DOES INTERNATIONALIZATION FOSTER FIRM PERFORMANCE?

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DOES INTERNATIONALIZATION FOSTER FIRM PERFORMANCE?

Bevordert internationalisering bedrijfsprestaties?
(met een samenvatting in het Nederlands)

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geboren op 9 december 1980 te Amersfoort

Promotoren: Prof. dr. C. van Marrewijk
Prof. dr. P.A.G. van Bergeijk

The wind carries to my ears
precious sounds of life
Ásgeir - Higher

Acknowledgement

I remember meeting my supervisor-to-be Peter at his office in The Hague in the summer of 2010 to talk about the opportunity to write my dissertation. I recall him saying: "Be very aware of what you are getting yourself in to. You should be prepared for four years of just you and a big pile of books in a room with the door closed if you decide to write the thesis". He was not wrong. Writing a dissertation can be lonely sometimes, but luckily I have had the opportunity to collaborate with many great people during this process. In my private life I have always been surrounded by my friends and family who offered me the necessary distraction from the everyday research struggles. I would like to take the opportunity to thank those people who have been important to me in the process of writing my dissertation.

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Marcel van den Berg
Bilthoven, March 2014

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Chapter 1

Introduction

1.1 Background

Until the mid-1970s firms have not been playing a central role in models of international trade. The basic assumptions regarding firm behavior were limited to profit maximization and constant returns to scale, but trade patterns were not determined by firm-level decision making (Greenaway and Kneller, 2007a). Porter (1990) was one of the first to acknowledge the importance of considering the behavior of individual firms in an international environment. A new generation of trade models sparked by the work of Krugman (1979), which are coined 'new theories of trade', does explicitly incorporate firms and firm behavior along the lines of the monopolistic competition premise. Krugman (1979) shows that international trade does not necessarily need to result from differences in factor endowments or technologies between countries. Indeed, Krugman (1979) shows that trade could just as well result from firms incurring scale efficiencies, thereby extending their markets across international borders. However, in this framework all firms export as a result of the assumed 'love of variety' preferences of consumers inducing firms to each produce a unique variety of a product for which consumer demand exists (Greenaway and Kneller, 2007a). Nonetheless, this premise does not align with what is being observed in the real economy; within sectors exporters and non-exporters co-exist and survive, an empirical observation first done by Bernard, Jensen, and Lawrence (1995) employing firm-level trade data from the United States. Since then, a stream of both theoretical and empirical research has continuously increased our knowledge of firm heterogeneity and internationalization of business activities.

The new generation of trade models derived from the empirical observa-

tion that considerable within sector heterogeneity along various dimensions exists is sometimes aptly but rather prosaically coined 'new new theories of trade'. The defining characteristic of this type of trade models, which sets them apart from the generation of 'new theories of trade', is the fixed cost associated with foreign market entry (Greenaway and Kneller, 2007a). Due to the sunk cost the firm needs to incur to enter foreign markets it needs to be more efficient than domestically oriented firms in order to be able to bear this sunk cost. Hence, only sufficiently productive firms, producing at lower marginal cost are able to bear the sunk cost and will thus enter foreign markets. Important theoretical contributions on this mechanism have been done by Roberts and Tybout (1997); Clerides, Lach, and Tybout (1998); Melitz (2003); Bernard, Eaton, Jenson, and Kortum (2003); Helpman, Melitz, and Yeaple (2004). Since the groundbreaking empirical observations of Bernard, Jensen, and Lawrence (1995) the increasing availability of firm-level panel data sets has fueled further empirical research in this field. A stream of empirical papers has since then presented compelling evidence that firms engaging in international trade perform better than firms that focus primarily on domestic markets. This holds for numerous dimensions of firm performance; trading firms are shown to be larger, more productive, more capital intensive, pay higher wages, invest more in R&D and have a higher probability of survival. Greenaway and Kneller (2007a), Wagner (2007), Bernard, Jensen, Redding, and Schott (2011) and Wagner (2012b) provide extensive surveys of the state of affairs in this empirical field of research.

The first decade of empirical research in the field of firm heterogeneity and internationalization mainly focused on establishing that exporters on average outperform non-exporters and unraveling the accompanying direction of causality issue: do exporters outperform non-exporters because they export or vice versa? Wagner (2007) summarizes the state of research by stating that compelling empirical evidence shows that future exporters are already more productive relative to continuing non-exporters years before export market entry. This implies that more productive firms tend to self-select for an export start. In addition, the empirical evidence in favor of the learning-by-exporting hypothesis is much less compelling. In recent years research in this field has been extended to other dimensions of firm heterogeneity and internationalization. As said, until recently most attention was directed towards the relationship between export status and firm performance, while the impact of importing on firm performance has been investigated considerably less frequently, a point also stressed by Wagner (2012b). In addition, research on the extensive margins of exports has also gained momentum in recent years. This research evolves around the cen-

tral question whether productivity premia of exporting are associated with (the number of) destination countries and (the number of products) being exported. The analogy of this association can be readily extended to productivity premia of importing. It seems intuitively straightforward to hypothesize that the potential for productivity gains from importing hinges crucially upon what products are being imported and where they are being imported from. The mechanisms through which importing and productivity could be causally related are myriad. Firms could benefit from specialization opportunities, high quality inputs from the technological frontier, cheaper inputs, a wider variety of inputs that better fit their production process or from learning from foreign suppliers (see section 3.2 for an elaborate discussion). This field has however remained largely unexplored empirically.

In addition to the connection between internationalization of business activities and productivity research on several other dimensions of firm performance has also gained momentum in recent years. Indeed, Wagner (2012b) surveys the empirical evidence concerning the relationship between trading and wages (frequently based on employer-employee linked data), trading and profitability and trading and firm survival. The increased availability of firm-level trade data fueled research in the field of export promotion as well. Until recently, empirical work regarding the effectiveness of export promotion efforts by governments was generally based on macro-level data. Abundant research exists, usually in the setting of the well-established gravity model of trade, concerning the impact of export promotion agencies, diplomatic representations of one country in another, trade missions, state visits or other expressions of economic diplomacy on aggregate exports (see Moons and Bergeijk (2013) for a meta-analysis). However, the increasing availability of firm-level data poses the huge advantage of enabling researchers to track the export performance of individual beneficiaries of economic diplomacy and export promotion and benchmark their performance against unsupported exporters at the micro-level. Nonetheless, most of the micro-level research in this field thus far focuses on export promotion in developing countries. In addition, due to data complexities the micro-level research on this topic is still quite scarce.

Regarding these extended fields of research, Wagner (2012b, p. 262) argues that *"In other sub-fields the number of studies is still too small to argue that we have sound empirical evidence on the direction (not to talk about the size) of the link between trade and the respective dimension of firm performance. ... The marginal return to further micro-econometric studies on these topics, therefore, is large."*In the next section we introduce the research questions underlying the analysis in this dissertation which are inspired by

the still undecided debates and the gaps in the literature identified in this section.

1.2 Research questions, motives and contributions

The synthesis of the current state of research in section 1.1 shows that our knowledge of firm heterogeneity and internationalization has accumulated greatly over the past two decades. Nonetheless, it also revealed that on a number of topics the jury is still out, in addition to a few apparent gaps in the literature. In this dissertation we aim to address a selection of the still outstanding issues identified in section 1.1.

Although the existence of a productivity premium of exporting and the direction of causality between export status and productivity are well-established, empirical work on the relationship between importing and productivity is much more scarce thus far. That is, the existence of a productivity premium associated with importing is rather undisputed, but the empirical results concerning the magnitude of the premium have not converged to consensus yet. In addition, the debate is still ongoing regarding the self-selection into import markets and learning-by-importing hypotheses. We aim to deepen our understanding of the mechanism connecting importing and productivity by addressing the following set of research questions, which is the topic of chapter 3:

Research question 1a. *Is there a productivity premium associated with importing activities of Dutch firms including small businesses?*

Research question 1b. *Is there heterogeneity in the relationship between importing and firm-level productivity along the firm size distribution?*

Research question 1c. *What is the direction of causality between importing and productivity: do firms self-select into import markets and/or do they learn-by-importing?*

Research question 1d. *Is there heterogeneity in self-selection into importing along the firm size distribution?*

This study adds to the literature in several ways. First, to the best of our knowledge it is the first Dutch attempt to investigate firm heterogeneity

regarding import status and firm performance.[1] The value of this contribution is stressed by Wagner (2011) who advises researchers to *"Recognize the important role of scientific replication studies that re-examine ideas from published research using different data sets from different countries and periods"*. Second, we investigate the relationship between firm size and productivity premia of importing along the full firm size distribution, particularly focusing on small firms (1-5 FTE). This is a sizable group particularly neglected in the firm heterogeneity literature, which has largely been focusing on medium-sized and large firms thus far. Data sets underlying research in this field frequently include only firms with at least 2, 5, 10 or sometimes even 20 employees. In many cases the underlying requirement for firms to show up in the data is to have at least one employee on payroll, which generally boils down to a minimum firm size of 2 FTE; the working owner plus one paid employee. A notable advantage of the Dutch micro-data is that it also includes sole proprietorships with a firm size of just 1 FTE. The focus on small business is interesting, since the persistence of trade increases with firm size and the fraction of non-traders is notably higher among small firms. The observation that trade patterns are more pronounced among smaller firms is an indication that taking the step into foreign markets is a more dramatic decision for small firms relative to larger firms. This is intuitively straightforward, since the fixed sunk cost associated with a trade start are expected to weigh relatively more heavily on smaller firms, rendering investigation of the magnitude of the importer premia along the firm size distribution an interesting avenue for research. Third, we account for differences between goods importing manufacturing firms, wholesale and retail traders and goods importing service providers in the analysis, whereas most research generally focuses on manufacturing sectors.

A notable gap in the literature we identified in section 1.1 is the impact of the extensive margin of imports on firm-level productivity. The little empirical work that has been done on this topic frequently confuses the impact of the geographic origin of imported goods on productivity with the intrinsic qualities of the imported goods. This confusion is most clear in studies where all imports from advanced countries are assumed to be high-technology of nature (and all other imports by implication are low-technology imports). This issue is investigated in chapter 4 where we aim to show that this assumption is unwarranted by addressing the following

[1] See Kox and Rojas-Romagosa (2010) for an empirical analysis of the relationship between export participation and productivity using Dutch firm-level data.

research questions.

Research question 2a. *Do the characteristics of imports in terms of the geographic origin affect the diffusion of productivity gains from importing?*

Research question 2b. *Do the characteristics of imports in terms of the factor intensity of the imported good affect the diffusion of productivity gains from importing?*

Research question 2c. *Do the characteristics of imports in terms of the degree of diversification of the import portfolio (the number of import markets in geographic or product terms on which the firm is active) affect the diffusion of productivity gains from importing?*

Research question 2d. *Do the characteristics of imports in terms of the geographic origin and the factor intensity of the imported good and the degree of diversification of the import portfolio simultaneously affect the diffusion of productivity gains from importing?*

Our contribution to the literature in this chapter is fourfold. We contribute by studying the relationship between firm productivity and (i) the geographic dimension of imported goods (both advanced-developing and proximate-remote), (ii) the intensity dimension of imported goods, (iii) the geographic-intensity interaction and (iv) the degree of diversification of the import portfolio. Our results regarding the geographic-intensity interaction will determine, in particular, how important it is to distinguish clearly between these two dimensions.

Theoretical models concerning firm heterogeneity and internationalization explicitly include profit levels as an expression of the profit maximization principle that is at the core of economic theory. These models do not explicitly consider profit rates, which are, however, important to take into account. Indeed, profit rates indicate to which extent the firm is able to operate competitively on both the production side and as a seller on domestic and foreign markets. In addition, considering profit rates enables the investigation of the relationship between profitability and exporting along the firm size distribution, since the firm size component is removed from the profit measurement. More generally, the question whether exporting affects firm level profitability is also relevant since profitability is an important dimension of firm performance evaluations by financial analysts and investors.

Nonetheless, as we have seen in section 1.1, the empirical literature dealing with the relationship between internationalization of business activities and profitability is rather small and yields inconclusive results thus far. Indeed, the fact that this empirical literature is still rather small seems to stem mainly from the limited availability of profit data. However, the compelling evidence showing that exporting and productivity are positively correlated cannot be readily extended to include profitability, since numerous other factors affect profitability as well. This brings us to the following research question, which will be tackled in chapter 5.

