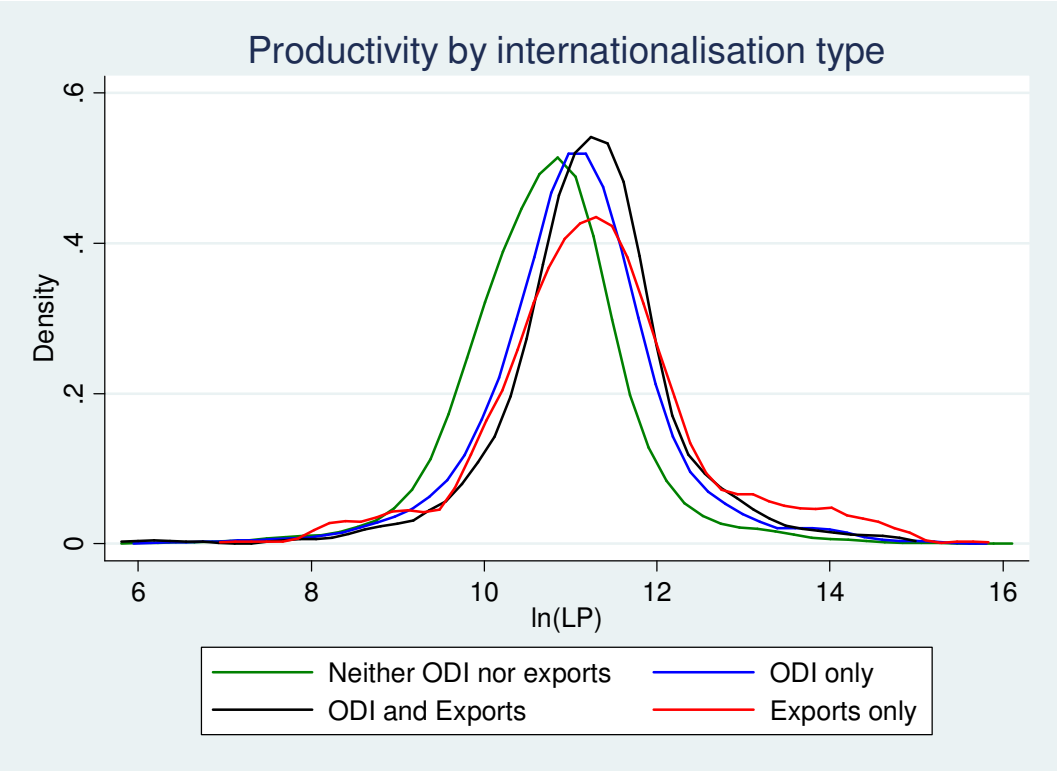
Firms that undertake ODI are considerably larger across all the measures than both exporters and domestically-focussed firms. Firms that also undertake ODI export a greater proportion of their sales from exports than exporters that do not have ownership interests in foreign firms. This suggests that ODI and exports are note necessarily simple substitutes.

Firms that do ODI but do not export employ more staff and produce higher sales and value-added than those that do both. However, they do have considerably lower labour productivity.

Turning our attention to inward internationalisation, we see that firms in which foreigners have an ownership interest are many times larger in terms of sales, employment, value-added and labour productivity.

A richer picture of the firms conducting each mode of outward internationalisation by comparing the entire distribution of firms. Figure 4 presents a kernel density graph of the (natural logarithm of) labour productivity by internationalisation type.

Figure 4 Kernel density graph of (ln) productivity by internationalisation type



- *Kernel = Epanechnikov, bandwidth = .2.*

We can test this statistically. In Table 11, we outline Wald tests of the equality of means across the groups of firms. All internationalising firms are more productive than those that do neither ODI nor exports (significant at the 1% level). The other predictions of economic theory are less clear. We cannot distinguish statistically between the mean of productivity for firms that do both ODI and exporting and those that do either ODI or exporting only. We can distinguish between firms that do ODI only and those that export only, but not at the 5% level.

Table 11 Wald tests

	Neither ODI nor exporter	Exporter only	ODI & exporter
Exporter only	26.18	.	
	(0.0000)	.	
ODI & exporter	11.4	1.41	.
	(0.0000)	(0.2348)	.
ODI only	35	3.26	0.66
	(0.0000)	(0.0712)	(0.4183)

- *Labour productivity is defined as sales minus purchases less changes in stocks divided by labour input, where labour input is defined as the sum of rolling mean employment and working proprietors*
- *Wald is an F-test of the mean of the group versus all other firms*
- *Weighted*

The Wald test is just an F-test of the means; there are tests that look at the whole distribution. The Kolmogorov-Smirnov equality-of-distributions test results are set out in Table 12 - Table 13. We can accept the hypothesis that all the distributions are different (Table 12). However, when we consider one-tailed tests these results are rather more ambiguous.

