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Innovation and international involvement of Dutch SMEs

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INNOVATION AND INTERNATIONAL INVOLVEMENT OF DUTCH SMES

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ABSTRACT

This study focuses on the relation between innovation and the international involvement of small and medium sized enterprises (SMEs), taking into account export as well as import activities of firms. The analysis is based on a sample of more than 1.800 Dutch SMEs using regression analysis. First, a positive impact is found for innovative investments on international involvement. The results of the analysis also suggest that there is a significant positive effect of several innovative realisations or practices on international involvement. More specifically, the results indicate that product innovations, strategic attention for innovation and inter-firm cooperation are positively related to export behaviour and export intensity. The results also indicate that product innovations, process innovations and supplier-driven innovations are positively related to import behaviour. Further, product innovations as well as innovations in distribution systems show a positive relation to a firm's import intensity. Finally, some evidence is also found that international involvement may stimulate firms to investment in product innovations and in new distribution systems.

Keywords: internationalisation; innovation; SMEs.

1. INTRODUCTION

Various studies suggest that small firms play an important role in realising technological innovations and in shaping a nation's innovation and competitiveness (e.g. Acs, 1996; Rothwell, 1989; Audretsch & Thurik, 2000; Audretsch, 2002). This is related to the revival of small businesses in Western economies from the 1970 onwards, commonly referred to as the emergence of the Entrepreneurial Economy (Audretsch & Thurik 2001; 2004). Increased globalisation and economic integration, developments in ICT and the increased importance of knowledge in the economic process (Thurik et al., 2002) have resulted in the re-emergence of small firms and in an increased specialisation in and importance of knowledge based activities in Western economies (Audretsch & Thurik 2000, 2001).

Furthermore, because of developments such as globalisation and technological changes, firms are increasingly involved in international markets. Yet only a small proportion of small and medium-sized enterprises (SMEs) are internationalising. This is one of the reasons why research on internationalisation of enterprises is traditionally strongly focused on large multinational enterprises. However, currently there is more attention for SME internationalisation, as it is recognised that SMEs are increasingly involved in international markets (European Commission, 2004).

The aim of this study is to explore whether a link exists between the innovativeness of SMEs and their internationalisation activities (imports and exports). Research into internationalisation of SMEs used to be primarily focused on exports. In recent years however, it has been increasingly acknowledged that exporting and importing are interrelated processes and there is more attention in research for imports and other inward modes of internationalisation (e.g. Korhonen, 1997; 1999; Liang & Parkhe, 1997).

A number of studies have explored the relationship between innovation and internationalisation of SMEs (e.g. Lefebvre & Lefebvre, 2002). These studies mainly focus on the relationship between innovation and export. However, there are also indications that a relation exists between innovation and import (Van de Graaff & Overweel, 2002; Blalock and Veloso, 2005) but there is a lack of empirical studies that address this relationship. Therefore it was decided to include imports as well as exports in the analysis.

In this study innovativeness is assessed by a number of indicators, such as the recent introduction of new products or services, the recent introduction of new or

improved internal business processes and inter-firm cooperation. International involvement is defined as being involved in exporting and/or importing activities. First, it is examined whether a positive relation exists between innovation (innovative investments and innovative practices or realisations) and international involvement of the enterprise. Second, it is also investigated whether international involvement influences innovative investments. The analysis is based on SMEs located in the Netherlands. The data relate to a sample of Dutch SMEs. Elaborating on existing research into innovativeness of SMEs (e.g. Vermeulen *et al.*, 2003), indicators for innovation will be used that are specifically developed for SMEs.

The paper is organised as follows. Section 2 provides a discussion of relevant literature and states the hypotheses. Section 3 elaborates on the main data used to test the hypotheses. Next, the results of the regression analyses are described in section 4. In section 5 the conclusions are presented.

2. LITERATURE ON INNOVATION AND INTERNATIONALISATION

2.1 Innovation in SMEs

Innovation involves the targeted renewal of products, services or working methods. Entrepreneurs innovate in order to be able to better address the demands of customers, to improve their competitiveness or to achieve better financial results for their businesses. For this reason innovation is as important for small enterprises as it is to large firms (Van de Graaff & De Jong, 2004). A growing body of literature states that small firms are important contributors for realising innovations and for shaping a country's innovativeness (e.g. Acs, 1996; Rothwell, 1989; Audretsch & Thurik, 2000; Audretsch, 2002).

There are a number of differences between SMEs and larger enterprises with respect to the way innovation takes place (Rothwell, 1991; Rothwell & Dodgson, 1994; Hadjimanolis, 2000). For example, SMEs traditionally have more limited resources for conducting R&D. Also, innovation is often less formalised in smaller enterprises. For many small firms, product innovations are not the result of a structured process or formal strategy (see e.g. Acs & Audretsch, 1990). On the other hand, SMEs are more flexible than larger firms, which enables them to respond more quickly to changes in the market than larger firms. For this reason SMEs are often

successful in developing new product-market combinations and in adapting products to the demands of niche markets or individual customers (Bernardt *et al.*, 2001).

These differences between small and larger enterprises affect the ways in which innovation is measured in SMEs. Many traditional indicators of innovation, such as expenditures on R&D are not very useful in measuring innovation in SMEs (e.g. Vermeulen *et al.*, 2003). That is why specific indicators have been developed for measuring the innovativeness of SMEs based on insights from literature (see e.g. Vermeulen *et al.*, 2003; Van de Graaff & De Jong, 2004). In this study the focus will be on these specific indicators.

2.2 Internationalisation of SMEs

The international activity of SMEs is of increased importance in a globalised economy. Traditionally, research on internationalisation of enterprises has strongly focused on large multinational enterprises. Currently there is more attention on SME internationalisation, since it is recognised that SMEs are increasingly involved in international markets (European Commission, 2004). Also, it is expected that as a result of increased globalisation and economic cooperation, SMEs will increasingly have to deal with international competition, even if the firm itself is active only in the domestic market (e.g. Reynolds, 1997; Hessels *et al.*, 2005).