Research question 3a. *Which empirically testable hypotheses concerning the relationship between exporting and profit margins can be derived from existing theoretical models regarding firm heterogeneity and trade?*

Research question 3b. *What is the relationship between internationalization and firm-level profit margins?*

Research question 3c. *Is there heterogeneity in the relationship between internationalization and firm-level profit margins along the firm size distribution?*

Research question 3d. *What is the relationship between firm-level productivity and profit margins?*

This chapter particularly adds to the still small literature dealing with the relationship between internationalization and profitability both theoretically and empirically. Our theoretical contribution lies in the process of making profit margins an explicit parameter in existing theoretical models concerning firm heterogeneity and internationalization. This process naturally enables us to derive predictions from the theory regarding the effect of exporting on profit margins. Our theoretical analysis contributes to the literature by explicitly accommodating for the potentially differential impact of internationalization on profit levels and profit margins. In addition, to the best of our knowledge it is the first attempt to investigate firm heterogeneity, internationalization and profitability employing Dutch firm-level data accounting for both import and export status and with a particular focus on small businesses.

In section 1.1 we argued that the increased availability of firm-level trade data fueled research in the field of export promotion. A field in which most research empirical work was based on macro-level data and gravity model

based research until recently. However, the increasing availability of firm-level data enables researchers to track the export performance of individual beneficiaries of public support and benchmark their performance against unsupported exporters at the micro-level. This facilitates evaluation of the direct connection between the export promotion instrument and export performance, which adds to the measurement quality of the effectiveness of export promotion efforts by governments. Nonetheless, due to data complexities the micro-level research on this topic is still scarce and most of the research in this field thus far focuses on export promotion in developing and emerging markets. We investigate the effectiveness of export promotion by the Netherlands along the lines of the following research questions, which we pick up in chapter 6.

Research question 4a. *What is the effect of export promotion program participation of Dutch small businesses on the export value generated by supported export starters relative to unsupported beginning exporters?*

Research question 4b. *What is the effect of export promotion program participation of Dutch small businesses on the export share in sales of supported export starters relative to unsupported beginning exporters?*

Research question 4c. *What is the effect of export promotion program participation of Dutch small businesses on the probability for supported export starters of becoming a permanent exporter relative to unsupported beginning exporters?*

This chapter contributes to the literature dealing with the impact of governmental export promotion instruments on export performance employing firm-level micro-data in three ways. First, this chapter contributes to the still small empirical literature tracking individual firms receiving public support and benchmark their export performance against that of unsupported beginning exporters. Second, this chapter adds to the virtually non-existent firm-level research of the effectiveness of export promotion in advanced economies, the small amount of research available on this topic thus far mostly concerns export promotion in developing and emerging economies. Third, the instrument we investigate specifically targets small businesses, a group that is not frequently considered separately in this respect even though perceived trade barriers are generally found to be more inhibiting to small businesses.

1.3 Outline of the thesis

This thesis consists of seven chapters.[2] Following this introductory chapter we start in chapter 2 by detailing the compilation procedure followed in the process of building the firm-level panel data set underlying the analysis in chapters 3 through 6. We introduce the various source data sets and the merging steps taken, resulting in the micro-level panel data set that serves as the basis for our empirical investigations. We detail the persistence of trade in the Netherlands and put the international involvement of Dutch businesses in an international perspective. The estimation procedure concerning total factor productivity, a key variable of interest in the analysis particularly in chapters 3 and 4, is laid out in chapter 2 as well. We conclude this chapter by providing some suggestions to facilitate future research based on micro-data sets provided by Statistics Netherlands. Chapters 3 through 6 each deal with an empirical aspect of firm heterogeneity and internationalization of business activities. Chapter 7 summarizes the main findings and concludes this thesis. We briefly discuss the topic of the research chapters below.

In chapter 3 we investigate the relationship between import status, firm size and productivity and we explore the direction of causality between import status and productivity. We proceed in three steps. In the first step we aim to gain an understanding of the productivity premia associated with importing, exporting or doing both simultaneously. In this step we specifically pay attention to possible heterogeneity in trade premia between firm size groups. In the second step we investigate the self-selection hypothesis; are import starters already more productive than firms that continuingly source their inputs exclusively from domestic markets? In the third step we consider the reversed causality and analyze whether firms incur efficiency gains in the years after entry into foreign input markets by learning from foreign suppliers.

We build on the empirical findings from chapter 3 in chapter 4 by investigating whether the relationship between import status and productivity is moderated by the geographic dimension and the intensity dimension of the imported goods; does the productivity premium depend on which goods are being imported from which country? This chapter is co-authored by Charles van Marrewijk. Again, we proceed in three steps. First we consider the geographical dimension of imports and investigate whether the distance to and the development level of the supplying country affect the productiv-

[2] This dissertation has been written in the context of the GAP-project. See Chang and Van Marrewijk (2013) and Tamminen and Chang (2013) for two research papers that have as yet been published as part of this project.

ity premium of importing. The intensity dimension of the imported good, what type of good is being imported, is considered in the second step. In the third step we factor in both dimensions simultaneously and analyze whether the productivity premium associated with importing depends on the two dimensional geographic intensity markets on which the firm sources its inputs. Throughout the analysis in this chapter we also account for the extensive margin of trade in order to establish whether the degree of diversification of imports in terms of the number of import markets on which the firm is active affects productivity premia.

We address another dimension of firm-level heterogeneity and internationalization in chapter 5: the relationship between exporting and firm-level profit rates. This chapter is co-authored by Saara Tamminen and Charles van Marrewijk. We explore this relationship both theoretically and empirically. Empirically testable hypotheses are derived from two existing theoretical models, the well-known workhorse model developed by Melitz (2003) and the model accommodating endogenous wages developed by Egger and Kreickemeier (2012), by squeezing out profit rates as an explicit parameter. These hypotheses are then taken to the data. Through a combination of regression analysis and propensity score matching we establish whether profit margins are affected by export market entry.

The focus of chapter 6 is on the effectiveness of public export promotion efforts. By combining participation records of an export promotion program developed by the Dutch government with firm-level trade data we investigate to what extent the export performance of foreign market entrants crucially hinges upon program participation. The export promotion program under investigation specifically targets small businesses in the early stages of their export involvement. We start by detailing the characteristics of program entrants and their submitted export projects before we turn to the evaluation of the export performance of beginning export starters which received support from the program relative to unsupported export starters. We consider three dimensions of export performance: export value, export share in sales and the probability of becoming a permanent exporter.

Chapter 2

Data

Chapters 3 through 6 are in essence all based on the same underlying firm-level micro-data set. We detail the compilation procedure of this data set in this chapter. Chapters 3 and 4 cover the years 2002-2008, while the analysis in chapters 5 and 6 are based on an extended panel data set including the years 2009 and 2010, since the underlying source data for these years had become available in the meantime. However, the preparation procedure employed is identical for all panel data sets. Table 2.1 presents an overview of the set-up of the panel data set employed for the analysis in chapters 3 through 6. In addition to the firm-level micro-data set detailed in this chapter, the analysis in chapter 6 is based on an additional source data set, containing participation records of the export promotion program under investigation. We detail this data set in that chapter, because of the specificity of the participation records to the analysis in chapter 6.

			sectors included			no. of	no. of
chapter	topic	panel dimension	manufacturing	wholesale & retail trading	services	obs. (×1,000)	firms (×1,000)
3	import status and productivity	2002-2008	✓	✓	✓	1,943	738
4	import characteristics and productivity	2002-2008	✓	✓		1,191	446
5	trade status and profitability	2002-2010	✓	✓		502	139
6	export promotion and export performance	2002-2010	✓	✓		1,849	511

Table 2.1: Set-up panel data sets by chapter

2.1 Compilation of the panel data set

For our empirical analysis in chapters 3 and 4 we merge data from three main Dutch data sources, the General Business Register (GBR), the Baseline Database and the International Trade Database, all provided by Statistics

Netherlands into a panel data set covering the years 2002 to 2008. The data from the three different sources are merged using a unique identification number which is assigned by Statistics Netherlands to each individual firm in the General Business Register. The merging procedure described in this section is graphically depicted in Figure 2.1.

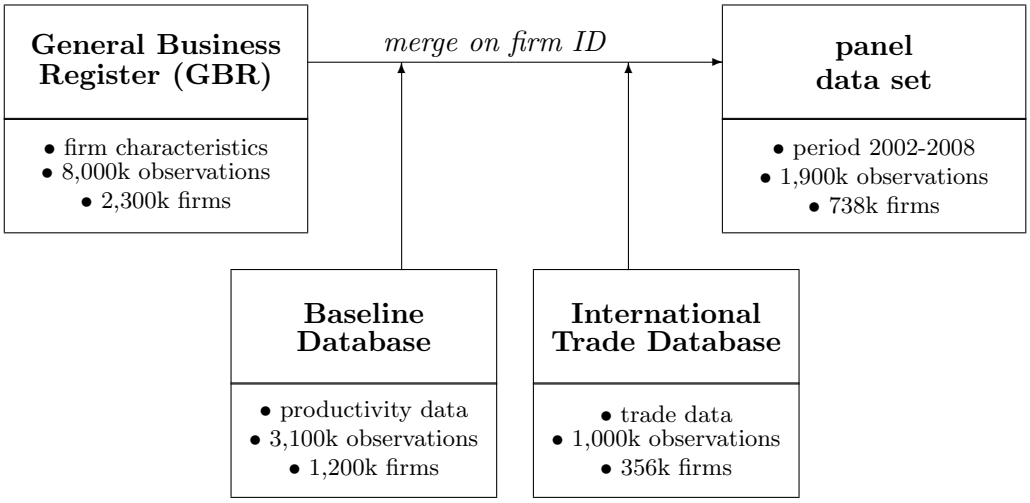

Figure 2.1: Graphical representation of the merging steps towards a panel data set

The GBR is, in principle, exhaustive in the sense that it contains information about every firm in the Netherlands including a set of basic firm characteristics such as the number of employees in fulltime equivalents, the sector in which the firm operates according to the internationally standardized ISIC Rev. 3.1 sector classification[1], the legal type of the firm and some general address information. The GBR forms the starting point for the accumulation of our panel. We take from a separate but related database information concerning the ultimate controlling institution of the firm, indicating whether this is located abroad. Note that this variable is not derived from the underlying ownership structure; it indicates whether the controlling institution is effectively located abroad (CBS, 2010a).

The information taken from the Baseline database contains data concerning gross output (turnover) and the value of capital, labor and intermediate inputs, and serves as the basis for our value added and productivity calculations. The data regarding input used and output produced are deflated

[1]The ISIC Rev. 3.1 sector classification equals the SBI'93 2 digit classification employed by Statistics Netherlands

using separate sector level price indices for gross output, value added, labor, capital and intermediate inputs.[2] The Baseline database contains a wealth of financial information collected from both corporate tax declarations and income tax declarations of entrepreneurs by the Dutch Tax Authority and modified by Statistics Netherlands for e.g. research purposes. However, corporate tax declarations are registered on Value Added Tax (VAT) numbers, which need to be connected to the business identification numbers used by Statistics Netherlands. According to Statistics Netherlands, this match is only allowed when the connection is absolutely certain. Since firm structures tend to get more complex with increasing firm size, the success rate of the matching procedure decreases accordingly. Moreover, the Baseline data cover income tax statements of entrepreneurs only since 2006, the years 2002-2005 contain only data from corporate tax declarations. This implies that the number of observations in our panel increases from about 100,000 to roughly 500,000 annually and the average firm size in our panel drops once income tax information is included. However, total employment and value added covered by the panel almost doubles once income tax information is included (see Table 2.2). The fraction of firms with less than five employees increases from about 58 percent, which is an underrepresentation, to over 85 percent from 2006 onwards (see Table 2.2), while we know from the full GBR that between 80 and 90 percent of Dutch firms fall in that size category (see Table 2.3). Moreover, Table 2.2 and Table 2.3 illustrate that the fraction of firms in the two largest size groups ($\geq$250 FTE) is somewhat underrepresented compared to the full GBR. From the GBR we know that the fraction of firms falling in the largest size class is 0.3 to 0.6 percent, whereas this fraction ranges from 0.1 to 0.3 percent in our panel data set.

[2]The sector level price indices of capital and labor are provided by the National Accounts department of Statistics Netherlands and are characterized by a slightly higher level of aggregation than the sector information derived from the General Business Register. Therefore mapping of the sector level price indices to our panel data set has been done manually. The price indices follow the A64-classification employed by the National Accounts department of Statistics Netherlands. We matched the price index information to the sector information in our panel at the SBI'93 3-digit level manually by comparing the labels. Generally, each A64-sector is matched to more than one SBI'93 3-digit sector, since the latter is registered at a lower level of aggregation. The labels of each sector in each classification system are informative to the extent that matching does not pose any problems.