Table 12 Combined Kolmogorov-Smirnov test

	Neither ODI nor exporter	Exporter only	ODI & exporter
Exporter only	0.1701	.	
	(0.0000)	.	
ODI & exporter	0.1821	0.0851	.
	(0.0000)	(0.0000)	.
ODI only	0.1731	0.0899	0.0704
	(0.0000)	(0.0000)	(0.0350)

- *Labour productivity is defined as sales minus purchases less changes in stocks divided by labour input, where labour input is defined as the sum of rolling mean employment and working proprietors*
- *Kolmogorov-Smirnov equality-of-distributions test*
- *Weighted*

Table 13 Single Kolmogorov-Smirnov test (Row greater than column)

	Neither ODI nor exporter	Exporter only	ODI & exporter
Exporter only	0.1701	.	
	(0.0000)	.	
ODI & exporter	0.1821	0.241	.
	(0.0000)	(0.3580)	.
ODI only	0.1731	0.0551	0.0704
	(0.0000)	(0.0280)	(0.0170)

- *Labour productivity is defined as sales minus purchases less changes in stocks divided by labour input, where labour input is defined as the sum of rolling mean employment and working proprietors*
- *One-sided Kolmogorov-Smirnov equality-of-distributions test*
- *Weighted*

Table 14 Single Kolmogorov-Smirnov test (Row less than column)

	Neither ODI nor exporter	Exporter only	ODI & exporter
Exporter only	-0.0134	.	
	0.223	.	
ODI & exporter	-0.0158	-0.851	.
	0.091	0	.
ODI only	-0.0183	-0.0899	-0.0638
	0.048	0	0.036

- *Labour productivity is defined as sales minus purchases less changes in stocks divided by labour input, where labour input is defined as the sum of rolling mean employment and working proprietors*
- *One-sided Kolmogorov-Smirnov equality-of-distributions test*
- *Weighted*

Table 15 Other firm characteristics, by mode of internationalisation

	Neither ODI nor exporter	*Exporter only*	*ODI & exporter*	*ODI only*	*Total*	*% firms in group*
R&D	4.2	21.3	43.3	12.2	100	7.3
Innovator	36.4	47.2	66.0	41.6	100	38.5
New investment	21.4	32.9	47.8	30.2	100	23.5
Monopoly	4.5	4.3	2.6	2.7	100	4.4
Competition						
Captive market/no effective competition	16.9	16.0	22.4	19.2	100	16.9
No more than one or two competitors	50.9	53.9	56.2	58.7	100	51.5
Many competitors, none dominant	22.0	20.5	16.2	13.4	100	21.6
Don't know	4.6	4.4	1.1	5.5	100	4.5

Notes

- *See notes to Table 3.*

5. Empirical model and variables

So how might we empirically investigate the patterns of firms' internationalisation behaviour? The first model we might consider is to take the theory at face value. In this case we can specify a latent value – which might call firms' 'propensity to innovation'. This then could be modelled as a function of explanatory variables, including, crucially, productivity, using an ordered probit regression. That is, we define a latent variable Y^*, ranging from $-\infty$ to ∞, which is mapped to an ordered observed variable Y, where $Y = 1$ signifies a firm that neither exports nor undertakes ODI, $Y = 2$ signifies firms that exports only, $Y = 3$ signifies a firm that both exports and undertakes ODI and $Y = 4$ indicates a firm that conducts ODI only. The variable Y is thought of as providing incomplete information about the underlying Y^* according to the measurement equation:

(1) $$Y_{it} = \mu \text{ if } \tau_{\mu-1} \leq y^*_{it} < \tau_{\mu} \quad \text{for } \mu = 1 \text{ to } 4.$$

The extreme categories are defined by open-ended intervals, with $\tau_0 = -\infty$ and $\tau_4 = \infty$. Thus, observed Y is related to Y^* according to the following measurement model:

$$(2) \qquad Y_{it} = \begin{cases} 1 \Rightarrow \text{Neither exports nor ODI} & \text{if } \tau_0 = -\infty \le Y_{it}^* < \tau_1 \\ 2 \Rightarrow \text{Exports only} & \text{if } \tau_0 = \tau_1 \le Y_{it}^* < \tau_2 \\ 3 \Rightarrow \text{ODI and exports} & \text{if } \tau_0 = \tau_2 \le Y_{it}^* < \tau_3 \\ 4 \Rightarrow \text{ODI} & \text{if } \tau_0 = \tau_3 \le Y_{it}^* < \tau_4 = \infty \end{cases}$$

The structural model is:

$$(3) \qquad Y_{it}^* = \boldsymbol{\beta}\mathbf{X}_{it} + \varepsilon_{it}$$

which gives us:

$$(4) \qquad \Pr\left(Y_i = \mu \middle| \mathbf{X}_{it}, \boldsymbol{\beta}, \boldsymbol{\tau}\right) = \Pr\left(\tau_{\mu-1} < \boldsymbol{\beta}\mathbf{X}_{it} + \varepsilon_{it} \le \tau_{\mu}\right).$$

We assume that ε_{it} is normally distributed.