Studies on the internationalisation of SMEs initially mainly focused on export activities (e.g. Bloodgood *et al.*, 1996; McDougall & Oviatt, 1996). More recently there has been more attention for imports and other inward modes of internationalisation in the fields of internationalisation research (e.g. Korhonen, 1997; 1999; Liang & Parkhe, 1997). It is important to study imports, for example because imports may contribute to the upgrading of products or services and may contribute to improving a firm's competitiveness.

Research has found that the majority of internationalised enterprises are involved in outward (e.g. export, foreign direct investment) as well as inward (e.g. import) international activities (Fletcher, 2001). The majority of Dutch SMEs that are involved in exporting activities, for example, are also involved in importing activities (Hessels *et al.*, 2005). It is increasingly recognised that inward and outward modes of internationalisation are interrelated processes (e.g. Korhonen, 1999; Van de Graaff & Overweel, 2002). For example, specific foreign inputs may be needed in order to be able to produce products that are competitive for selling on foreign markets. Also,

foreign purchasing, for example, may stimulate enterprises to start exporting (Korhonen, 1999; Lefebvre & Lefebvre, 2002; Van de Graaff & Overweel, 2002). The logic behind this idea is that the step to start exporting may be smaller when an enterprise already has business contacts in foreign countries. A firm that is involved in importing maintains a channel to a foreign market through which it gets information about this market. Lefebvre & Lefebvre (2002) found that import activity is a strong determinant of the probability for SMEs to export and of the export performance of SMEs. However, it is also possible that the export activity of firms may result in (more) imports. It is advisable not to study export and import behaviours of firms as isolated activities. In the current study, inward (imports) as well as outward (exports) modes of internationalisation are included in the analysis.

2.3 Innovativeness and internationalisation of SMEs

The link between innovation and trade has been gaining attention for a considerable length of time in several studies. A number of previous studies (e.g. Gruber et al., 1967; Baldwin, 1971; Lowinger, 1975; Stern & Maskus, 1981; Hughes, 1986; Vestal, 1989) focusing on the US, the UK and Japan have reported a significant positive influence of R&D efforts on trade in general. Also, various firm-level studies have been conducted in which technological orientation of firms is linked to their export behaviour, focusing on innovative investments as well as innovative realisations or practices. For example, a study by Hirsch & Bijaoui (1985) found that firms that undertake R&D-activities are more likely to be exporters as compared to other firms in the same industry. A study by Sterlacchini (1999), focusing on Italian manufacturing firms, demonstrated an important impact of R&D activities on export performance. Kleinknecht and Oostendorp (2002) showed that a firm's R&D intensity significantly influences the probability that a firm will be an exporter. Lefebvre & Lefebvre (2002) found that R&D is an important determinant of the probability that SMEs (defined as firms with up to 500 employees) will export, and of export performance.

A number of empirical studies suggest that innovativeness of enterprises is likely to affect the probability or propensity of enterprises to export, for example because innovation may improve the international competitiveness of an enterprise (see e.g. Wakelin, 1998; Sterlacchini, 1999; Roper & Love, 2001; Karagozoglu & Lindell, 1998). For example Karagozoglu and Lindell (1998) argue, in their study on small and

medium-sized technology based firms, that innovative enterprises are more likely to export, because prospects in international markets are more promising as compared to prospects in national markets. Also, the potential market for products of innovative firms may be much wider than is the case for less innovative firms (Autio *et al.*, 2000). In addition, innovative firms often have to anticipate competitive responses, which may encourage them to make international commitments (Franko, 1989). Therefore, innovation may result in (more) international involvement.

In explaining the relation between innovation and export performance it may be advised to distinguish between product and process innovation (Kleinknecht and Oostendorp, 2002). Product innovations may make it possible for enterprises to target new markets. Improved, modified or new products may give enterprises a (temporary) competitive advantage in foreign markets (Van Dijken & Prince, 1997).

Furthermore, improved or renewed business processes make it possible for firms to adapt or innovate products, to increase the speed of the production process and to reduce costs (Van Dijken & Prince, 1997). The acquisition of new process technology may motivate enterprises to review or revise their strategic direction and market focus (Bell *et al.*, 2004). This may stimulate enterprises to undertake international business activities or to accelerate their internationalisation process.

Most previous studies focus only on the link between innovation and export. Innovation, however, may not only stimulate enterprises to export but may also have an effect on the propensity of enterprises to import goods or services from abroad. In order to realise the necessary product and/or process innovation enterprises may need to purchase foreign inputs. Indications can be found that a positive relationship exists between innovativeness and a firm's importing activities (e.g. Blalock & Veloso, 2005; Van de Graaff & Overweel, 2002). However, there is a lack of empirical studies that address the link between innovation and import at the firm level.

Since a positive relation between innovation (innovative investments as well as realisations/practices) and the propensity of enterprises to export and/or import is expected the following hypotheses are formulated in the research design:

Hypothesis 1: Innovative investments of SMEs are positively related to international involvement.

Hypothesis 1A: Innovative investments of SMEs are positively related to export behaviour and export intensity.

Hypothesis 1B: Innovative investments of SMEs are positively related to import behaviour and import intensity.

Hypothesis 2: Innovative realisations or practices of SMEs are positively related to international involvement.

Hypothesis 2A: Innovative realisations or practices of SMEs are positively related to export behaviour and export intensity.