	FTE 1-5	FTE 5-10	FTE 10-20	FTE 20-50	FTE 50-100	FTE 100-250	FTE 250+	no. of firms	total employment (FTE, $\times 1,000$)	total value added ($\times 1$ mln €)
2002	57.3	18.1	13.0	8.5	2.0	0.9	0.2	104,202	1,114	46,168
2003	57.3	18.4	12.9	8.3	2.0	0.9	0.3	105,414	1,141	54,571
2004	57.6	18.2	12.8	8.2	2.0	0.9	0.3	106,738	1,153	57,416
2005	58.8	17.8	12.8	7.6	1.9	0.8	0.3	110,585	1,141	63,038
2006	85.4	7.8	4.0	2.0	0.5	0.2	0.1	466,107	1,854	111,656
2007	85.6	7.8	3.9	2.0	0.5	0.2	0.1	486,965	1,962	122,215
2008	86.5	7.0	3.8	1.9	0.5	0.2	0.1	559,504	2,224	127,611

Note: The dashed line marks the break in the data due to the inclusion of income tax statements from 2006 onwards.

Table 2.2: Distribution of firms by size, full panel(%)

	FTE 1-5	FTE 5-10	FTE 10-20	FTE 20-50	FTE 50-100	FTE 100-250	FTE 250+	total
2002	81.9	8.8	4.3	2.9	1.0	0.6	0.4	868,990
2003	81.9	9.0	4.3	2.9	1.0	0.6	0.4	870,419
2004	82.2	8.9	4.2	2.8	0.9	0.6	0.4	870,354
2005	82.8	8.6	4.2	2.6	0.9	0.5	0.4	901,736
2006	84.3	7.0	4.0	2.5	0.9	0.7	0.6	1,073,595
2007	85.7	7.0	3.6	2.2	0.7	0.5	0.3	1,095,521
2008	86.7	6.2	3.5	2.1	0.7	0.4	0.3	1,188,377

Table 2.3: Distribution of firms by size, General Business Register (%)

In the next step we merge the trade data to the GBR. Trade data were taken from the International Trade database. It includes information on all imports and exports of goods by Dutch firms.[3] The total value of intra-EU imports and exports is recorded by the Dutch Tax Authority. Firms with intra-EU import and/or export values larger than a total of 900,000 euro (threshold in 2009) are required to specify their trade transactions at the 8-digit level according to the Combined Nomenclature (CN) and specify the origin and destination of trade through an additional questionnaire from Statistics Netherlands. Below this threshold firms only need to report the total import and export value of intra-EU trade. Extra-EU trade is recorded by the Customs Authority. These data always include product information at the 8-digit CN-level and specification of origin and destination country. Finally, we also include import and export values according to the factor intensity of the goods traded, following Van Marrewijk (2002) and

[3]The trade data also include intra-firm trade, which cannot be distinguished from inter-firm trade. Note that apart from the import value Statistics Netherlands does not provide information as to whether it concerns imports of capital goods, intermediate inputs or final goods.

distinguishing between (i) primary products, (ii) natural resource intensive products, (iii) unskilled labor intensive products, (iv) high-tech products and (v) human capital intensive products.

The trade data available at the firm level cover 80-90 percent of annual aggregate imports and 75-85 percent of aggregate exports in terms of value in the Netherlands.[4] However, since we only consider observations for which productivity information is available, the coverage of aggregate imports and exports in our panel is 19-24 percent of the value of Dutch imports and 13-20 percent of the value of exports. As we noted earlier, the loss of coverage is mostly on account of an underrepresentation of large firms. However, as we argued in chapter 1, the focus of our analysis is mainly on small and medium-sized firms (SMEs), since large firms, representing large trade values, are more likely to be global traders, whereas our research questions focus particularly on trade-off decisions in import and export patterns, and trading patterns are likely to be more pronounced among small traders (see e.g. Table 2.6).

After a preliminary investigation of the data we eliminate micro-firms (less than one fulltime equivalent), since these turn out to be difficult to measure consistently.[5] Moreover, we eliminate implausible observations with zero or negative output or exports exceeding gross output, thereby eliminating an additional 3 percent of the data (52,552 and 7,352 observations). In addition we eliminate two sectors with five observations or less. This procedure results in an unbalanced panel data set containing a total of 1.9 million observations of about 738,000 firms spanning a period of seven years (2002-2008).

2.2 The persistence of trade in the Netherlands

We employ information on trade values to construct a series of dummy variables, indicating whether the firm only exports, only imports, does both

[4]The trade data are recorded on VAT-numbers. Connection to the firm identification key used by Statistics Netherlands leads to a merging loss of 10-25 percent of annual trade values (CBS, 2012).

[5]By doing so we eliminate 177,623 observation representing 8.2 percent of the data set. A relatively large fraction of the firms in this group, more than 10 percent, reports larger exports than gross output and an additional 10 percent reports negative or zero output. Furthermore, a considerable number of these firms is either inactive or reportedly has zero employees, but positive and considerable turnover, labor cost, etc, which raises the suspicion that holding companies or other legal structures form a substantial part of this group, thereby falling outside the scope of this research.

(two-way trade) or does neither (non-trader). A firm is considered an exporter in a particular year if it reports an export value larger than zero in that year, importers are defined analogously. Table 2.4 shows that over 70 percent of the firms in our panel do not trade internationally.[6] Once the income tax information is included from 2006 onwards, this percentage increases to over 80 percent. This percentage is higher than studies for Germany (Vogel and Wagner, 2010) and Sweden (Andersson, Lööf, and Johansson, 2008) show, but comparable to Belgium (Muûls and Pisu, 2009). An explanation can be found in the composition of the data, since our data cover all firms including sole proprietorships, whereas most comparable studies only consider firms with at least one fulltime employee. This increases the fraction of small enterprizes in our data relative to other studies. This is illustrated by the fact that the percentage of non-traders in our panel drops to about 65 percent (before 2006) and 70-80 percent (from 2006 onwards) once we only consider firms of at least two fulltime equivalents. Furthermore, our panel includes service sectors in addition to manufacturing and wholesale & retail trading, which also offers a partial explanation for the higher fraction of non-traders in our panel compared to the studies regarding Germany and Sweden (see Table 3.13). Tamminen, Van den Berg, and Van Marrewijk (2014) show by comparing two harmonized micro-data sets covering Finland and the Netherlands that the export involvement of Finnish firms is considerably higher than that of Dutch firms. In addition, Gallup (2007) shows, based on survey research, that the export involvement of Dutch SMEs is relatively low compared to other small open Northern European economies such as Finland, Denmark and Sweden, but higher than that of Belgian SMEs. The fraction of firms only importing (around 10 percent) is in line with German data and Belgian data, but higher than in Sweden. The fraction of firms only exporting is relatively low in the Netherlands at 2 to 4 percent. These figures are higher in Germany (10 percent), and Sweden (13 percent). However, Muûls and Pisu (2009) present comparable figures for Belgium with a percentage of sole exporters of about 4 percent. The share of two-way trading firms varies over the years, due to the availability of income tax data from 2006 onwards, causing a drop from 15 to around 5 percent. This is relatively low compared to Belgium (11 percent), Sweden (22 percent) and Germany (25 percent).

[6] The fraction of non-trading firms in the Dutch economy in total is about 80-85 percent (CBS, 2010b).

	non-trading	only exports	only imports	two-way trading	total
2002	70.9	3.9	9.6	15.6	105,341
2003	70.2	3.8	10.2	15.8	106,389
2004	70.4	3.8	10.2	15.7	107,587
2005	70.7	3.6	10.3	15.4	111,257
2006	86.0	1.7	7.2	5.2	466,107
2007	84.3	1.9	8.2	5.6	486,965
2008	81.4	2.4	10.1	6.1	559,504
total	1,570,081	46,776	173,467	152,826	1,943,150

Note: The number of (larger) firms keeps gradually increasing over the years 2006-2008 mainly because of the improving quality of the connection between VAT-numbers and GBR-identification numbers. The dashed line marks the break in the data due to the inclusion of income tax statements 2006 onwards.

Table 2.4: Trade status of Dutch firms by year (2002-2008, %)

	non-trading	only exports	only imports	two-way trading	total
2002	67.3	4.1	10.7	17.8	62,411
2003	67.0	4.1	11.2	17.7	68,448
2004	67.4	4.0	11.1	17.5	74,151
2005	67.9	3.8	11.1	17.2	81,274
2006	68.0	3.4	11.2	17.4	79,758
2007	67.5	3.4	11.3	17.7	77,172
2008	60.5	4.5	14.0	20.9	70,908
Total	342,311	19,902	59,219	92,690	514,122

Note: The number of (larger) firms keeps gradually increasing over the years 2006-2008 mainly because of the improving quality of the connection between VAT-numbers and GBR-identification numbers. The smoothed panel only contains firms which are observed at least once both before and after the break in 2006, when the income tax declarations were added, in order to get a grasp of the bias associated with the inclusion of income tax data.

Table 2.5: Trade status of Dutch firms by year, smoothed panel (%)

Table 2.5 shows the distribution of firms by trade status by year for the subset of firms that is observed at least once before and after the break in 2006. Paired with Table 2.4, Table 2.5 gives an indication of the bias associated with the inclusion of the income tax data from 2006 onwards. The distribution of firms by trade status appears to be rather stable in

the 'smoothed' panel. However, the fraction of non-traders is relatively low compared to Table 2.4, which is due to the fact that both the probability of being active on foreign markets and the probability of survival increases with firm size, causing a bias in Table 2.5 towards larger firms. The drop in the number of observations in 2008, mainly on account of non-traders, is also a consequence of this bias, since the probability of being observed in 2008 and before 2006 increases in firm size.

Table 2.6 shows the distribution of trade status over firm size categories. The fraction of non-traders decreases gradually with increasing firm size, although still 29 percent of the largest firms does not trade internationally. Especially two-way trading increases dramatically with firm size to over half of the largest firms engaging in both imports and exports. The fraction of firms only importing also increases with firm size, albeit to a lesser extent.

	non-trading	only exports	only imports	two-way trading	total
FTE<5	85.5	2.1	7.9	4.5	1,545,683
5<=FTE<10	67.3	3.6	13.4	15.7	191,142
10<=FTE<20	61.9	3.9	12.6	21.6	113,513
20<=FTE<50	54.4	3.7	13.1	28.8	64,573
50<=FTE<100	47.8	3.3	13.7	35.2	15,382
100<=FTE<250	39.8	2.0	14.0	44.1	6,863
FTE>250	28.9	1.8	16.7	52.6	2,359
total	1,566,728	46,715	173,348	152,724	1,939,515

Table 2.6: Trade status of Dutch firms by firm size (%, 2002-2008)

The distribution of trading firms by sector is depicted in Table 2.7. The number of observations per sector in our panel varies a lot. The sector containing firms providing 'other business activities' accounts for the largest number of observations. As expected, the fraction of firms in this service sector trading manufactured goods is low. Two-way trading in obvious manufacturing sectors is much more common. Trading is, as expected, less common in sectors like construction and hospitality. Another intuitively straightforward observation is the relatively high fraction of importers in retail trading. Transport sectors show surprisingly little trade activity, except for air transport where importing is relatively important. Trading in manufactured goods, especially importing and two-way trading, is relatively common in research and development.