In our second model, we relax the assumption that these categories are ordered and merely investigate the correlates with the four separate outcomes. That is we investigate the correlates of each internationalisation outcome against the baseline of neither exporting nor ODI. Specifically, we estimate

$$(5) \qquad \Pr\left(Y_{it} = m\right) = \begin{cases} \dfrac{1}{1 + \sum_{m=2}^{4} \exp\left(\boldsymbol{\beta}_m \mathbf{X}_{it}\right)}, & \text{if } m = 1 \\ \dfrac{\exp\left(\boldsymbol{\beta}_m \mathbf{X}_{it}\right)}{1 + \sum_{m=2}^{4} \exp\left(\boldsymbol{\beta}_m \mathbf{X}_{it}\right)}, & \text{if } m = 2,3,4 \end{cases}$$

This relaxes the 'parallel regression' assumption (Long,1997) and allows the βs to vary across outcomes. In (5) we have set m=1 (neither exports nor ODI) as the baseline outcome.

One issue with using the multinomial logit model outline above is that the odds in each equation are determined without reference to the other outcomes that might be available. This is known as the independence from irrelevant alternatives property (IIA). Because of this we test the IIA assumption using the tests of Hausman and McFadden (1984) and Small and Hsiao's (1985).

The variables we use in our X vector include the following. To account for firm size, we include the (the log of) sales in the firm (from the BAI). We measure labour productivity as value added relative to total employment. Value added is calculated

as sales minus purchases (from the BAI) adjusted for changes in stocks (from the IR10) where available. Labour input is measured by the sum of rolling mean employment and working proprietors (from LEED). The variable we include in our regressions is labour productivity relative to the industry mean (taken from the whole universe of firms in the LBD), as per Grimes, Ren and Stevens (2009). From the BOS we also include variables for the firm is the recipient of FDI[8], whether it conducts R&D[9], and whether it produced a new innovation[10]. In order to remove some of the endogeneity, we include all these variables as first and/or second lags.

6. Results

6.1. Ordered probit

The results of our estimation of the ordered probit model of outward internationalisation are set out in Table 16. We use three specifications. In column (1) we present a general encompassing regression with both first and second lags of the explanatory variables. In columns (2) and (3) we present results of estimating our model with the first and second lags separately. It appears that the general model is rather over-specified, judging by the results of the two single-year specifications. Firms with greater sales and those with higher labour productivity than the industry average are 'more internationalised' than their peers. The same is true for firms in receipt of FDI and who have conducted R&D. There is also some evidence of a positive impact of previous innovation activity. However, there is evidence that the ordered probit model is a misspecification of the underlying process. This is evidenced in the estimates of the threshold parameters. Not only are these very similar to each other, but the estimates have extremely large standard errors.

[8] whether any individual or business located overseas hold an ownership interest or shareholding in the business
[9] For the last financial year, did this business undertake or fund any research and development (R&D) activities?
[10] In the last financial year, did this business develop or introduce any new or significantly improved: goods or services; operational processes; organisational/managerial processes; marketing methods?

Table 16 Ordered probit of internationalisation

Variable	(1)	(2)	(3)
$ln(sales)_{(t-1)}$	0.185	0.351***	
	(0.222)	(0.029)	
$ln(sales)_{(t-2)}$	0.163		0.341***
	(0.225)		(0.035)
$rel\_ln(LP)_{(t-1)}$	-0.045	0.110***	
	(0.056)	(0.020)	
$rel\_ln(LP)_{(t-2)}$	0.176**		0.117***
	(0.060)		(0.023)
$fdi_{(t-1)}$	0.148	0.636***	
	(0.247)	(0.108)	
$fdi_{(t-2)}$	0.384		0.648***
	(0.247)		(0.148)
$rand_{(t-1)}$	0.781***	1.363***	
	(0.180)	(0.116)	
$rand_{(t-2)}$	0.930***		1.362***
	(0.214)		(0.143)
$innovate_{(t-1)}$	0.188	0.183*	
	(0.134)	(0.091)	
$innovate_{(t-2)}$	0.047		0.152
	(0.132)		(0.107)
year	-0.038	-0.016	-0.015
	(0.073)	(0.036)	(0.065)
Threshold 1	-71.406	-27.31	-24.768
	(146.488)	(73.184)	(130.317)
Threshold 2	-69.239	-25.316	-22.769
	(146.467)	(73.184)	(130.301)
Threshold 3	-68.329	-24.403	-21.925
	(146.45)	(73.18)	(130.29)
F	35.888	92.454	69.752
p	0.0000	0.0000	0.0000
N	6,849	13,407	8,190