Hypothesis 2B: Innovative realisations or practices of SMEs are positively related to import behaviour and import intensity

Also, in previous research evidence is found for a reversed influence or an impact of export on innovation. For example, Hughes (1986) and Zhao and Li (1997) have found evidence of a mutual or reciprocal relationship between R&D and exports. Dahlman and Westphal (1982) have demonstrated, focusing on firms from Korea, that export activity enables firms to gain improvements in product quality. Kleinknecht and Oostendorp (2002) found that export intensity has a positive impact on the probability of firms to engage in R&D and on a firm's R&D intensity. The idea is that exporting provides access to new markets, knowledge, product ideas and technologies which may (further) enhance innovative capabilities (see e.g. Cavusgil & Zou, 1994). Furthermore, foreign market expansion can increase the probability for a firm to pick up foreign technology spillovers (Kleinknecht and Oostendorp, 2002). The same arguments may also hold for imports. Therefore, the following hypotheses are formulated:

Hypothesis 3: The international involvement of SMEs is positively related to innovative investments.

Hypothesis 3A: Export behaviour and export intensity of SMEs is positively related to innovative investments.

Hypothesis 3B: Import behaviour and import intensity of SMEs is positively related to innovative investments.

3. DATA

3.1 Method

The hypotheses are tested by using SME Policy Panel data. This panel is set up and controlled by EIM Business and Policy Research in the Netherlands. The panel is used for both cross-sectional and longitudinal research. Twice a year about 2000 Dutch business owners participate in this panel. The panel is stratified in two size-classes and eight economic sectors of industry.¹ For the current research detailed information on innovativeness and international business activities was collected from the business owners that participated in the SME Policy Panel in July 2004. The sample consists of 1,846 Dutch SMEs (firms with up to 100 occupied persons). The hypotheses will be tested using regression analysis.

¹ The size classes are: 0 through 9 employees, 10 through 99 employees. The sectors of industry are: Manufacturing, Construction, Trade, Lodging, Transport, Business services, Financial services and Other Services.

3.2 Measures

In the following section the measures that are used in the analysis are described.

International involvement

Several measures of international involvement are used in this paper. The measures were identified by asking the entrepreneurs whether they were currently undertaking exporting and or importing activities. Enterprises were categorised into the following categories:

- (1) **Export and/or import (2004)**. This variable takes the value 1 for enterprises that are exporting and/or importing goods or services and 0 for enterprises that are not involved in these modes of internationalisation.
- (2) **Export and import (2004)**. This variable is coded 1 for enterprises that are involved in exporting as well as importing activities and otherwise coded 0.
- (3) **Export (2004)**. This variable gets the value 1 for enterprises that are involved in exporting activities, and the value 0 for all other enterprises.
- (4) **Import (2004)**. This variable takes the value 1 for enterprises that are involved in importing activities, and 0 for all other enterprises.

Furthermore, two variables that relate to intensity of exports and imports were also included in the analysis:

- (1) **Export intensity (2004)**. This variable indicates the share of exports in a firm's total sales.
- (2) **Import intensity (2004)**. This variable indicates the share of imports in a firm's total business costs.

Innovativeness

Innovativeness was measured by several dichotomous (0/1) variables developed specifically for measuring the innovativeness of SMEs.

The following measures for the realisation of innovations were used:

- **Recent product/service introductions: new to the firm (past 3 years).** This variable is a proxy for product innovation or the renewal of products and/or services that a firm offers. The variable is coded 1 when the firm introduced at least one product new to the firm during the last three years; otherwise coded 0.
- **Recent changes or innovations in internal business processes (past 3 years).** This variable is a proxy for process innovation or the renewal or improvement of the working methods that are used. The variable is coded 1 when the firm has introduced changes or innovations in internal business processes during the last three years, and coded 0 otherwise.
- **Recent changes or innovations in distribution systems (past 3 years).** This variable is a proxy for innovations or renewals in patterns of distribution. The variable is coded 1 when the firm has introduced changes or innovations in distribution systems during the last three years, and otherwise it is coded 0.
- **Recent changes or innovations developed by suppliers (past 3 years).** This variable is a proxy for innovations that are driven or proposed by suppliers. The variable is coded 1 when the firm has introduced changes or innovations that were developed by suppliers during the last three years, and coded 0 otherwise.

Also, the following measures for innovative practices were included in the analysis:

- **Strategic attention for innovation (2004).** When the firm is continuously seeking and providing support to innovative opportunities this variable is coded 1, and coded 0 in all other cases.
- **Use of external networks (2004).** This variable is coded 1 for enterprises that maintain regular contacts with an external network of universities, suppliers and/or knowledge institutes to extend its knowledge base, and is coded 0 otherwise.
- **Inter-firm cooperation (2004).** When the firm formally cooperated with other firms or institutes to initiate or develop any renewal activities (evidenced by a formal agreement), this variable is coded 1; otherwise it is coded 0.

Finally, a number of measures were included that refer to a firm's innovative investments. One measure relates to a firm's past expenditures:

- **Expenditures on innovation (2003).** When the firm indicates having spent money on innovation in 2003 this variable is coded 1; it is coded 0 when this has not been the case.

The following measures refer to a firm's future innovative investments:

- **Plans to invest in new products/services (next 12 months).** When the firm will certainly or probably invest in new products or services in the next 12 months this variable is coded 1, and in all other cases coded 0.
- **Plans to invest in renewals in internal business processes (next 12 months).** When the firm will certainly or probably invest in renewals in internal business processes in the next 12 months this variable is coded 1, and coded 0 otherwise.
- **Plans to invest in new distribution systems (next 12 months).** When the firm will certainly or probably invest in new patterns of distribution in the next 12 months this variable is coded 1, and in all other cases coded 0.

Control variables

The following control variables were used:

- **Sector of industry:** The firms were assigned to one of the following eight industries: (1) manufacturing, (2) construction, (3) trade, (4) lodging, (5) transport, (6) financial services (7) business services, and (8) other services. 'Other services' was used as a reference category in the regression analysis.
- **Firm size:** Two size classes were distinguished for the SMEs in our sample: (1) 0-9 employed persons, (2) 10-99 employed persons.
- **Gender:** This variable takes the value 0 for females and the value 1 for males.

4. EMPIRICAL ANALYSIS

4.1 Correlation analysis

The bivariate correlation coefficients between the variables for innovation and current international involvement are presented in Table 1. A significant positive correlation is found between all indicators for innovation and all categories of internationalised enterprises. In order to shed more light on the relations between the measures for innovation and international involvement regression analysis is carried out.