	non-trading	only exports	only imports	two-way trade	total
man. of petr. and nucl. prod.	23.0	6.6	7.4	63.1	122
man. of chemical products	25.8	6.3	8.2	59.8	2,989
man. of paper products	26.9	5.1	7.5	60.5	1,416
man. of rubber and plast. prod.	31.5	5.8	10.6	52.0	4,276
manufacture of basic metals	39.2	7.2	8.9	44.7	1,004
man. of radio, TV and comm. eq.	41.0	3.5	16.0	39.6	1,448
tanning and dressing of leather	45.7	7.0	10.4	36.9	1,063
recycling	45.9	8.5	9.5	36.1	706
man. of machinery and eq.	46.4	6.5	9.1	38.0	16,486
man. of motor vehicles	49.1	5.8	10.7	34.5	2,486
man. of electrical machinery	50.2	4.0	11.3	34.5	3,634
man. of office and comp. mach.	54.4	4.3	11.6	29.8	658
manufacture of textiles	56.4	3.5	13.1	26.9	4,397
man. of non-metallic min. prods.	58.5	3.2	19.4	19.0	5,445
man. of fabricated metal prod.	65.1	5.1	9.7	20.2	28,882
man. of med. and optical instr.	65.6	3.1	11.3	20.0	7,901
man. of products of wood	67.3	2.4	15.2	15.0	6,866
man. of food products	67.5	2.9	9.4	20.3	13,054
man. of wearing apparel	70.7	2.2	12.9	14.1	4,002
air transport	71.2	2.9	17.6	8.3	615
man. of furniture	71.6	2.6	14.5	11.4	24,153
publishing, printing and repro	72.2	9.0	6.6	12.2	23,329
man. of other transport eq.	72.6	4.8	8.7	13.8	6,180
agriculture and hunting	78.1	5.6	4.7	11.7	1,376
supporting transport act.	80.0	4.8	7.9	7.3	21,032
post and telecommunication	90.2	2.4	4.7	2.7	11,798
land transport	90.7	3.5	3.3	2.5	44,371
construction	93.1	0.8	4.8	1.3	295,239
hotels and restaurants	94.2	0.1	5.4	0.3	103,631
water transport	95.5	1.3	2.4	0.8	11,538
forestry and logging	X	X	X	X	12
fishing and aquaculture	X	X	X	X	22
extr. of crude petr. and nat. gas	X	X	X	X	20
other mining and quarrying	X	X	X	X	18
man. of tobacco products	X	X	X	X	42
electricity, gas, and hot water	X	X	X	X	50
wholesale and comm. trade	45.3	5.7	14.6	34.4	219,402
retail trade	69.5	1.0	25.1	4.3	244,804
sale, maint., rep. of motor veh.	75.5	5.2	9.4	9.8	76,323
research and development	72.4	4.1	11.2	12.2	5,141
sewage and sanitation	83.1	3.8	3.3	9.8	183
rent of mach. without operator	83.7	2.3	8.4	5.7	15,636
computer and related act.	84.3	4.1	7.4	4.2	83,871
recr., cult. and sporting act.	84.7	2.1	7.8	5.4	1,773
act. aux. to fin. intermediation	86.7	2.8	5.5	5.1	1,224
health and social work	87.7	1.2	6.0	5.1	583
real estate activities	88.2	2.4	4.9	4.5	1,704
financial intermediation	88.5	1.5	5.4	4.7	4,095
education	90.5	1.5	6.1	1.8	655
other business activities	92.8	1.9	3.4	2.0	535,638
other service activities	95.0	0.2	4.6	0.3	101,303
insurance and pension funding	X	X	X	X	65
public adm. and defense	X	X	X	X	25
act. of membership org.	X	X	X	X	194
total	1,569,834	46,772	173,455	152,819	1,942,880

Note: Due to confidentiality issues the values are not displayed in each cell. The entire distribution by trade status of a sector is not displayed if an individual cell contains less than 5 observations. The cases at hand are marked with an "X", but have not been dropped from the analysis.

Table 2.7: Trade status of Dutch firms by sector (%)

2.3 Estimating firm-level productivity

We employ the data from tax declarations to calculate three different measures of productivity. Labor productivity (LP) is computed in two ways, as value added and gross output per employee, both deflated using a sector specific price index. We estimate total factor productivity (TFP) by employing the procedure proposed by Levinsohn and Petrin (2003) and facilitated by Petrin, Poi, and Levinsohn (2004), which is an extension of the basic Cobb-Douglas framework. We assume production takes the form of the standard Cobb-Douglas production function:

$$Y_{it} = A_{it} K_{it}^{\beta_k} L_{it}^{\beta_l} M_{it}^{\beta_m} \tag{2.1}$$

With Y_{it} representing output produced by firm i in year t by employing input factors capital (K), labor (L) and intermediate inputs (M). In this production function A_{it} represents the level of productive efficiency of firm i in year t with which input is converted into output. It is referred to as total factor productivity since it affects the marginal product of all input factors simultaneously. Ideally, Y_{it}, K_{it}, L_{it} and M_{it} would be observed in quantities, since factoring out input and output prices would enable the measurement of the actual productive efficiency most accurately. However, as in most cases, we observe input and output in value terms, except for labor inputs which is measured in fulltime equivalents.[7]

Total factor productivity, A_{it} is inevitably unobserved and needs to be estimated. In order to do so, we start by taking the natural log of (2.1) (denoted by lower-case letters), yielding:

$$y_{it} = a_{it} + \beta_k k_{it} + \beta_l l_{it} + \beta_m m_{it} \tag{2.2}$$

This makes the production function to be estimated linear in its parameters, where total factor productivity consists of two elements (Arnold, 2005; Van Beveren, 2010):

$$ln(A_{it}) = a_{it} = \beta_0 + \varepsilon_{it} = \beta_0 + \omega_{it} + u_{it} \tag{2.3}$$

The mean level of productivity across firms and years is represented by β_0, whereas the last two terms on the righthand side of equation 2.3 represent the deviation from that mean by a particular firm in a particular year.

[7] Note that an alternative measure for labor input would be the use of labor cost, but this would decrease the number of observations in our panel substantially since all firms without employees generally do not report positive labor costs.

The observable part of firm-level productivity is represented by ω_{it}, while u_{it} is the independently identically distributed error term due to unobservable productivity shocks or measurement error. Total factor productivity estimated using this procedure is also referred to as the Solow-residual of the production function. An inherent weakness of this approach is that all non-observable firm-level variation affecting output is by assumption assigned to total factor productivity, such as varying levels of market power, factor market distortions, product mix differences, measurement errors and idiosyncratic shocks (Bustos, 2011). Furthermore, estimation of (2.2) is complicated by a few econometric issues. There is the well-established problem of endogeneity of inputs. In order for the estimation of (2.2) to yield unbiased estimators, the explanatory variables need to be uncorrelated with the error term. However, firms generally observe at least part of their productivity early enough to be able to adjust the choice of inputs used accordingly. This means that inputs are not exogenous, but correlated with unobserved productivity shocks, yielding biased results when estimating (2.2). Imperfect competition in input and output markets is another potential source of endogeneity, especially over time. Since information regarding quantities of input and output and firm-specific price levels are generally not available, sector-level prices are commonly used to deflate firm-level input and output measures. However, an endogeneity issue arises when the input choice of the firm is correlated with unobserved deviations from the sector-level price levels by the individual firm in input or output markets.

Van Beveren (2010) provides an excellent review of the available estimation techniques to deal with endogeneity issues. He argues that the choice of the estimation technique will ultimately depend on the availability of data. Information regarding investments is not part of the panel data set at hand, ruling out the procedure proposed by Olley and Pakes (1996) as an alternative. Moreover, an important issue regarding the use of investments as a proxy is that generally a considerable number of firms reports zero investments, causing these observations to drop out of the estimation procedure after the log-transformation (Van Beveren, 2010). Particularly SMEs frequently report zero investments, which would pose a problem to our analysis, since SMEs are the focus of our empirical analysis. This problem is less urgent using intermediate inputs as a proxy, since reporting zero intermediate inputs is rare (Van Beveren, 2010). These considerations taken together we decide to adopt the Levinsohn-Petrin procedure, mainly motivated by availability and the nature of the data regarding intermediate inputs.

The Levinsohn-Petrin model uses intermediate inputs as a proxy for unobservable productivity shocks (Levinsohn and Petrin, 2003). This is

done by expressing intermediate inputs in terms of capital and productivity: $m_{it} = m_{it}(k_{it}, \omega_{it})$. This function can be inverted, assuming that intermediate inputs are monotonically increasing in productivity given capital input: $\omega_{it} = \omega_{it}(k_{it}, m_{it})$. Rewriting (2.2) yields output as a function of labor, capital and intermediate inputs in addition to productivity expressed in terms of capital and intermediate inputs:

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \beta_m m_{it} + \omega_{it}(k_{it}, m_{it}) + u_{it} \tag{2.4}$$

Equation 2.4 is estimated assuming productivity follows a first order Markov process, with $\omega_{it} = E[\omega_t \mid \omega_{t-1}] + \eta_t^*$. Estimation of equation 2.4 is done in two separate steps, the first being:

$$y_{it} = \beta_l l_{it} + \phi_{it}(k_{it}, m_{it}) + u_{it} \tag{2.5}$$

In the second step the coefficient on the proxy variable intermediate inputs is obtained by estimating ϕ_{it}:

$$\phi_{it} = \beta_0 + \beta_k k_{it} + \beta_m m_{it} + \omega_{it}(k_{it}, m_{it}) + u_{it} \tag{2.6}$$

We estimate total factor productivity with labor input in quantities (full-time equivalents) as our freely variable input.[8] Capital input is the summation of costs of depreciation and interest. Intermediate inputs cannot be disentangled into material, energy and service inputs, which renders us unable to test alternative proxies. Labor productivity is calculated as discussed above. Tables 2.8 and 2.9 present some descriptive statistics of the different productivity measures.[9] Labor productivity in terms of gross output per employee (Table 2.8) shows average values comparable to the figures presented by Vogel and Wagner (2010) for Germany. Again, we observe a break in the data in 2006, when the coverage of smaller firms rises. Before 2006, the average labor productivity was somewhat higher than reported for Germany, but after the break, the average productivity is lower. The data also show labor productivity increasing with firm size. Non-traders show the lowest productivity on average, and two-way traders the highest, which is also as expected. A comparable picture emerges when we look at labor

[8] Since we employ labor in fulltime equivalents as our measure of labor input rather than wage costs we avoid the necessity to impute a remuneration to working owners.

[9] We present a number of descriptive statistics concerning labor productivity of gross output, to be able to benchmark our data against comparable studies. However, for our analysis we choose to work with value added as our output measure, mainly because of the different nature of the firms in our panel, ranging from manufacturing firms to wholesale traders and service providers.

productivity (Table 2.8) and total factor productivity (Table 2.9) in terms of value added.[10]

	gross output (×1,000 €)				value added (×1,000 €)			
	no. of obs.	mean	median	st. dev.	no. of obs.	mean	median	st. dev.
total	1,900,725	117.1	66.4	164.2	1,748,516	41.5	30.6	43.4
by trade status								
non-trader	1,540,328	93.4	56.5	131.1	1,409,175	38.8	28.4	41.7
only exports	45,412	200.4	111.9	241.8	42,838	50.2	38.7	46.6
only imports	170,821	159.3	110.1	175.8	155,139	43.5	34.1	41.0
two-way trader	144,164	293.3	199.0	274.8	141,364	63.8	48.8	54.0
by year								
2002	99,825	165.7	98.0	209.1	89,936	53.2	38.6	52.5
2003	101,425	162.4	96.1	205.3	91,961	52.4	37.9	52.2
2004	102,541	164.8	97.7	208.2	92,994	53.1	38.4	52.6
2005	106,004	169.5	101.1	210.8	96,130	55.2	39.6	54.3
2006	459,743	101.3	58.7	143.6	425,642	36.6	27.6	38.3
2007	479,771	105.8	60.2	150.0	443,904	39.1	29.1	40.7
2008	551,416	104.0	58.7	147.1	507,949	39.0	29.0	40.5
by firm size								
FTE<5	1,513,039	106.3	57.2	158.7	1,366,339	40.6	28.0	45.5
5<=FTE<10	188,089	158.3	101.1	180.0	184,564	44.5	36.3	35.9
10<=FTE<20	111,902	157.1	102.1	171.7	110,720	44.8	37.8	33.2
20<=FTE<50	63,572	159.5	105.1	173.6	63,077	44.7	38.5	32.9
50<=FTE<100	15,102	167.0	105.8	194.1	14,931	45.0	39.6	35.8
100<=FTE<250	6,719	177.1	111.8	205.3	6,646	46.9	40.5	39.7
FTE>250	2,302	205.4	127.8	225.1	2,239	51.4	42.3	45.1

Note: The dashed line marks the break in the data due to the inclusion of income tax statements from 2006 onwards.

Table 2.8: Labor productivity (the Netherlands, 2002-2008)

[10]The estimations of total factor productivity are obtained by running a Levinsohn-Petrin estimation procedure excluding the top and bottom 1% of capital, intermediate inputs and value added per employee.

	no. of obs.	mean (×1,000 €)	median (×1,000 €)	st. dev. (×1,000 €)
total	1,643,956	10.5	8.1	9.4
by trade status				
non-trader	1,311,887	9.7	7.5	8.9
only exports	41,579	12.2	10.1	9.7
only imports	151,248	10.9	8.9	9.1
two-way trader	139,242	16.5	13.6	12.0
by year				
2002	87,755	13.2	10.9	10.5
2003	89,841	12.9	10.6	10.4
2004	90,949	13.2	10.8	10.6
2005	94,142	13.6	11.0	11.1
2006	398,297	9.2	7.1	8.5
2007	412,770	10.1	7.7	9.2
2008	470,202	9.8	7.5	9.0
by firm size				
FTE<5	1,266,074	9.4	6.9	9.2
5<=FTE<10	182,754	12.3	10.4	8.5
10<=FTE<20	109,720	14.4	12.5	9.0
20<=FTE<50	62,305	16.7	15.0	9.8
50<=FTE<100	14,628	19.5	18.2	11.7
100<=FTE<250	6,395	22.4	21.4	13.2
FTE>250	2,080	28.1	27.5	15.8

Note: The dashed line marks the break in the data due to the inclusion of income tax statements from 2006 onwards.