- *Dependent variable = 0 for neither exports or ODI, = 1 for exports only, = 2 for ODI and exports, = 3 for ODI only*
- *Weighted and stratified*

This apparent misspecification may be due to the big choice being between internationalising or not (which is what we get if we constrain the thresholds to equal zero). Because of this, we exclude the 'neither exporting nor ODI' category and see if we can distinguish between the modes of outward internationalisation. In this case we can interpret the latent variable as *the propensity to undertake ODI over exporting, given the choice to internationalise*. The results of this estimation are set out in Table 17.

Table 17 Ordered probit of internationalisation, excluding domestic focussed firms

Variable	(1)	(2)	(3)
$ln(sales)_{(t-1)}$	0.648	0.150*	
	(0.351)	(0.065)	
$ln(sales)_{(t-2)}$	-0.433		0.180**
	(0.356)		(0.066)
$rel\_ln(LP)_{(t-1)}$	-0.239*	-0.04	
	(0.093)	(0.044)	
$rel\_ln(LP)_{(t-2)}$	0.125		-0.125**
	(0.085)		(0.048)
$fdi_{(t-1)}$	0.671	0.157	
	(0.508)	(0.185)	
$fdi_{(t-2)}$	-0.572		0.238
	(0.516)		(0.266)
$rand_{(t-1)}$	0.295	0.057	
	(0.248)	(0.165)	
$rand_{(t-2)}$	0.042		0.18
	(0.244)		(0.202)
$innovate_{(t-1)}$	0.29	0.144	
	(0.238)	(0.191)	
$innovate_{(t-2)}$	0.076		0.181
	(0.223)		(0.196)
year	0.348*	0.114	0.267*
	(0.136)	(0.086)	(0.110)
Threshold 1	706.757**	233.319	542.943*
	(272.208)	(172.624)	(220.288)
Threshold 2	707.760**	234.316	543.884*
	(272.169)	(172.624)	(220.260)
F	5.052	1.536	6.915
p	0.0000	0.1620	0.0000
N	2,001	3,723	2,397

- *Dependent variable = 0 for exports only, = 1 for ODI and exports, = 2 for ODI only*
- *Weighted and stratified*

The results of this alternative ordered probit specification are rather different. There is some evidence that the ordering works as a specification (at least in columns (1) and (3)). However, the power of the variables to distinguish between the mode of internationalisation of internationalising firms is rather less. There is some evidence that larger firms (in terms of sales) are more likely to prefer ODI over exporting, but the evidence on relative labour productivity goes the other way. There is no evidence of a statistically significant effect of FDI, R&D or innovating.

We now turn our attention to the multinomial logit specification.

6.2. Multinomial logit

The results of our multinomial logit estimation are set out in Table 18. The table is divided into three sections, with the estimates of the parameters of the binary comparison between each internationalisation mode and the baseline category of none listed separately.

We find evidence that larger firms are indeed more likely to undertake all forms of internationalisation. However, the impact of relative labour productivity is less clear. Firms that are more productive than their industry peers are more likely to export in both first- and second-lag models. There is weaker evidence of a positive relationship between relative labour productivity and firms choosing to both undertake ODI and export, with the coefficient significant only in the second-lag model. It is significant in neither model for ODI only. There appears to be a significant positive relationship between whether a firm receives FDI and the probability of each mode of outward internationalisation (with the exception of the coefficient in the second-lag specification for 'ODI and exporter', which is positive but insignificant).

Firms that conducted R&D in the years previous appear to be more likely to export and to simultaneously undertake ODI and export. There is no such relationship for the choice to do just ODI. The effect of previous innovation is apparent only in the 'ODI and exporter' category.