Table 1:
Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 International involvement (2004)	1.00																
2 Export and import (2004)	0.58***	1.00															
3 Export (2004)	0.73***	0.79***	1.00														
4 Import (2004)	0.85***	0.68***	0.48***	1.00													
5 Export intensity (2004)	0.49***	0.56***	0.67***	0.34***	1.00												
6 Import intensity (2004)	0.52***	0.52***	0.38***	0.62***	0.33***	1.00											
7 Expenditures on innovation (2003)	0.17***	0.18***	0.19***	0.16***	0.13***	0.11***	1.00										
8 Product/service introductions: new to firm (past 3 years)	0.24***	0.24***	0.28***	0.19***	0.18***	0.17***	0.34***	1.00									
9 Changes or innovations in internal business processes (past 3 years)	0.13***	0.13***	0.13***	0.13***	0.08***	0.09***	0.42***	0.25***	1.00								
10 Changes/innovations in distribution systems (past 3 years)	0.07***	0.06**	0.08***	0.05**	0.07***	0.09***	0.24***	0.25***	0.22***	1.00							
11 Changes/innovations developed by suppliers (past 3 years)	0.07***	0.09***	0.06**	0.10***	0.01	0.05**	0.22***	0.13***	0.21***	0.13***	1.00						
12 Strategic attention for innovation	0.18***	0.17***	0.21***	0.14***	0.16***	0.11***	0.40***	0.36***	0.41***	0.25***	0.28***	1.00					
13 Use of external networks	0.09***	0.08***	0.10***	0.07***	0.07***	0.03	0.25***	0.21***	0.21***	0.15***	0.18***	0.28***	1.00				
14 Inter-firm cooperation	0.16***	0.16***	0.20***	0.12***	0.14***	0.08***	0.31***	0.30***	0.23***	0.19***	0.18***	0.32***	0.35***	1.00			
15 Invest in new product/services (next 12 months)	0.15***	0.17***	0.18***	0.14***	0.14***	0.10***	0.30***	0.36***	0.22***	0.20***	0.17***	0.39***	0.21***	0.29***	1.00		
16 Invest in renewals in internal business processes (next 12 months)	0.12***	0.13***	0.13***	0.12***	0.07***	0.08***	0.32***	0.23***	0.42***	0.21***	0.15***	0.37***	0.23***	0.24***	0.32***	1.00	
17 Invest in new distribution systems (next 12 months)	0.08***	0.10***	0.12***	0.06**	0.11***	0.09***	0.18***	0.17***	0.15***	0.34***	0.09***	0.20***	0.16***	0.16***	0.23***	0.22***	1.00
Mean	0.33	0.14	0.21	0.26	6.34	5.53	0.59	0.39	0.69	0.18	0.36	0.63	0.51	0.40	0.45	0.58	0.15
Standard Deviation	0.47	0.35	0.41	0.44	18.60	15.31	0.49	0.49	0.46	0.38	0.48	0.48	0.50	0.49	0.50	0.49	0.35
Observations	1846	1846	1824	1822	1815	1804	1843	1844	1843	1842	1835	1843	1846	1844	1775	1813	1816

Standardised regression coefficients; ***: $p < 0.01$; **: $p < 0.05$;

4.2 Regression analysis: impact of innovative investments on international involvement

First, it is investigated whether innovative investments have an impact on international involvement. 'Expenditures on innovation in 2003' is taken as a proxy for innovative investments. Table 2 shows the results of the logistic regression analysis when expenditures on innovation in 2003 are used as an explanatory variable. Various categories for international involvement are taken as the dependent variable. Considering the binary nature of the dependent variables, logistic regression analysis is used. For each of the dependent variables, both the control variables and the predictor variable are included. It is found that larger enterprises are more likely to undertake international trading activities than smaller ones ($p \leq 0.01$). Also, it can be seen that males show higher international involvement than females ($p \leq 0.01$). Furthermore, manufacturing and trade are the industries that are most likely to engage in international business activities. The predictor variable 'expenditures on innovation in 2003' has a positive impact on the categories 'export and/or import' and on the combination of export and import. With the purpose of gaining more insight into differences between the impact of innovation on export and import activities, export and import are also taken separately as dependent variables. It can be seen that manufacturing and transport are specifically export-oriented industries for SMEs, whereas trade and also manufacturing are industries that are likely to be involved in import activities. The variable 'expenditures on innovation in 2003' has a significant positive impact on 'export' as well as 'import'. Also, the results confirm that export and import are interrelated processes as the variables 'import' as well as 'import intensity' have a significant positive impact on 'export', whereas 'export' and 'export intensity' have a significant positive impact on 'import'.

Table 2: Investigating the impact of innovative investments (2003) on international involvement (2004)

	DEPENDENT VARIABLE					
	EXPORT AND/OR IMPORT (2004)	EXPORT AND IMPORT (2004)	EXPORT (2004)	IMPORT (2004)	EXPORT (2004)	IMPORT (2004)
Expenditures on innovation in 2003	0.71***	1.01***	0.61***	0.48***	0.74***	0.65***
Constant	-2.80***	-5.13***	-4.44***	-2.90***	-3.91***	-2.87***
Industry: manufacturing ¹	1.54***	2.18***	1.79***	0.62**	1.80	0.96***
Industry: construction	0.16	0.19	0.03	0.16	0.04	0.19
Industry: trade	1.32***	1.44***	0.50	1.24***	0.38	1.28***
Industry: lodging	-0.69**	-1.21*	-0.98*	-0.38	-1.03**	-0.53
Industry: transport	0.46*	0.86**	1.57***	-0.74**	1.10***	-0.63*
Industry: financial services	-0.46	0.09	0.64	-0.91**	0.16	-0.77**
Industry: business services	0.13	0.38	1.15***	-0.76**	0.79**	-0.47*
Firm size	0.41***	0.77***	0.42***	0.29**	0.51***	0.34**
Gender	0.66***	0.70**	0.43*	0.45**	0.46**	0.53***
Import (2004)			2.37***			
Export (2004)				2.38***		
Import intensity (2004)					0.05***	
Export intensity (2004)						0.03***
<i>Nagelkerke R2</i>	<i>0.192</i>	<i>0.229</i>	<i>0.396</i>	<i>0.383</i>	<i>0.307</i>	<i>0.285</i>
<i>- Δ -2 Log likelihood</i>	<i>2054***</i>	<i>1236***</i>	<i>1333***</i>	<i>1539***</i>	<i>1444***</i>	<i>1685***</i>
Observations	1843	1843	1819	1819	1801	1810

Standardised regression coefficients; ***: p<0.01; **: p<0.05; *: p<0.10.