Table 2.9: Total factor productivity (value added, the Netherlands, 2002-2008)

A key condition underlying the estimation of total factor productivity employing the Levinsohn-Petrin procedure is monotonicity of productivity. This condition implies that intermediate input use, expressed in terms of capital and productivity, strictly increases in productivity, since only then intermediate input usage can be inverted, which allows us to express unobserved firm-level productivity in terms of capital and intermediate input usage (Van Beveren, 2010). If the monotonicity condition holds, productivity should be increasing in the use of intermediate inputs, given the level of capital input. Levinsohn and Petrin (2003) suggest a visual test for examining the monotonicity condition. We perform this test in Figure 2.2, visual inspection shows that the condition seems to be met in our panel. Fixing the amount of capital used (depicted on the x-axis), thus looking vertically along the y-axis, we generally see average productivity increasing in the use of intermediate inputs (graphically represented by the vertical darkening of the quadrangles).

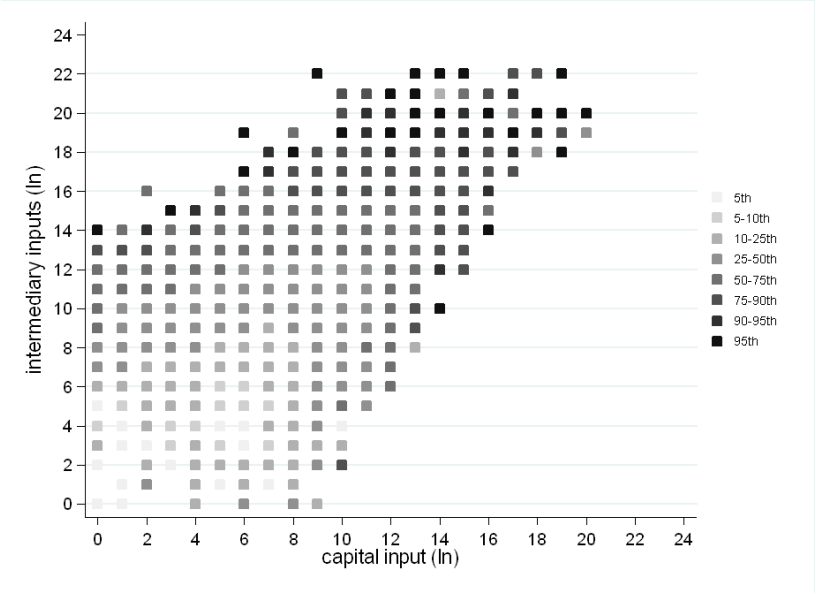

Figure 2.2: Productivity levels given capital and intermediate inputs (2002-2008)

Notes: the legend denotes the percentiles of the distribution of mean TFP.

Figure 2.3 plots TFP-estimations at the firm-level against labor productivity, both using value added as a measure for output. There is strong correlation between labor productivity and total factor productivity, although total factor productivity is obviously the preferred productivity measure, since it captures the efficiency with which the firm translates all inputs into output instead of just labor. Importantly, the fact that both productivity measures are closely correlated indicates that the data behave in a reassuringly consistent way.

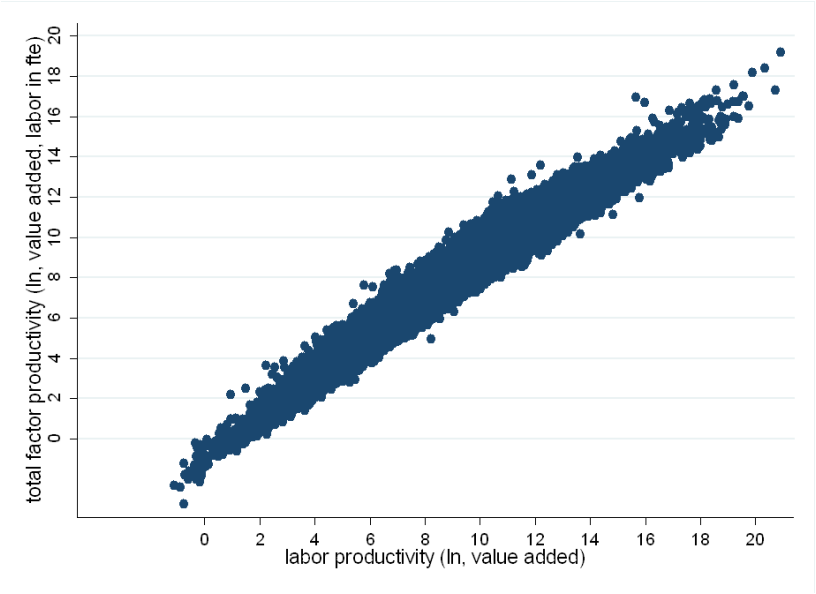

Figure 2.3: Labor productivity and total factor productivity (2002-2008)

2.4 Extending the panel data set

The panel data set underlying the analysis in chapters 5 and 6 is extended with two additional years, 2009 and 2010, since these data had become available in the meantime. The compilation steps towards this extended panel are generally identical to the procedure discussed in section 2.1. To facilitate the analysis of profitability premia in chapter 5 we include a set of variables concerning various firm-level profit measures from the Baseline database in addition to the input and output information we take from this database. These data will be introduced in detail in chapter 5. We estimate total factor productivity following exactly the same procedure as discussed in section 2.3 on the full sample covering the years 2002-2010. Table 2.10 shows that adding two years of data to the panel yields an additional 1.1 million observations available, increasing the total number of observations to over 3 million spanning a period of 9 years.[11]

[11]Note that the annual number of observations available for the period 2002-2008 is somewhat smaller in the extended panel. This is due to the compilation procedure, which we replicate in a slightly different order and includes an additional set of profitability related variables, which will be introduced in detail in chapter 5.

	non-trading	only exports	only imports	two-way trading	total
2002	70.9	3.9	9.6	15.6	105,076
2003	70.2	3.8	10.1	15.9	106,108
2004	70.3	3.8	10.2	15.7	107,272
2005	70.7	3.7	10.2	15.4	110,946
2006	86.0	1.7	7.2	5.2	465,461
2007	84.2	1.9	8.2	5.6	486,147
2008	81.4	2.4	10.1	6.2	558,465
2009	82.4	2.1	9.3	6.2	559,689
2010	77.8	3.6	11.0	7.6	538,532
total	2,447,429	77,830	283,991	228,446	3,037,696

Note: The number of (larger) firms keeps gradually increasing over the years 2006-2010 mainly because of the improving quality of the connection between VAT-numbers and GBR-identification numbers. The dashed line marks the break in the data due to the inclusion of income tax statements from 2006 onwards.

Table 2.10: Trade status of Dutch firms by year (2002-2010, %)

2.5 Suggestions for facilitation of future research employing the source data

The compilation procedure concerning the panel data set detailed in this chapter has proven to be an elaborate and complicated process.[12] However, the depth, scope and quality of the firm-level micro-data available at Statistics Netherlands are such that the research opportunities are sheer endless. We thus end this chapter by presenting some suggestions to facilitate future research endeavors based on firm-level micro-data provided by Statistics Netherlands. Two key points come to mind.

First, an important complicating factor in the compilation of a panel data set is the general lack of a panel dimension in the underlying source data. This implies that in order to be able to analyze data with a panel dimension the separate annual source data sets need to be appended, which complicates the tracking of individual firms over time and increases the risk of incurring selection biases without noticing. In addition, the mapping between the General Business Register and firm-level trade data has become available just several years ago and is still being improved. This mapping procedure has been applied to annual trade data increasingly further back in time and is considered to be of sufficient quality up to 2002. This would

[12]The preparation and analysis of the data has been done inside the office of Statistics Netherlands. The firm-level data employed for the analysis in this dissertation are confidential but not exclusive.

make it a potentially fruitful strategy to compile a general backbone panel data set for research purposes which can be enriched on an ad hoc basis with additional source data for individual research projects.

Second, the myriad of registry keys employed to identify individual firms in separate source data sets and the stand-alone nature of the source data sets form a seriously complicating feature of the source data. Trade data and data concerning inputs used and outputs produced are registered on VAT-numbers, whereas the General Business Register, which serves as the backbone of the panel, is set up using a unique identification number assigned by Statistics Netherlands. The participation register of the export promotion program introduced in chapter 6 is based on a third unique registry key. Developing the mapping structure between the various registry keys is far from a trivial task. Since a match between firm observations in separate data sets is only allowed when it is certain that the entities comprise of the same economic activity the merging process inevitably leads to a loss of observations. Harmonization of the separate registers would improve efficiency and the coverage of the Dutch business population in panel data sets.

Chapter 3

Importing, productivity and SMEs: firm-level evidence from the Netherlands

3.1 Introduction[1]

Since the mid-1990s a stream of papers has been published on the different nature of firms that are internationally competing and firms that solely serve domestic markets. The surge in research on this topic was spurred by the seminal work of Bernard, Jensen, and Lawrence (1995), Roberts and Tybout (1997) and Melitz (2003). An impressive body of literature has presented compelling evidence that firms engaging in international trade are larger, more productive, more capital intensive, pay higher wages, invest more in R&D and have a higher probability of survival than firms that focus primarily on domestic markets (see Greenaway and Kneller (2007a), Wagner (2007), Bernard, Jensen, Redding, and Schott (2011) and Wagner (2012b) for a survey of the empirical evidence). However, until recently most attention was directed towards the relationship between export status and firm performance, while the impact of importing on firm performance has been investigated considerably less frequently, a point also stressed by Wagner (2012b).

We add to the literature in several ways. First, we test whether importers outperform non-importers as the empirical evidence from previous studies suggests (see section 3.2), by investigating whether a productivity

[1]This chapter is derived from Van den Berg (2013).

premium is associated with importing activities of Dutch firms. Second, we analyze whether there is heterogeneity in the relationship between importing and firm-level productivity along the firm-size distribution. Third, we investigate the direction of causality between import status and productivity by testing the self-selection and learning-by-doing hypotheses empirically, utilizing propensity score matching to test the latter. The results are summarized in four empirical regularities. This chapter marks the first effort to analyze firm heterogeneity regarding import status and firm performance employing Dutch firm-level data.[2] In addition, we investigate the relationship between firm size and productivity premia of importing along the full firm size distribution, in particular including small firms (1-5 FTE). This is a sizable group frequently neglected in the firm heterogeneity literature, which has largely been focusing on medium-sized and large firms. Finally, we account for differences between (i) goods importing manufacturing firms, (ii) wholesale and retail traders and (iii) goods importing service providers in the analysis.

This chapter is organized as follows. Section 3.2 provides a brief discussion of the empirical literature with respect to the relationship between import status and firm performance. Section 3.3 introduces the data employed in the empirical analysis, which is provided in section 3.4. Section 3.5 concludes and provides some directions for further research.

3.2 Firm heterogeneity and imports

The literature distinguishes several mechanisms through which importing and firm-level productivity could be causally related. Firms can raise productivity by importing R&D intensive intermediate inputs from the technological frontier. Coe and Helpman (1995) and Coe, Helpman, and Hoffmaister (1997) show empirically that productivity gains from R&D are indeed not only considerable in the source country, but that the benefits are also reaped by importing economies, both developed and less developed. Lööf and Andersson (2010) argue that global specialization plays a key role in enhancing firm productivity, since importing enables firms to utilize inputs from the technological frontier. Acharya and Keller (2009) present evidence suggesting that importing is an important vehicle for technology transfers between countries, while Acharya and Keller (2008) show that trade liberalization induces technological learning and thereby raises domestic productivity if

[2]See Kox and Rojas-Romagosa (2010) for an empirical analysis of the relationship between export participation and productivity using Dutch firm-level data.

it affects the imports of advanced technologies. This enables specialization and the focusing of resources on activities in which firms excel. Moreover, importing might offer firms the possibility to purchase intermediate inputs at lower cost. The wider variety of intermediate inputs that becomes available through importing, amongst which higher quality inputs, can increase firm-level productivity, if imported and domestic inputs are imperfect substitutes. Manova and Zhang (2012) show empirically that firms vary the quality of their products across export destinations by using inputs of differing quality. In addition, importing firms may benefit from spill-over effects and increase productivity by learning from foreign suppliers. This combination of learning and variety effects is also referred to as the complementarity aspect of importing (Halpern, Koren, and Szeidl, 2009). Finally, importing final goods increases competition on domestic markets, which forces domestic producers, regardless of their trading status, to operate more efficiently and thus become more productive (Amiti and Konings, 2007).