Table 18 Multinomial Logit Results

Variable	(1)	(2)	(3)
Exporter only			
$ln(sales)_{(t-1)}$	0.035	0.324***	
	(0.234)	*(0.030)*	
$ln(sales)_{(t-2)}$	0.271		0.302***
	(0.239)		*(0.038)*
$rel\_ln(LP)_{(t-1)}$	0.008	0.125***	
	(0.067)	(0.020)	
$rel\_ln(LP)_{(t-2)}$	0.154*		0.153***
	(0.074)		*(0.025)*
$fdi_{(t-1)}$	-0.074	0.678***	
	(0.278)	*(0.118)*	
$fdi_{(t-2)}$	0.662*		0.665***
	(0.282)		(0.148)
$rand_{(t-1)}$	0.745***	1.424***	
	(0.219)	(0.142)	
$rand_{(t-2)}$	0.971***		1.385***
	(0.266)		(0.183)
$innovate_{(t-1)}$	0.133	0.146	
	(0.155)	(0.100)	
$innovate_{(t-2)}$	0.028		0.108
	(0.152)		(0.123)
year	-0.117	-0.043	-0.084
	(0.081)	(0.040)	(0.075)
Constant	231.636	80.732	164.354
	(162.825)	(79.689)	(149.604)
ODI & exporter			
$ln(sales)_{(t-1)}$	0.496	0.524***	
	(0.454)	(0.064)	
$ln(sales)_{(t-2)}$	0.115		0.576***
	(0.447)		(0.063)
$rel\_ln(LP)_{(t-1)}$	-0.094	0.097	
	(0.087)	(0.055)	
$rel\_ln(LP)_{(t-2)}$	0.238**		0.131**
	(0.085)		(0.046)
$fdi_{(t-1)}$	0.784	0.628**	
	(0.417)	(0.225)	
$fdi_{(t-2)}$	-0.356		0.476
	(0.422)		(0.269)
$rand_{(t-1)}$	1.322***	2.026***	
	(0.245)	(0.205)	
$rand_{(t-2)}$	1.369***		2.235***
	(0.247)		(0.201)
$innovate_{(t-1)}$	0.724*	0.805***	
	(0.315)	(0.206)	
$innovate_{(t-2)}$	0.328		0.644**
	(0.302)		(0.203)
year	-0.009	-0.043	-0.086
	(0.147)	(0.070)	(0.126)
Constant	6.526	75.24	160.801
	(294.433)	(141.122)	(252.616)

Variable	(1)	(2)	(3)
ODI only			
$ln(sales)_{(t-1)}$	0.907	0.383***	
	(0.545)	(0.095)	
$ln(sales)_{(t-2)}$	-0.516		0.345***
	(0.510)		(0.096)
$rel\_ln(LP)_{(t-1)}$	-0.362**	0.069	
	(0.113)	(0.069)	
$rel\_ln(LP)_{(t-2)}$	0.299**		-0.08
	(0.101)		(0.059)
$fdi_{(t-1)}$	0.354	1.100***	
	(0.871)	(0.312)	
$fdi_{(t-2)}$	0.693		1.365**
	(0.862)		(0.447)
$rand_{(t-1)}$	0.753	0.541	
	(0.437)	(0.327)	
$rand_{(t-2)}$	0.323		0.511
	(0.450)		(0.401)
$innovate_{(t-1)}$	0.103	-0.229	
	(0.254)	(0.246)	
$innovate_{(t-2)}$	-0.091		0.008
	(0.264)		(0.285)
year	0.475*	0.193	0.445*
	(0.221)	(0.147)	(0.177)
Constant	-965.438*	-395.358	-903.911*
	(444.054)	(295.732)	(355.859)
Statistics			
F	15.943	38.571	27.404
p	0.0000	0.0000	0.0000
N	6,849	13,407	8,190

- *Weighted and stratified*

As we have noted above, the robustness of our results depend upon the appropriateness of the IIA assumption. The results of our Hausman and McFadden (1984) and Small and Hsiao (1985) tests of IIA are set out in Table 19. The results of the Small and Hsiao tests support the assumption of IIA, but those of Hausman and McFadden are a little more ambiguous.

Table 19 Hausman and McFadden (1984) and Small and Hsiao (1985) tests of Independence of irrelevant alternatives

		Hausman			Small-Hsiao				
		χ^2	p		$\ln L_0$	$\ln L_1$	χ^2	p	
T12a	Exporter	66.3	0.0000	against H_0	-873.2	-2,731.6	-3,716.9	1.0000	for H_0
	ODI & exporter	9.0	0.9933	for H_0	-1963.2	-8,708.4	-13,490.5	1.0000	for H_0
	ODI only	3.0	1.0000	for H_0	-2086.3	-8,858.8	-13,545.0	1.0000	for H_0
	Neither ODI nor exporter	22.1	0.3359	for H_0	.	.	.	.	
T12b	Exporter	-1880.8	-	*	-1557.0	-5,567.7	-8,021.4	1.0000	for H_0
	ODI & exporter	136.0	0.0000	against H_0	-3591.9	-17,283.5	-27,383.2	1.0000	for H_0
	ODI only	-12.9	-	*	-3907.4	-17,657.5	-27,500.3	1.0000	for H_0
	Neither ODI nor exporter	15.8	0.1999	for H_0	.	.	.	.	
T12c	Exporter	25.3	0.0048	against H_0	-1059.0	-3,436.1	-4,754.2	1.0000	for H_0
	ODI & exporter	272.5	0.0000	against H_0	-2361.9	-10,665.3	-16,606.9	1.0000	for H_0
	ODI only	15.1	0.1777	for H_0	-2494.5	-10,728.1	-16,467.2	1.0000	for H_0
	Neither ODI nor exporter	11.1	0.4310	for H_0	.	.	.	.	