¹ Industry category “other services” used as base case

As a next step in Table 3 ‘export intensity’ and ‘import intensity’ are taken as the dependent variables using ordinary regression analysis. The Table shows that ‘expenditures on innovation in 2003’ has a significant positive impact on a firm’s export intensity as well as on a firm’s import intensity in 2004.

Table 3: Investigating the impact of innovative investments (2003) on export intensity (2004) and import intensity (2004)

	DEPENDENT VARIABLE			
	EXPORT INTENSITY (2004)	IMPORT INTENSITY (2004)	EXPORT INTENSITY (2004)	IMPORT INTENSITY (2004)
Expenditures on innovation in 2003	2.53**	1.56*	2.98***	2.30***
Constant	-4.83**	-1.78	-3.10	-1.75
Industry: manufacturing ¹	15.43***	3.55*	16.23***	4.93**
Industry: construction	-0.55	0.39	-0.64	0.78
Industry: trade	1.55	9.39***	0.71	9.98***
Industry: lodging	0.11	-0.12	-0.74	-0.65
Industry: transport	11.97***	0.52	9.95***	0.21
Industry: financial services	3.13	0.26	1.32	0.34
Industry: business services	1.54	-1.31	0.85	-0.35
Firm size	0.04**	-0.01	0.05**	-0.01
Gender	1.75	1.80	1.93	2.36**
Import (2004)	13.25***			
Export (2004)		14.02***		
Import intensity (2004)			0.34***	
Export intensity (2004)				0.26***
<i>Adjusted R-sqaure</i>	<i>0.231</i>	<i>0.216</i>	<i>0.219</i>	<i>0.181</i>
Observations	1357	1348	1345	1345

Standardised regression coefficients; ***, p<0.01; **, p<0.05; *, p<0.10.

¹ Industry category “other services” used as base case

4.3 Regression analysis: impact of innovative practices/realisations on international involvement

In Table 4 the logistic regression results for the impact of innovative practices and realisations on international involvement are demonstrated. Again, logistic regression analysis is used because of the binary nature of the dependent variables. The following picture emerges from the analysis. The variables ‘recent product introductions’, ‘strategic attention for innovation’ and ‘inter-firm cooperation’ have a significant positive impact on international involvement.

Table 4 also shows results for the analysis in which ‘export’ and ‘import’ are taken separately as dependent variables. Some differences appear between the impact of innovative practices or realisations on export activity and import activity. The variables ‘recent product/service introductions’, ‘strategic attention for innovation’ and ‘inter-firm cooperation’ have a significant positive impact on export activity. The variables ‘recent product/service introductions’, ‘recent changes/innovations in internal business processes’ and ‘recent changes/innovations developed by suppliers’ have a significant positive impact on the probability of firms to be involved in import activity.

Table 4: Investigating the impact of innovative practices/realisations on international involvement (2004)

	DEPENDENT VARIABLE					
	EXPORT AND/OR IMPORT (2004)	EXPORT AND IMPORT (2004)	EXPORT (2004)	IMPORT (2004)	EXPORT (2004)	IMPORT (2004)
Recent product /service introductions: New to the firm (past 3 years)	0.78***	0.99***	0.85***	0.32**	0.86***	0.53***
Recent changes/innovations in internal business processes (past 3 years)	0.17	0.23	-0.08	0.37**	-0.03	0.43***
Recent changes/innovations in distribution systems (past 3 years)	0.03	-0.18	-0.18	0.09	-0.33*	0.01
Recent changes/innovations developed by suppliers (past 3 years)	0.01	0.23	-0.19	0.25*	-0.02	0.24*
Strategic attention for innovation	0.35**	0.46**	0.66***	-0.05	0.62***	0.04
Use of external networks	0.06	0.02	0.00	0.12	0.03	0.06
Inter-firm cooperation	0.24*	0.32*	0.43***	-0.03	0.44***	0.11
Constant	-2.83***	-5.28***	-4.65***	-2.93***	-4.06***	-2.91***
Industry: manufacturing ¹	1.39***	1.95***	1.61***	0.60**	1.59***	0.87***
Industry: construction	0.17	0.15	0.11	0.11	0.05	0.14
Industry: trade	1.20***	1.23***	0.35	1.19***	0.17	1.18***
Industry: lodging	-0.86***	-1.34**	-1.27**	-0.43	-1.32**	-0.63*
Industry: transport	0.38	0.80*	1.54***	-0.73**	1.02***	-0.63*
Industry: financial services	-0.68**	-0.19	0.46	-1.05***	-0.04	-0.95***
Industry: business services	-0.06	0.14	0.97***	-0.82***	0.55	-0.57**
Firm size	0.28**	0.67***	0.33**	0.22	0.43***	0.24*
Gender	0.59***	0.62**	0.37	0.41*	0.39	0.47**
Import (2004)			2.38***			
Export (2004)				2.36***		
Import intensity (2004)					0.05***	
Export intensity (2004)						0.03***
<i>Nagelkerke R2</i>	<i>0.235</i>	<i>0.274</i>	<i>0.442</i>	<i>0.392</i>	<i>0.359</i>	<i>0.303</i>
<i>- Δ -2 Log likelihood</i>	<i>1960***</i>	<i>1168***</i>	<i>1243***</i>	<i>1503**</i>	<i>1350***</i>	<i>1633***</i>
Observations	1821	1821	1798	1798	1781	1789

Standardised regression coefficients; ***: p<0.01; **: p<0.05; *: p<0.10.