Firm level evidence suggests that firms importing inputs are indeed more productive than firms that source inputs solely domestically. However, the direction of causality is less well understood. Vogel and Wagner (2010) employ a panel data set of German manufacturing firms and perform a propensity score matching procedure to investigate the direction of causality between productivity and imports. They do not find convincing evidence for the learning-by-importing hypothesis. However, their results do indicate that future importers are already more productive than continuing non-importers three years prior to import start. This points to self-selection of more productive firms into foreign supply markets. These findings are largely congruent with related studies by Kasahara and Lapham (2008), Muûls and Pisu (2009), Eriksson, Smeets, and Warzynski (2009), and Andersson, Lööf, and Johansson (2008). Evidence supporting the learning-by-importing hypothesis is presented by Lööf and Andersson (2010) and Hagemejer and Kolasa (2011).

A few general conclusions can be taken from the preceding discussion:

1. Importers tend to be more productive and perform better in general than non-traders.
2. Two-way traders are consistently considered to be among the most productive firms.
3. The evidence regarding the productivity ordering of sole importers and sole exporters is less conclusive.
4. The evidence pointing to self-selection into importing is quite compelling, indicating that firms need to have a certain threshold level of productivity in order to be able to bear the costs associated with an

import start.

5. There is little evidence supporting the learning-by-importing hypothesis.

3.3 Data

For the empirical analysis we merge information from three main Dutch data sources: the General Business Register (GBR), the Baseline Database and the International Trade Database, all provided by Statistics Netherlands, into a panel data set covering the years 2002 to 2008. The compilation procedure of the panel data set is detailed in chapter 2.

The GBR contains a set of basic firm characteristics about every firm in the Netherlands such as the number of employees in fulltime equivalents, the sector in which the firm operates according to the internationally standardized ISIC Rev. 3.1 sector classification and some general address information.[3] From a related database we take information concerning the ultimate controlling institution of the firm, indicating whether the ultimate controlling owner of the Dutch firm is located abroad.[4] The information taken from the Baseline database contains information about gross output, value added and the value of capital, labor and intermediate inputs. The data regarding input used and output produced are deflated using separate sector level price indices for gross output, value added, labor, capital and intermediate inputs and serve as the basis for the productivity estimations. We calculate two different measures of productivity. Labor productivity (LP) is computed as value added per employee. We estimate total factor productivity (TFP) by adopting the procedure proposed by Levinsohn and Petrin (2003).[5]

Trade data were taken from the International Trade database and include information on all imports and exports of goods by Dutch firms.[6] Since we only consider observations for which input and output information is available, we incur a loss of coverage mainly on account of a relatively small

[3]The ISIC Rev. 3.1 sector classification mirrors the SBI'93 2-digit classification employed by Statistics Netherlands

[4]The dummy variable indicating whether a firm is ultimately controlled by a foreign company is not derived from the underlying ownership structure, it indicates whether the controlling institution is effectively located abroad.

[5]See section 2.3 for further details regarding the estimation procedure.

[6]The total value of intra-EU imports and exports is recorded by the Dutch Tax Authority. Extra-EU trade is recorded by the Customs Authority. Note that apart from the import value we do not have information as to whether it concerns imports of capital goods, intermediate inputs or final goods.

number of large firms. However, the merging strategy adopted aims at maximizing the number of trading firms in the panel rather than the trade value.[7] In addition, the key focus of this chapter is on small and medium-sized firms (SMEs), and trading patterns are likely to be more pronounced among small traders.

This procedure results in an unbalanced panel data set containing a total of 1.9 million observations of 738,000 unique firms spanning a period of seven years (2002-2008).[8]

3.4 Empirical findings

3.4.1 Do importers perform better?

We start by establishing showing some descriptive statistics. Table 3.1 shows that, in line with the literature reviewed in section 3.2, firms that only serve domestic markets are on average the least productive, both in terms of labor productivity and total factor productivity.[9] The picture emerging from the data is comparable for both productivity measures; Dutch importers (without exporting) are on average less productive than sole exporters, and two-way traders outperform both sole importers and exporters. The productivity difference between non-traders, exporting and importing firms is relatively small, whereas two-way traders are further ahead.

Running a series of Wilcoxon rank-sum tests, which test the hypothesis that two independent samples are drawn from the same distribution, shows that the mean differences presented in Table 3.1 are all statistically significant in the hypothesized direction, for both productivity measures (see Table 3.2). In addition, Fischer's exact test indicates that the hypotheses of equality of the medians of the different groups are consistently and significantly rejected (see Table 3.3).

[7] The coverage of aggregate imports and exports in the panel is roughly 20 to 25 percent of the value of Dutch imports and 15 to 20 percent of the value of exports. As noted in chapter 2, this is mostly on account of an underrepresentation of large firms.

[8] This is after eliminating micro-firms (less than one fulltime equivalent) and implausible observations with zero or negative output or exports exceeding gross output. See chapter 2 for details.

[9] From this point onwards, the productivity measures referred to are estimated using value added as the measure of output, unless explicitly stated otherwise. The top and bottom 1% of the observations along the relevant productivity distribution are excluded throughout this section, in order to eliminate implausible observations due to measurement errors, which we are unable to further investigate due to confidentiality considerations.

	total factor productivity		labor productivity		number of employees	
	mean	index (%)	mean	index (%)	mean	index (%)
all firms	10,470	100.0	41,494	100.0	5.5	100.0
by trade status						
non-trader	9,723	92.9	38,766	93.4	3.8	69.1
only importing	10,930	104.4	43,521	104.9	8.4	152.7
only exporting	12,192	116.4	50,173	120.9	6.5	118.2
two-way trader	16,493	157.5	63,834	153.8	18.3	332.7

Note: Mean calculations are based on pooled data in constant prices over the years 2002-2008.

Table 3.1: Mean productivity and firm size of Dutch firms by trade status

	non-trading	only exports	only imports	two-way trading
non-trader	-	$<^{***}$	$<^{***}$	$<^{***}$
only imports	$>^{***}$	-	$<^{***}$	$<^{***}$
only exports	$>^{***}$	$>^{***}$	-	$<^{***}$
two-way trader	$>^{***}$	$>^{***}$	$>^{***}$	-

Notes: Test results regarding TFP are presented on the left hand side of the diagonal, results regarding LP on the right. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.2: Wilcoxon rank-sum tests of mean productivity differences by trade status

	non-trading	only exports	only imports	two-way trading
non-trader	-	$<^{***}$	$<^{***}$	$<^{***}$
only imports	$>^{***}$	-	$<^{***}$	$<^{***}$
only exports	$>^{***}$	$>^{***}$	-	$<^{***}$
two-way trader	$>^{***}$	$>^{***}$	$>^{***}$	-

Notes: Test results regarding TFP are presented on the left side of the diagonal, results regarding LP on the right. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.3: Fischer's exact tests of median productivity differences by trade status

However, analyzing differences in means or medians of different populations does not tell the complete story, since it only involves one moment of the productivity distribution for each group. The complete distribution of firm-level total factor productivity by trade status is depicted in Figure 3.1,

which illustrates that the productivity distribution of non-traders is located left of the distributions of trading firms, namely exporters, importers and two-way traders, in that order, from left to right. The results of a series of two-sided Kolmogorov-Smirnov tests for both total factor productivity and labor productivity are significant in all cases, indicating that the productivity distributions of the four groups divided by trade status do indeed differ (see Table 3.4).[10]

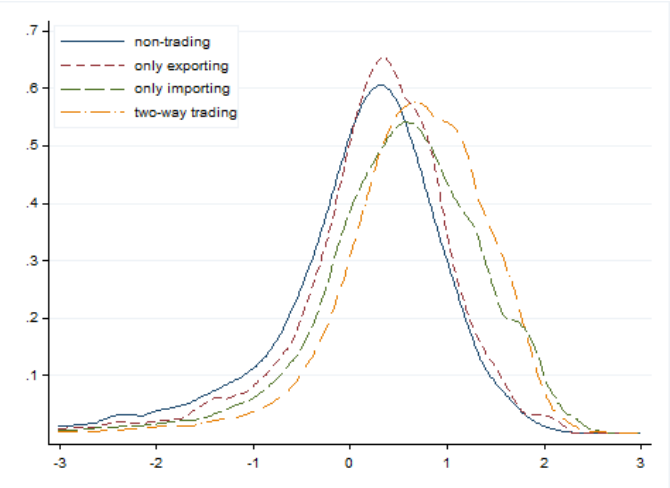

Figure 3.1: Firm-level productivity distribution by trade status (2002-2008)

Notes: Following Melitz and Trefler (2012), the horizontal axis represents firm-level log of total factor productivity scaled by subtracting the annual median log productivity of the firm's 2-digit sector. The vertical axis represents the kernel density of firms at that particular productivity level, weighted by firm size in terms of employment.

[10]The results of the one-sided tests, without controlling for other firm characteristics, show that the productivity distribution of non-traders is being dominated by, respectively, sole importers, sole exporters and two-way traders. The ranking of sole exporters and sole importers is thus reversed compared to the productivity distributions depicted in Figure 3.1. See Girma, Görg, and Strobl (2004) for a discussion of the Kolmogorov-Smirnov test.

	TFP	LP
non-trader vs importer	0.0857***	0.0947***
non-trader vs exporter	0.1567***	0.1593***
non-trader vs two-way trader	0.3155***	0.2960***
importer vs exporter	0.0743***	0.0721***
importer vs two-way trader	0.2408***	0.2109***
exporter vs two-way trader	0.1719***	0.1402***

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.4: Kolmogorov-Smirnov tests of equality of productivity distributions by trade status

The next step in the empirical analysis consists of estimating the trader premia, that is, the productivity difference between non-traders and traders that can be attributed to the differing trade status. In order to do so, we estimate the following empirical model:

$$\begin{aligned} ln(prod_{it}) = \alpha + \beta_1 importer_{it} + \beta_2 exporter_{it} + \beta_3 twowaytrader_{it} \\ + \beta_4 firmsize_{it} + \beta_5 foreigncontrolled_{it} \\ + \beta_6 year_t + \beta_7 sector_{it} + \beta_8 region_i + e_{it} \end{aligned} \quad (3.1)$$

We estimate a pooled OLS-regression model employing the panel data concerning Dutch firms over the years 2002 to 2008.[11] Note that estimating this model enables us to analyze whether productivity and import status are associated, however, it does not uncover any causal relationships. The purpose of this first step is mainly to get a grasp of the correlation between productivity and import status, whereas the issue of causality will be addressed in later steps.

In this model the subscript i identifies individual firms and t indexes the year. The dependent variable to be estimated ($ln(prod_{it})$) is either the natural log of total factor productivity, denoted by $lnTFP_{it}$, or the natural log of labor productivity, denoted by $lnLP_{it}$. Dummy variables regarding trade status, with non-trading firms as the reference group, are

[11] It is customary in this strand of empirical literature that firm fixed effects models are estimated next to pooled OLS-models. However, the trade status of individual firms is generally relatively stable. The panel consists of more than 738,000 unique firms of which about 65,000 switch import status during the observed period, corresponding to about 9% of the population. This implies that the individual firm-specific intercept would capture the better part of the effect of trade status on firm-level productivity for those firms where the trade status does not change during the observed period. This implies that the estimated coefficient only reflects the effect of trade status on productivity for those firms where the trade status changed during the observed time period, leading to biased estimates of the trade premia.

defined by $importer_{it}$, $exporter_{it}$ and $twowaytrader_{it}$.[12] We also include a series of control variables: firm size in terms of employment in fulltime equivalents ($firmsize_{it}$), a dummy variable indicating whether the firm is controlled by a company located abroad $foreigncontrolled_{it}$) and a full set of year ($year_t$), 2-digit sector ($sector_{it}$) and region ($region_i$) dummy variables. The region dummies identify the twelve Dutch provinces.[13] Equation 3.1 is estimated in several ways. The data set contains firms from every 2-digit sector, and are thus not limited to particular manufacturing sectors. To gain an understanding of the underlying dynamics of the different sectors, we run each regression in four steps, one including all firms in the sample and three for separate subsets, one only including manufacturing sectors, one including wholesale and retail traders and one for typical (financial and public) service sectors.[14] We run separate regressions for these main sectors, since the trade data only concern goods trade, and we have no information regarding trade in services, which could bias the estimations of trade premia of goods traders. Furthermore, we also distinguish firms active in wholesale and retail trading separately from manufacturing firms, since this group is likely to show different trading behavior. Table 3.13 in the appendix illustrates in this respect that non-trading of goods is, straightforwardly, much more persistent among service firms than manufacturing firms, but that importing and two-way trading is much more common among wholesale and retail traders.