- *H_0: Odds(Outcome-J vs Outcome-K) are independent of other alternatives.*
- *Long and Fresse (2001) quote Hausman and McFadden (1984) as concluding that a negative χ^2 is evidence that IIA has not been violated.*

7. Conclusion

In this paper we have use data from the prototype Longitudinal Business Database, and in particular the Business Operations Survey, to examine firms' propensity to conduct ODI and exporting using qualitative limited dependent variable models. Firms that internationalise are larger and more productive than domestically-focused firms. However, the predictions of modern New, New Trade Theory of a clear ranking of firms that do not internationalise, those that export and those that conduct ODI is not borne out by our data. It appears that either the relationship is rather more complex, or that our analysis is insufficient to identify the process.

In our econometric analysis, we find evidence that larger firms are indeed more likely to undertake all forms of internationalisation. However, the impact of relative labour productivity is less clear. Firms that are more productive than their industry peers are more likely to export in both first- and second-lag models. There is weaker evidence of a positive relationship between relative labour productivity and firms choosing to both undertake ODI and export, with the coefficient significant only in the second-lag model. It is significant in neither model for ODI only. There appears to be a significant positive relationship between whether a firm receives FDI and the probability of each mode of outward internationalisation (with the exception of the coefficient in the second-lag specification for 'ODI and exporter', which is positive but insignificant).

We must be careful in interpreting these results. First, this paper is work in progress. It is the first iteration of our work. Second, we have identified correlations, but are less certain of uncovering causation between the explanatory variables and firms' choice of mode of internationalisation. Whilst including lags of variables accounts for this in part, in some variables there is little time-variation and so we may not be 'exogenising' effectively. We have also focussed on the BOS for simplicity. The rest of the LBD is a rich source of useful variables. In future work we will investigate new variables and methods.

References

Bernard, A.B., Eaton, J., Jensen, J.B., and Kortum, S., (2003), 'Plants and Productivity in International Trade', *American Economic Review*, 93(4), pp. 1268-1290

Boulhol, H., and de Serres, A., (2008), 'Have developed countries escaped the curse of distance?' OECD WP 610.

Devine, H., (2010), 'New Zealand Exchange Rate Volatility: Exploring Trade Implications', ESB Research Team Paper 01/10, Ministry of Economic Development, Wellington.

Devine *et al.*, (2011a), Paper presented to the New Zealand Association of Economists Annual Conference, Wellington, 28 June – 1 July 2010.

Devine *et al.*, (2011b), Paper presented to the New Zealand Association of Economists Annual Conference, Wellington, 28 June – 1 July 2010.

Devine *et al.*, (2011c), Paper presented to the New Zealand Association of Economists Annual Conference, Wellington, 28 June – 1 July 2010.

Dixit, A.K. and Stiglitz, J.E., (1977), 'Monopolistic competition and optimum product diversity', *American Economic Review*, 67, pp. 297-308.

Fabling, Richard, (2009), 'A rough guide to New Zealand's Longitudinal Business Database', Global COE Hi-Stat Discussion Paper Series, Institute of Economic Research, Hitotsubashi University, Tokyo. Available online at http://gcoe.ier.hit-u.ac.jp/english/research/discussion/2008/gde09-103.html

Fabling, R., Grimes, A., Sanderson, L., and Stevens, P.A., (2008), 'Some rise by sin, and some by virtue fall: Firm dynamics, market structure and performance', Ministry of Economic Development Occasional Paper 08/01. Available online at http://www.med.govt.nz/templates/MultipageDocumentTOC____34197.aspx

Fabling, R., and Sanderson, L., (2008), 'Firm Level Patterns in Merchandise Trade', Ministry of Economic Development Occasional Paper 08/03. Available online at http://www.med.govt.nz/templates/MultipageDocumentTOC____34258.aspx

Greenaway, D., and Kneller, R.A., (2007), 'Firm heterogeneity, exporting and foreign direct investment', *Economic Journal*, 117.517, pp. F134-F161.

Grimes, A., Ren, C., and Stevens, P.A., (2009), 'The Need for Speed: Impacts of Internet Connectivity on Firm performance', Motu Working Paper 09/15.