¹ Industry category “other services” used as base case

In Table 5 the results for the analysis of the impact of innovative practices or realisations on export intensity and import intensity are displayed. They are based on ordinary regression analysis. The measures ‘recent product/service introductions’ and ‘strategic attention for innovation’ have a significant positive impact on a firm’s export intensity. For import intensity it is ‘recent product/service introductions’ and ‘recent changes/innovations in distribution systems’ that have a significant positive influence.

Table 5: Investigating the impact of innovative practices/realisations on export intensity (2004) and import intensity (2004)

	DEPENDENT VARIABLE			
	EXPORT INTENSITY (2004)	IMPORT INTENSITY (2004)	EXPORT INTENSITY (2004)	IMPORT INTENSITY (2004)
Recent product /service introductions: New to the firm (past 3 years)	3.12***	2.04**	3.10***	3.27***
Recent changes/innovations in internal business processes (past 3 years)	-0.75	1.48	-0.57	1.81*
Recent changes/innovations in distribution systems (past 3 years)	0.27	2.69***	-0.80	2.21**
Recent changes/innovations developed by suppliers (past 3 years)	-0.70	-0.39	-0.03	-0.16
Strategic attention for innovation	2.52**	-0.67	2.43**	-0.32
Use of external networks	-0.75	-0.23	-0.70	-0.33
Inter-firm cooperation	1.39	-1.34	1.99*	-1.18
Constant	-4.87**	-1.74	-3.23	-1.93
Industry: manufacturing ¹	14.72***	3.42*	15.48***	4.67**
Industry: construction	-0.24	0.32	-0.44	0.73
Industry: trade	1.24	9.24***	0.40	9.65***
Industry: lodging	-0.12	-0.27	-1.02	-0.99
Industry: transport	11.65***	0.11	9.77***	-0.14
Industry: financial services	2.48	-0.53	0.80	-0.50
Industry: business services	1.08	-1.51	0.41	-0.68
Firm size	0.03	-0.01	0.04**	-0.01
Gender	1.64	1.89	1.76	2.34*
Import (2004)	12.85***			
Export (2004)		13.96***		
Import intensity (2004)			0.33***	
Export intensity (2004)				0.25***
<i>R-square</i>	<i>0.239</i>	<i>0.224</i>	<i>0.227</i>	<i>0.190</i>
Observations	1340	1331	1328	1328

Standardised regression coefficients; ***: p<0.01; **: p<0.05; *: p<0.10.

¹ Industry category “other services” used as base case

4.4 Regression analysis: impact of international involvement on innovative investments

As a next step, the impact of current international involvement on innovative investments was investigated. Since the data relates only to the year 2004 a number of indicators for innovative investments are used that relate to future plans to innovate. The dependent variables are binary in nature and therefore logistic regression analysis was carried out. Table 6 shows the result for the impact of the variables ‘export and/ or import’ and ‘export and import’ on future plans to innovate. It can be seen that both measures have a significant positive impact on plans to invest in new products or services in the next 12 months. No evidence is found of an impact of the internationalisation measures on plans to invest in renewals in internal business processes. Further, whereas the measure ‘export

and/or import' has no significant impact on plans to invest in new distribution systems, a significant positive impact is found for a combination of export and import activities.

Table 6: Investigating the impact of international involvement (2004) on innovative investments (next 12 months)

	DEPENDENT VARIABLE					
	INVEST IN NEW PRODUCTS/SERVICES (next 12 months)		INVEST IN RENEWALS IN INTERNAL BUSINESS PROCESSES (next 12 months)		INVEST IN NEW DISTRIBUTION SYSTEMS (next 12 months)	
Export and/or import (2004)	0.23*		0.05		0.17	
Export and import (2004)		0.36**		0.13		0.37*
Constant	-1.43***	-1.38***	-2.64***	-2.63***	-4.02***	-3.96***
Recent product /service introductions: New to the firm (past 3 years)	0.96***	0.95***	0.11	0.10	0.13	0.11
Recent changes/innovations in internal business processes (past 3 years)	0.08	0.08	1.25***	1.25***	0.18	0.17
Recent changes/innovations in distribution systems (past 3 years)	0.33**	0.34**	0.50***	0.50***	1.53***	1.54***
Recent changes/innovations developed by suppliers (past 3 years)	0.18	0.17	-0.03	-0.03	0.09	0.07
Strategic attention for innovation	1.18***	1.18***	0.81***	0.81***	0.76***	0.77***
Use of external networks	0.19	0.19	0.37***	0.37***	0.39**	0.40**
Inter-firm cooperation	0.54***	0.53***	0.33***	0.33**	0.26	0.26
Industry: manufacturing ¹	-0.27	-0.30	0.34	0.33	0.55	0.47
Industry: construction	-0.41	-0.41	0.01	0.01	-0.04	-0.05
Industry: trade	-0.59**	-0.58**	0.23	0.23	0.53	0.50
Industry: lodging	-0.70***	-0.70***	0.05	0.05	0.55	0.55
Industry: transport	-0.63**	-0.64**	0.21	0.20	0.96**	0.94**
Industry: financial services	-0.64**	-0.65**	0.47*	0.47*	0.82**	0.79**
Industry: business services	-0.17	-0.18	0.04	0.04	0.42	0.41
Firm size	0.16	0.15	0.77***	0.76***	-0.05	-0.07
Gender	-0.37**	-0.36**	-0.02	-0.02	0.19	0.19
<i>Nagelkerke R2</i>	<i>0.311</i>	<i>0.312</i>	<i>0.344</i>	<i>0.344</i>	<i>0.225</i>	<i>0.227</i>
<i>- Δ -2 Log likelihood</i>	<i>1948***</i>	<i>1947***</i>	<i>1908***</i>	<i>1908***</i>	<i>1241***</i>	<i>1239***</i>
Observations	1752	1752	1790	1790	1793	1793

Standardised regression coefficients; ***: p<0.01; **: p<0.05; *: p<0.10.