[12] A firm is considered being an exporter resp. importer in a particular year if it reports an export resp. import value larger than zero in that year.

[13] The Dutch provinces align with the second level of regional aggregation of the Nomenclature of Units for Territorial Statistics (NUTS2) developed by the European Union.

[14] Manufacturing sectors correspond in the analysis to ISIC Rev. 3.1 sections A through I, excluding G. Wholesale and retail traders correspond to ISIC Rev. 3.1 section G and service sectors are defined as sections J to Q. The OECD and Eurostat recommend to define manufacturing as sections A through F and to include section G to Q in services. However, the main purpose of this division regards the output side, in terms of goods imports this division is less sensible, since a considerable part of goods trade takes place in trade and transport sectors it seems more appropriate to separate these sections from typical (financial and public) service sectors.

	all firms	manufacturing	wholesale and retail trade	services
trade dummies				
non-trader	reference	reference	reference	reference
only imports	0.085***	0.065***	0.134***	-0.007
	(33.40)	(16.43)	(36.86)	(-1.09)
only exports	0.125***	0.121***	0.213***	0.036***
	(27.65)	(17.72)	(28.31)	(4.07)
two-way trader	0.300***	0.202***	0.374***	0.147***
	(103.71)	(45.63)	(89.48)	(18.99)
control variables				
domestically controlled	reference	reference	reference	reference
foreign controlled	0.302***	0.094***	0.329***	0.396***
	(38.32)	(7.04)	(30.07)	(20.09)
firm size (FTE, log)	0.254***	0.249***	0.314***	0.224***
	(354.10)	(256.67)	(223.85)	(160.25)
No. of observations	1,642,142	583,987	446,037	612,121
adj. R^2	0.167	0.217	0.176	0.140

Notes: All regressions include year, sector and region fixed effects. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.5: Total factor productivity premia of Dutch firms (pooled OLS, 2002-2008)

	all firms	manufacturing	wholesale and retail trade	services
trade dummies				
non-trader	reference	reference	reference	reference
only imports	0.183***	0.147***	0.227***	0.121***
	(64.33)	(33.46)	(55.35)	(17.55)
only exports	0.220***	0.204***	0.317***	0.126***
	(43.99)	(26.98)	(37.74)	(13.11)
two-way trader	0.442***	0.312***	0.515***	0.323***
	(137.92)	(63.97)	(110.95)	(38.30)
control variables				
domestically controlled	reference	reference	reference	reference
foreign controlled	0.293***	0.120***	0.246***	0.425***
	(34.27)	(8.59)	(21.00)	(19.49)
firm size (FTE, log)	0.104***	0.093***	0.191***	0.069***
	(128.22)	(86.51)	(120.27)	(43.23)
No. of observations	1,746,625	608,120	466,291	672,214
adj. R^2	0.111	0.115	0.108	0.113

Notes: All regressions include year, sector and region fixed effects. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.6: Labor productivity premia of Dutch firms (pooled OLS, 2002-2008)

Table 3.5 and Table 3.6 report the estimation results of the baseline model using TFP and LP as productivity measures. The results are largely as expected and confirm the previously established productivity ordering by trade status. The trade premia are of considerable magnitude and statistically significant. Only importing firms are an estimated 8.5 percent more productive in terms of TFP and 18.3 percent in terms of labor productivity. The difference between the estimated coefficients of the distinguished trade statuses is statistically significant in the models including all firms and the three separate subsets by main sector. This holds for both productivity measures.[15] The coefficients of the control variables show the expected results. Firms controlled by a foreign owner consistently show a productivity premium and firm size significantly positively affects firm-level productivity. The geographic location of firms within the Netherlands significantly impacts upon firm-level productivity, indicating that economically peripheral regions seem to face a productivity penalty compared to the economic center of the country.[16]

Empirical regularity 1. *The estimated productivity premia of trading translate into the following ranking of firms by trade status for both total factor productivity and labor productivity:*

$$\textit{non-trader} < \textit{only imports} < \textit{only exports} < \textit{two-way trader}$$

Empirical regularity 2. *Firm size and being controlled by a company located abroad are positively associated with firm-level productivity for both total factor productivity and labor productivity.*

Splitting the panel into three parts for typical manufacturing, trading and service sectors does reveal some interesting patterns. Wholesale and retail traders show the highest productivity premium for both TFP and labor productivity of 13.4 resp. 22.7 percent, followed closely by manufacturers; 6.5 resp. 14.7 percent. In addition, we find a consistent productivity ordering for each subset, with two-way traders being the most productive, followed by sole exporters, sole importers and non-traders, in that order. The estimated productivity premia of goods trade for service sectors are considerably smaller. These results hold for both TFP and labor productivity estimates, although the effect is more pronounced for the TFP-estimations.[17] It is difficult to hypothesize about the impact of separating service sectors. Including

[15] The only exception is the statistically insignificant difference between the estimated labor productivity premia of importing and exporting for service firms.

[16] See Table 3.14 in the appendix.

[17] The baseline TFP-model even returns an insignificant coefficient for goods importing service providers.

service sectors in the full panel implies that firms that trade in services but do not engage in goods trade are considered a non-trader. This might reduce the estimated productivity premia of goods traders relative to non-traders. However, engaging in both goods and service trading could imply incurring higher fixed cost of trading, which would raise the threshold level of productivity required to make both goods and service trade profitable. This would increase the estimated productivity premium of goods traders relative to non-traders.

		the Netherlands	Belgium	Germany	Sweden
LP	only imports	15.8	-	22.3	3.9
	only exports	22.6	-	18.9	4.3
	two-way trade	36.6	-	55.8	8.3
TFP	only imports	6.7	9.0	-	-
	only exports	12.8	6.0	-	-
	two-way trade	22.4	21.0	-	-

Note: Studies may differ in terms of e.g. sample selection and composition, period under investigation or methodological approach. Estimated trade premia regarding Belgium, Germany and Sweden are derived from respective studies by Muûls and Pisu (2009), Vogel and Wagner (2010) and Andersson, Lööf, and Johansson (2008).

Table 3.7: Benchmarking estimated trade premia of manufacturing sectors

Kox and Rojas-Romagosa (2010) find a labor productivity premium of 23 percent for exporters versus non-exporters in the Netherlands. This result is in line with our findings, although Kox and Rojas-Romagosa (2010) do not separately control for the import status of the firm.[18] Table 3.7 shows that the estimated labor productivity premia for manufacturing sectors mirror the findings of Vogel and Wagner (2010) for Germany quite closely. Muûls and Pisu (2009) present empirical evidence regarding TFP-premia of trade in manufacturing sectors in Belgium that are comparable with our findings for the Netherlands. Andersson, Lööf, and Johansson (2008) present considerably lower labor productivity premia for Sweden, but these results are difficult to compare because of differing estimation procedures and sample compositions.

[18]In addition, differences between our findings and the findings of Kox and Rojas-Romagosa (2010) should be interpreted with caution because the underlying data cover different time periods and are derived from different source data. A consequence of the latter is that the data employed by Kox and Rojas-Romagosa (2010) are biased towards large firms, whereas our data set provides a more comprehensive coverage of smaller firms.

3.4.2 Trade premia and firm size

The results of the baseline models estimated in section 3.4.1 show that trade status, firm size and productivity are correlated. In this section we take the analysis one step further and investigate whether trade premia vary along the firm size distribution.[19] We proceed in two steps. First, we add interaction terms between firm size and trade status to the baseline model. Second, to be able to identify possible nonlinearities in the relationship between productivity, trade status and firm size, we run the baseline model for each size class separately.[20] We specifically focus attention on the smallest firm size classes in this section, since these size groups in the panel are well covered, while they have been largely ignored thus far in the empirical literature.

$$\begin{aligned} ln(prod_{it}) = \alpha + \beta_1 importer_{it} + \beta_2 exporter_{it} + \beta_3 twowaytrader_{it} \\ + \beta_4 firmsize_{it} \times tradestatus_{it} + \beta_4 firmsize_{it} \\ + \beta_5 foreigncontrolled_{it} + \beta_6 year_t + \beta_7 sector_{it} + \beta_8 region_i + e_{it} \end{aligned} \tag{3.2}$$

The baseline model including interaction terms between firm size and trade status is given in equation 3.2. The trade status of firms (non-trader, only imports, only exports or two-way trader) is interacted with either the (natural logarithm) of firm size in terms of fulltime equivalents as a continuous variable or firm size by size class. The results of regression 3.2 with firm size as a continuous variable are shown in column (1) of Table 3.15 in the appendix and indicate that the productivity premium of importing increases in firm size. Productivity premia of exporting and two-way trading decrease in firm size. This could indicate that the fixed cost associated with exporting is higher relative to importing for smaller firms, which raises the threshold level of productivity required for profitable exporting relative to importing. However, since interacting trade status with a continuous measure of firm size does not reveal possible nonlinearities we also run the model including size class dummies. The results, depicted in column (2) of Table 3.15 show that productivity continuously increases in firm size. In addition,

[19] To make sure that the firms under investigation do not differ fundamentally in terms of the underlying business operations we focus attention from this point onwards on manufacturing sectors.

[20] We only include size classes up to 250 employees in this section, thereby omitting the largest size class, containing firms with more than 250 employees, from the analysis, since we know that we do not observe a representative subset of large firms in the panel data set. Furthermore, robustness tests (estimation results available from the author on request) indicate that the estimated trade premia from the baseline model in section 3.4.1 are robust to the exclusion of the largest size class of firms from the analysis.

productivity premia of importing generally increase in firm size, although the coefficient turns insignificant for the largest size class. The interaction terms show that the productivity premium of exporting generally decreases in firm size, except for firms up to 250 employees. The picture emerging for two-way trading is mixed, although relative to the smallest firms the estimated premia for the larger size classes are consistently significant and negative.

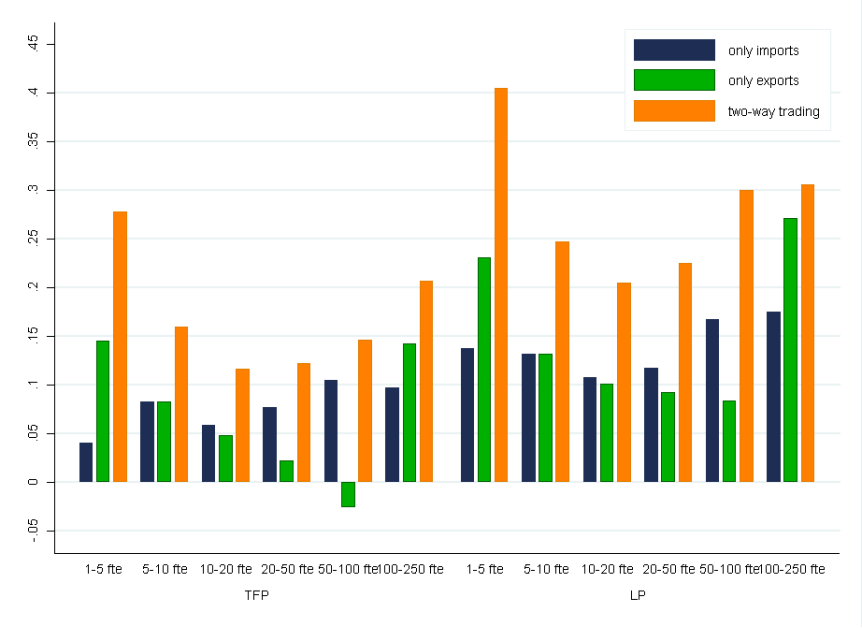

Figure 3.2: Total factor productivity premia of Dutch manufacturing firms by size class (2002-2008)

To allow for maximum flexibility in the estimation procedure we finally run the baseline model presented in equation 3.1 on the subset of manufacturing firms for the different firm size classes separately. The results regarding the estimated trade premia are graphically presented in Figure 3.2. We consistently find evidence for the existence of a productivity premium for Dutch importers. Import premia are significant and positive for all size classes for both TFP and labor productivity. However, a clear picture does not emerge in terms of the magnitude of import premia for different size groups. The results show that firms with up to five employees return the smallest TFP-premium of importing of 4 percent and firms over 50 FTE show the largest TFP-premium of importing, up to 10.5 percent. However,

size classes in between do not show a steady increase of import premia. As for labor productivity we also find evidence indicating that firms over 50 employees experience the largest productivity premium. In addition, firms in the mid-section of the firm size distribution, with 10 to 50 employees, return the smallest import premia, yielding a U-shaped import premium pattern by size class.