Hausman, J., and D. McFadden, (1984), 'A Specification Test for the Multinomial Logit Model', *Econometrica*, 52, pp. 1219-40.

Helpman, E., (1984), 'A Simple Theory of International Trade and Multinational Corporations', *Journal of Political Economy*, 92.3, pp. 451-471.

Helpman E., and Krugman, D., (1985), *Market Structure and Foreign Trade*, MIT Press.

Helpman, E., Melitz, M.J., and Yeaple, S.R., (2004), 'Export Versus FDI with Heterogeneous Firms', *American Economic Review*, 94(1), pp. 300-316

Horstmann, I.J., and Markusen, J.R, (1987), 'Strategic Investments and the Development of Multinationals', *International Economic Review*, 28(1), pp. 109-21.

Horstmann, I.J., and Markusen, J.R, (1992), 'Endogenous market structures in international trade (*natura facit saltum*)', *Journal of International Economics*, 32(1-2), pp. 109-129

International Monetary Fund, (2005), 'Exchange Rate Volatility and Foreign Exchange Hedging of Exports', In IMF New Zealand: Selected Issues. Asia-Pacific Department. April.

Long, J.S., (1997), *Regression Models for Categorical and Limited Dependent Variables*, Thousand Oaks, CA.: Sage.

Markusen, J.R., (1984), 'Multinationals, multi-plant economies, and the gains from trade', *Journal of International Economics*, 16. 3-4, p. 205-226.

Markusen, J.R. & Venables, A.J., (1998), 'Multinational firms and the new trade theory', *Journal of International Economics*, 46(2), pp. 183-203

Markusen, J.R. & Venables, A.J., (2000), 'The theory of endowment, intra-industry and multi-national trade', *Journal of International Economics*, 52(2), pp. 209-234

Melitz, M.J., (2003), 'The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity', *Econometrica*, 71(6), pp. 1695-1725.

Sayb, A., (2004), 'The Longitudinal Business Frame', Statistics New Zealand.

Small, K.A. and Hsiao, C., (1984), 'Multinomial Logit Specification Tests', *International Economic Review*, 26.3, pp. 619-627.

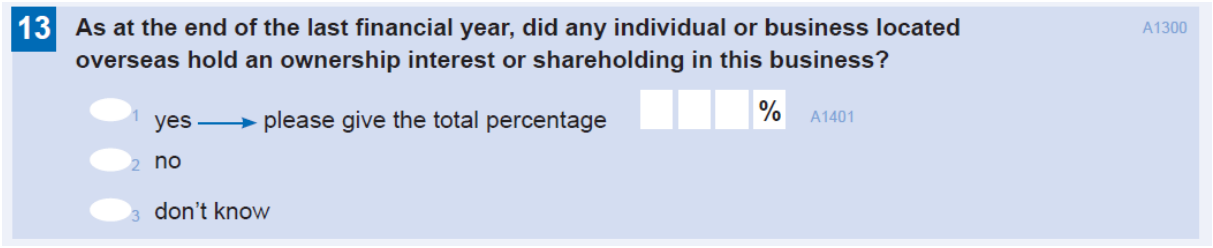
Appendix A1. Data Appendix

A1.1 Business Operations Survey

The BOS collects information from a wide cross-section of New Zealand private-for-profit businesses with six or more employees. It was designed to build a better understanding of a range of business practices and behaviours that may have some impact on business performance. The BOS has a three-part modular design. Module A collecting annual information on firm performance and operations. Module B alternates between collecting information on innovation behaviour and outcomes (in odd years) and communication technology use (in even years). The third Module is open to competitive bidding between government agencies. This has been used to address general business practices (2005 and 2009); employment practices (2006); international engagement (2007 and 2011); business strategy and skills (2008); and price-setting and wage-bargaining (2010). Crucially, the survey contains information on whether the business holds 'any ownership interest or shareholding in an overseas located business (including its own branch, subsidiary or sales office)?' It also asks whether these were gained through joint venture, acquisition of existing overseas businesses or greenfield establishment of new overseas businesses. It also asks questions whether any individual or business located overseas holds an ownership interest or shareholding in the New Zealand business (and, if so the percentage) and the percentage of its sales of goods and services that came from exports.

The key variables used in our analysis came from the following questions.