¹ Industry category "other services" used as base case

In Table 7, the influence of the measures 'export' and 'import' on future plans to innovate is investigated separately. A significant positive impact is found for 'import' on plans to invest in new products or services in the next 12 months, and no significant impact for 'export'. Similar to results that were found for the other categories of international involvement ('import and/or export' and 'import and export') the variable 'import' and the variable 'export' do not have a significant influence on plans to invest in

renewals in internal business processes. For plans to invest in new distribution systems a significant positive effect is found for ‘export’ and no significant effect for ‘import’.

Table 7: Investigating the impact of export (2004) and import (2004) on innovative investments (next 12 months)

	DEPENDENT VARIABLE		
	INVEST IN NEW PRODUCTS/SERVICES (next 12 months)	INVEST IN RENEWALS IN INTERNAL BUSINESS PROCESSES (next 12 months)	INVEST IN NEW DISTRIBUTION SYSTEMS (next 12 months)
Import (2004)	0.28*	0.09	-0.07
Export (2004)	0.11	0.02	0.42**
Constant	-1.43***	-2.67***	-3.95***
Recent product /service introductions: New to the firm (past 3 years)	0.94***	0.12	0.05
Recent changes/innovations in internal business processes (past 3 years)	0.08	1.25***	0.17
Recent changes/innovations in distribution systems (past 3 years)	0.35**	0.49***	1.56***
Recent changes/innovations developed by suppliers (past 3 years)	0.15	-0.03	0.08
Strategic attention for innovation	1.17***	0.79***	0.74***
Use of external networks	0.17	0.37***	0.37*
Inter-firm cooperation	0.56***	0.33**	0.27
Industry: manufacturing ¹	-0.32	0.31	0.49
Industry: construction	-0.38	0.04	-0.06
Industry: trade	-0.59**	0.25	0.53
Industry: lodging	-0.69**	0.07	0.54
Industry: transport	-0.62**	0.26	0.85**
Industry: financial services	-0.59**	0.48*	0.75**
Industry: business services	-0.14	0.07	0.37
Firm size	0.15	0.76***	-0.06
Gender	-0.38**	-0.01	0.20
<i>Nagelkerke R2</i>	<i>0.311</i>	<i>0.343</i>	<i>0.226</i>
<i>- Δ -2 Log likelihood</i>	<i>1921***</i>	<i>1890***</i>	<i>1220***</i>
Observations	1731	1769	1772

Standardised regression coefficients; ***, p<0.01; **, p<0.05; *, p<0.10.

¹ Industry category “other services” used as base case

Finally, Table 8 investigates the impact of ‘export intensity’ and ‘import intensity’ on future plans to innovate. The table shows that no significant impact is found for these measures on intentions to invest in innovations in the near future.

Table 8: Investigating the impact of export intensity (2004) and import intensity (2004) on innovative investments (next 12 months)

	DEPENDENT VARIABLE		
	INVEST IN NEW PRODUCTS/SERVICES (next 12 months)	INVEST IN RENEWALS IN INTERNAL BUSINESS PROCESSES (next 12 months)	INVEST IN NEW DISTRIBUTION SYSTEMS (next 12 months)
Import intensity (2004)	0.00	0.00	0.00
Export intensity (2004)	0.00	0.00	0.00
Constant	-1.34***	-2.71***	-3.97***
Recent product /service introductions: New to the firm (past 3 years)	0.94***	0.14	0.06
Recent changes/innovations in internal business processes (past 3 years)	0.05	1.25***	0.16
Recent changes/innovations in distribution systems (past 3 years)	0.32**	0.51***	1.51***
Recent changes/innovations developed by suppliers (past 3 years)	0.16	-0.02	0.09
Strategic attention for innovation	1.19***	0.79***	0.75***
Use of external networks	0.18	0.36***	0.37**
Inter-firm cooperation	0.57***	0.35***	0.28*
Industry: manufacturing ¹	-0.31	0.38	0.62
Industry: construction	-0.41	0.00	0.02
Industry: trade	-0.61**	0.28	0.56
Industry: lodging	-0.75***	0.04	0.59
Industry: transport	-0.69**	0.30	0.94**
Industry: financial services	-0.64**	0.45	0.88**
Industry: business services	-0.21	0.07	0.51
Firm size	0.15	0.79***	-0.06
Gender	-0.39**	0.02	0.15
<i>Nagelkerke R2</i>	<i>0.310</i>	<i>0.342</i>	<i>0.219</i>
<i>-Δ -2 Log likelihood</i>	<i>1898***</i>	<i>1869***</i>	<i>1203***</i>
Observations	1708	1746	1749

Standardised regression coefficients; ***: p<0.01; **: p<0.05; *: p<0.10.

¹ Industry category “other services” used as base case

Based on the above support is found for Hypothesis 1, since expenditures on innovation are positively related to all categories of international involvement. Also, some support is found for Hypothesis 2, as a significant positive influence is found for various measures of innovative practices/realisations on various categories of international involvement. Finally, the results of this study also provide some support for Hypothesis 3, which states that international involvement may contribute to a firm’s innovativeness.

5. CONCLUSION AND DISCUSSION

In this study the relationship between innovation and international involvement was explored. International involvement was defined as the extent to which enterprises are importing and/or exporting goods or services. While existing literature on the internationalisation of enterprises is strongly focused on export and other outward modes of internationalisation, inward modes of internationalisation (imports) were also included in the analysis. Also, literature on the relationship between innovation and internationalisation has thus far mainly focused on export.