FDI



13 **As at the end of the last financial year, did any individual or business located overseas hold an ownership interest or shareholding in this business?** A1300

1 yes → please give the total percentage ☐☐☐ % A1401

2 no

3 don't know

ODI

14 **As at the end of the last financial year, did this business hold any ownership interest or shareholding in an overseas located business (including its own branch, subsidiary or sales office)?** A1400

1 yes → go to **15**
2 no
3 don't know
→ go to **16**

15 **Mark all that apply. Through which of the following methods did this business gain those overseas ownership interests or shareholdings?**

joint ventures A1501
acquisitions of existing overseas businesses A1502
greenfields (ie establishment of new overseas businesses) A1503
other methods A1504

R&D

Research and development

10 **For the last financial year, did this business undertake or fund any research and development (R&D) activities?** A1000

Include:
- any activity characterised by originality: it should have investigation as its primary objective, and an outcome of gaining new knowledge, new or improved materials, products, services or processes
- the buying abroad of technical knowledge or information

Don't include:
- market research
- efficiency studies
- style changes to existing products

1 yes → go to **11**
2 no
3 don't know
→ go to **13**

Exporting

7 **For the last financial year, estimate the proportion of this business's sales of goods and services that came from exports:** ☐☐☐% A0701

Innovation

42 **In the last financial year, did this business develop or introduce any new or significantly improved:**
- **goods or services**
- **operational processes**
- **organisational / managerial processes**
- **marketing methods?**

A4200

1 yes
2 no
3 don't know

New Investment

New investment

9 **For the last financial year, did this business invest in its expansion?**

A0900

Include:
- purchase of one or more businesses or assets (eg land, buildings, equipment)
- development or introduction of new or significantly improved goods, services or processes
- entry into new markets

Don't include:
- increases in turnover for existing business
- ongoing operational expenses

1 yes
2 no
3 don't know

Competition

29 **How would you describe this business's competition?**

A2900

1 captive market / no effective competition
2 no more than one or two competitors
3 many competitors, several dominant
4 many competitors, none dominant
5 don't know

A1.2 Business Activity Indicator (BAI) Data

The Business Activity Indicator uses GST data from the Inland Revenue Department matched to the SNZ Business Frame. The BAI data come from the Goods and Services Tax return form, GST 101. In order to create the BAI dataset, SNZ temporarily apportion the data down to a monthly frequency, apportion returns across GST group members and apply limited imputation in cases where a single return appears to be missing. As noted in Fabling *et al*. (2008), the GST-based sales and purchases data is potentially contaminated by capital income and expenditure. In particular this includes sales of second-hand assets and businesses, purchases of land, buildings, plant, machinery and businesses. For more on this subject see section 5.4 of Fabling *et al*. (2008).

Sales

The sales data in the BAI relate to 'Total sales and income for the period (including GST and any zero-rated supplies).' This is adjusted to an ex-GST basis using data on zero-rated sales as follows

$$S_E = \frac{8}{9}(S_I - Z) + Z$$

where S_E = Sales excluding GST, S_I = Sales including GST, Z = zero rated sales. In a small number of cases zero-rated GST data is missing. This scenario arises when GST total sales (and purchases) have been imputed. For these observations, we assume Z equals zero in the GST adjustment process.

Purchases

The purchases data in the BAI also come from the Goods and Services Tax return form, GST 101. They relate to 'Total purchases and expenses (including GST) for which tax invoicing requirements have been met' and include an estimate for imported goods and the use of private goods and services in taxable activity adjusted by 8/9.

A1.4 LEED/PAYE Data

Our data on employment come from the Linked Employer-Employee Database. It has two components, counts of employees and working proprietors.

Employees

Employment is measured using an average of twelve monthly PAYE employee counts in the year. These monthly employee counts are taken as at 15th of the month. This figure excludes working proprietors and is known as Rolling Mean Employment (RME).

Working proprietors

The working proprietor count is the number of self-employed persons who were paid taxable income during the tax year (at any time). In LEED, a working proprietor is assumed to be a person who (i) operates his or her own economic enterprise or engages independently in a profession or trade, and (ii) receives income from self-employment from which tax is deducted.

From tax data, there are five ways that people can earn self-employment income from a firm:

- As a sole trader working for themselves (using the IR3 individual income tax form [this is used for individuals who earn income that is not taxed at source]);
- Paid withholding payments either by a firm they own, or as an independent contractor (identified through the IR348 employer monthly schedule);
- Paid a PAYE tax-deducted salary by a firm they own (IR348);
- Paid a partnership income by a partnership they own (IR20 annual partnership tax form [this reports the distribution of income earned by partnerships to their partners] or the IR7 partnership income tax return);
- Paid a shareholder salary by a company they own (IR4S annual company tax return [this reports the distribution of income from companies to shareholders for work performed (known as shareholder-salaries)]).

Note that it is impossible to determine whether the self-employment income involves labour input. For example, shareholder salaries can be paid to owner-shareholders

who were not actively involved in running the business. Thus there is no way of telling what labour input was supplied, although the income figures do provide some relevant information.