First, it was investigated whether innovation has a positive impact on international involvement. The results of this study reveal that when firms invested money in innovation in 2003, it had a significant positive impact on their international involvement in 2004.

Looking more specifically at innovative realisations or practices it is found that a number of measures for innovation have a significant positive effect on international involvement. More specifically, the results suggest that SMEs that recently realised product innovations are more likely to be involved in international trading activities than other SMEs. In accordance with previous studies it is found that product innovations are related to export behaviour and to a firm's export intensity (e.g. Karagozoglu & Lindell, 1998; Lefebvre & Lefebvre, 2002). Also, a significant positive impact of recent product innovations on the propensity of firms to import and on import intensity is illustrated. This supports the idea that the realisation of product innovations may require specific foreign inputs, such as technologies or knowledge. It is also found that recent product innovations may stimulate enterprises to combine both export and import activities.

Furthermore, according to the results of this study, recent innovations in business processes have a significant positive impact on the probability for enterprises to import. Also, some evidence is found of a positive impact of process innovations on a firm's import intensity. One explanation for the positive effect of recent process innovations on the import behaviour and import intensity of SMEs is that process innovations are often initiated in order to realise cost reductions. One of the most important reasons for SMEs to import is to get access to know how and technology and to buy products at lower

prices than would be possible on the national market (Hessels *et al.*, 2005). Thus, imports may provide firms with access to the necessary know how/technology or to (cheap) inputs needed for realising the required innovations in internal business processes. A focus on internal processes and cost reduction may also imply that enterprises are not so much concentrating on seeking foreign market expansion, which may explain that no significant effect was found on the propensity of enterprises to export.

Also, the results of this study indicate that when a firm realises innovations that are initiated by suppliers this may enhance their involvement in import activity. With this type of innovation firms are stimulated by their suppliers to adopt e.g. new technologies or applications in their firm. Again the argument is that this type of innovations possibly requires foreign purchases or knowledge. Another result of this study is that the realisation of innovations in distribution systems only shows a significant positive relation to a firm's import intensity and not to other categories of international involvement.

Furthermore, it is also found that the innovative practice 'strategic attention for innovation' has a significant positive impact on the likelihood of enterprises to be involved in international markets. Enterprises with strategic attention for innovation are more likely to be involved in international trading activities than other enterprises. Strategic attention for innovation is positively related to export behaviour, export intensity and to the combination of both export and import activities. No significant impact is found on import behaviour and import intensity. Thus, strategic attention for innovation seems to be mainly related to an outward-oriented international focus. In general it requires more effort for a firm to export than to import, which is for example illustrated by the fact that enterprises barely face barriers in the import process (Hessels *et al.*, 2005). In order to export their products or services enterprises normally need to develop an export plan and export strategy. It is possible that enterprises with strategic attention for innovation are more ready or capable to devoting strategic attention to and preparing themselves for the export process.

In addition, the results of this study reveal that inter-firm cooperation has a significant positive impact on the probability of enterprises to be involved in export and/or import

activity. A positive impact for this variable was found on the combination of export and import activities. This may suggest that when a firm cooperates in the field of innovation, it may require or stimulate import activity on the one hand and result in export opportunities on the other hand. Looking at export and import separately, the effect of inter-firm cooperation is significant positive on exports while no significant effect is found on imports. Also, some evidence is found of a positive impact on a firm's export intensity. Finally, the results of the analysis suggest that keeping up regular contacts with external networks of universities, suppliers and/or knowledge institutes does not have a significant effect on the international involvement of SMEs.

Next, it was also investigated whether international involvement has an impact on innovative investments. It is found that 'export and/or import' and a combination of export and import have a significant positive impact on a firm's intentions to invest in new products or services in the coming year. Looking at export and import separately it is found that SMEs that import are more likely to invest in new products or services in the next year as compared to other SMEs, whereas no significant effect was found for SMEs that export. This may illustrate that when a firm imports goods or services from abroad, it may get access to knowledge, technologies or product ideas in the foreign market that could stimulate the firm to (further) invest in renewals of its own products or services. No evidence is found of an impact of international involvement on plans to invest in renewals or improvements in internal business processes. Finally, the results of this study indicate that exporters as well as firms that combine export and import activities are more likely to invest in new distribution systems in the near future as compared to other firms.

Based on the analysis it may be concluded that it is useful to include imports in the analysis when studying the relationship between innovation and internationalisation. Several measures of innovation have an effect on import behaviour and import intensity and the impact of innovation on import differs in a number of ways from that of innovation on export. Of course import and export are different activities. Imports relate to the buying or purchasing function whereas exports are per definition sales oriented. But, for example, the significant positive effect of a number of measures for innovation on the probability of enterprises to be involved in a combination of export and import

activity may imply that there is some interaction effect between imports and exports. Also, in accordance with previous findings (e.g. Lefebvre & Lefebvre 2002), the separate analysis for export, in which import was concluded as a control variable, and for import, in which export was included as one of the controls, illustrate that there is a clear link between export and import. However, in the current analysis it was not possible to identify directions of causality between export and import since both indicators were only measured for the year 2004.

The results of this study give a number of options for possible linkages that may exist between innovation and international involvement. For example, the results suggest that recent innovations in products or services or recent process innovations may stimulate SMEs to be involved in import activities. Then, import activity is suggested (in addition to recent product innovations) to further enhance investments in product innovations. More research is needed in order to assess the complex relationship between international business activities and innovation, and to better understand the connection between inward and outward modes of internationalisation.

Using an analysis over a longer period of time would provide better insight into the relation between innovation and internationalisation behaviour of firms. For example, because entrepreneurs were only questioned at one point in time it is not possible to assess whether firms that have indicated intention to invest in innovations in the next 12 months will actually make these investments. In the analysis presented above only two modes of internationalisation (import and export) are included in the analysis. Future research could also take account of other modes of internationalisation such as foreign direct investments and international cooperation. This study only focused on SMEs in the Netherlands. The results should also be tested for SMEs in other countries.

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