The TFP-premium for exporters decreases steadily in firm size, even turning insignificant for firms with more than 20 employees. Firms with up to 5 employees thus show the highest export premium with 14.5 percent. For labor productivity the picture is less clear. Export premia decrease in firm size, turning insignificant for firms over 50 employees, thus largely comparable with the findings for TFP. However, for firms with 100 to 250 employees the export premium turns significant again, with a considerable size of 27.1 percent. As for two-way trading we see a consistently U-shaped productivity premium pattern for both TFP and labor productivity, with the highest trade premium for firms up to 5 employees. These results suggest that in relative terms, compared to larger firms, employing export activities is more complex for small firms than engaging in international sourcing of inputs. This implies that a higher level of productivity is required for smaller firms in order to be able to successfully deal with the apparent complexity of export markets, hence the disappearing significance of exporter premia with increasing firm size, while import premia remain significant and positive throughout the complete firm size distribution. Furthermore, the adjusted R^2 is lower in the model specification regarding firms up to 5 employees compared to larger firms. An explanation for this observation could be that for this size group there are unobserved, most likely firm specific, determinants of trading behavior which play a less prominent role in the decision process of larger firms. International orientation and experience of the working owner could be an example of a factor that impacts upon trade patterns among small firms without playing a major role in the decision process of larger firms.

3.4.3 Direction of causality I: self-selection or not?

In the previous section we presented empirical evidence that Dutch importers are more productive than non-traders. The next question to answer concerns the direction of causality: does the firm become an importer because it is more productive than its non-importing peer prior to the switching of trade status, or does it become more productive once it starts importing due to learning effects. In order words, do firms self-select into importing, learn by

importing, or both?

2002	2003	2004	2005	2006	2007	2008	no. of firms
Non-trader							
NT	NT	NT					15,371
	NT	NT	NT				15,927
		NT	NT	NT			13,191
			NT	NT	NT		13,055
				NT	NT	NT	99,449
Non-trader starting to import in t+2							
NT	NT	IMP					473
	NT	NT	IMP				470
		NT	NT	IMP			424
			NT	NT	IMP		523
				NT	NT	IMP	4,398
Non-importing exporter (at least exporting once before t+2)							
NT/EXP	NT/EXP	NT/EXP					1,015
	NT/EXP	NT/EXP	NT/EXP				1,003
		NT/EXP	NT/EXP	NT/EXP			803
			NT/EXP	NT/EXP	NT/EXP		729
				NT/EXP	NT/EXP	NT/EXP	1,781
Exporter starting to import in t+2 (at least exporting once before t+2)							
NT/EXP	NT/EXP	IMP/TWT					135
	NT/EXP	NT/EXP	IMP/TWT				131
		NT/EXP	NT/EXP	IMP/TWT			117
			NT/EXP	NT/EXP	IMP/TWT		133
				NT/EXP	NT/EXP	IMP/TWT	361

Note: NT denotes non-trading, *EXP* denotes solely exporting, *IMP* denotes solely importing and *TWT* denotes two-way trading.

Table 3.8: Definition of cohorts for self-selection analysis (2 years)

In order to investigate the self-selection hypothesis we look at persisting productivity differences between import starters and continuing non-importers several years before the import start. It is common in the literature to evaluate productivity differences three years prior to the import start. The choice for this time horizon seems to be arbitrary. Roberts and Tybout (1997) show that the effect of past export experience depreciates in about two years, implying that firms with past export experience are no different from persistent non-exporters as soon as they have been out of export markets for more than two years, which could justify the choice for a time horizon of (at least) three years. To get a grasp of possible different productivity premia in the years leading up to an import start we consider time horizons of two, three and four years prior to the import start in the analysis.

In order to do so we compare two groups of import starters with their continuing non-importing peers; firms that start importing in year t that did

not trade in years *t-T* through *t-1* and firms that start importing in year t that exported at least once in years *t-T* through *t-1*, with $2 \leq T \leq 4$. The first group is compared to the group of firms that continued to be non-trader in year t, the latter is compared to firms that did not import, but exported at least once in years *t-T* through *t-1*. The exact definitions of the different identifiable cohorts and the corresponding number of firms satisfying the conditions for $T = 2$ are presented in Table 3.8. See Tables 3.16 and 3.17 in the appendix for the definitions of the cohorts with time horizons of three and four years.

The panel, covering the years 2002-2008, allows us to identify three to five cohorts of import starters, depending on the time horizon. For each paired cohort we estimate a pooled OLS-regression model that is specified as follows:

$$\begin{aligned} ln(prod_{it-T}) = \alpha + \beta_1 importer_{it} + \beta_2 foreigncontrolled_{it-T} \\ +\beta_3 firmsize_{it-T} + \beta_4 year_t + \beta_5 sector_{it-T} + \beta_6 region_i + e_{it} \end{aligned} \tag{3.3}$$

Each variable in this model is defined in the same way as in equation 3.1, all explanatory variables are also lagged T years, except for time-invariant variables and the dummy marking the import start. Table 3.9 shows the results for both total factor productivity and labor productivity and varying time horizons.[21]

The evidence regarding self-selection of manufacturing firms into import markets is mixed. However, all significant estimated coefficients of the importer dummy are positive. Especially for non-trading import starters the evidence pointing towards self-selection into importing is rather compelling, particularly considering a time horizon of three years. All but one of the cohorts for TFP and labor productivity return a significant estimate three years prior to import market entry of non-traders. The magnitude of the labor productivity difference between non-traders and import starters at *t-3* is somewhat greater than the findings of Vogel and Wagner (2010) for Germany. The estimations suggest that labor productivity of import starters is 7.4 to 17.4 percent higher three years prior to the import start than that of continuing non-traders. For TFP the estimated premia are lower; 7.3 to 13.3 percent. Exporting import starters show less convincing self-selection behavior, although still more than half of the cohorts returns a significantly positive estimate. The results suggest that non-trading import starters are more productive two years prior to import start, particulary in terms of labor productivity. The evidence does not confirm this for import starters in

[21] We only present the coefficient on the importer dummy for space considerations, the full estimation results are available from the author upon request.

possession of export experience. Finally, firms do not seem to be concerned with an impending import start four years prior to import market entry, considering the scarcity of significant premia for the four year time horizon.

		non-trader starting to import		exporter starting to import	
		TFP	LP	TFP	LP
dependent variable: productivity 2 years prior to import start in year t					
t=2004	coefficient	0.076*	0.084*	0.096	0.115
		(2.53)	(2.55)	(1.51)	(1.67)
	no. of observations	14,356	14,489	1,052	1,052
t=2005	coefficient	0.071*	0.138***	0.122	0.119
		(2.23)	(4.05)	(1.87)	(1.72)
	no. of observations	14,890	15,033	1,044	1,043
t=2006	coefficient	0.057	0.09*	-0.089	-0.066
		(1.56)	(2.25)	(-1.19)	(-0.77)
	no. of observations	12,951	12,968	867	869
t=2007	coefficient	0.047	0.082*	0.141*	0.161*
		(1.69)	(2.53)	(2.22)	(2.32)
	no. of observations	12,949	13,009	806	817
t=2008	coefficient	0.036**	0.103***	0.08*	0.118**
		(3.31)	(8.58)	(2.06)	(2.63)
	no. of observations	96,035	99,859	2,002	2,036
dependent variable: productivity 3 years prior to import start in year t					
t=2005	coefficient	0.133***	0.174***	0.219**	0.201**
		(3.75)	(4.31)	(3.13)	(2.73)
	no. of observations	12,422	12,533	1,031	1,028
t=2006	coefficient	0.073*	0.109**	-0.032	-0.05
		(2.02)	(2.77)	(-0.38)	(-0.53)
	no. of observations	11,039	11,074	860	864
t=2007	coefficient	0.048	0.074*	0.136*	0.15*
		(1.48)	(2.16)	(2.06)	(2.09)
	no. of observations	11,081	11,093	819	824
t=2008	coefficient	0.086***	0.123***	0.095	0.107*
		(3.84)	(5.02)	(1.91)	(2.05)
	no. of observations	10,576	10,625	781	788
dependent variable: productivity 4 years prior to import start in year t					
t=2006	coefficient	0.034	0.080	0.009	0.042
		(0.79)	(1.63)	(0.1)	(0.4)
	no. of observations	9,283	9,315	854	853
t=2007	coefficient	-0.037	-0.02	0.21**	0.206**
		(-1.02)	(-0.5)	(3.01)	(2.8)
	no. of observations	9,509	9,537	793	796
t=2008	coefficient	0.088***	0.129***	0.016	0.052
		(3.66)	(5.14)	(0.32)	(0.96)
	no. of observations	9,172	9,168	763	763

Notes: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.9: Self-selection of Dutch manufacturing firms into goods import markets

		1-5 FTE		5-10 FTE		10-20 FTE		20-50 FTE	
		TFP	LP	TFP	LP	TFP	LP	TFP	LP
dependent variable: productivity 2 years prior to import start in year t									
t=2004	coefficient	0.14	0.181*	0.093*	0.082	0.008	0.029	0.107	0.105
		(1.87)	(2.25)	(2.03)	(1.6)	(0.16)	(0.49)	(1.66)	(1.39)
	no. of obs.	5,373	5,448	3,619	3,652	3,071	3,093	1,886	1,886
t=2005	coefficient	0.093	0.226**	0.099	0.136*	0.02	0.06	0.052	0.091
		(1.26)	(2.89)	(1.75)	(2.3)	(0.39)	(1.07)	(0.97)	(1.43)
	no. of obs.	5,679	5,772	3,734	3,768	3,183	3,195	1,882	1,885
t=2006	coefficient	0.082	0.094	0.091	0.138*	0.013	0.053	0.033	0.105
		(1.02)	(1.04)	(1.49)	(1.99)	(0.22)	(0.79)	(0.39)	(1.32)
	no. of obs.	4,724	4,708	3,429	3,451	2,891	2,901	1,605	1,605
t=2007	coefficient	0.085	0.113	0.012	0.023	0.057	0.108*	-0.071	-0.02
		(1.45)	(0.171)	(0.23)	(0.36)	(1.37)	(2.2)	(-0.92)	(-0.23)
	no. of obs.	4,789	4,800	3,457	3,483	2,864	2,874	1,541	1,551
t=2008	coefficient	0.027	0.102***	0.037	0.086***	0.082***	0.105***	0.035	0.097*
		(1.87)	(6.45)	(1.89)	(4.15)	(3.81)	(4.46)	(0.99)	(2.39)
	no. of obs.	81,310	85,060	8,429	8,484	4,282	4,293	1,699	1,705
dependent variable: productivity 3 years prior to import start in year t									
t=2005	coefficient	0.291***	0.349***	0.084	0.14*	0.033	0.064	0.016	0.05
		(3.7)	(3.78)	(1.34)	(2.02)	(0.51)	(0.9)	(0.24)	(0.63)
	no. of obs.	4,666	4,734	3,140	3,164	2,689	2,708	1,607	1,607
t=2006	coefficient	0.122	0.184*	0.055	0.076	0.086	0.141*	0.083	0.107
		(1.37)	(2.00)	(0.88)	(1.08)	(1.75)	(2.35)	(1.42)	(1.56)
	no. of obs.	3,996	3,998	2,954	2,975	2,473	2,483	1,364	1,365
t=2007	coefficient	0.094	0.103	-0.058	-0.002	0.084	0.121*	-0.057	-0.019
		(1.35)	(1.38)	(-0.97)	(-0.03)	(1.96)	(2.53)	(-0.68)	(-0.21)
	no. of obs.	4,067	4,050	2,944	2,964	2,466	2,474	1,358	1,359
t=2008	coefficient	0.092	0.136*	0.072*	0.094*	0.104**	0.144***	-0.012	0.037
		(1.62)	(2.18)	(1.97)	(2.26)	(3.19)	(3.82)	(-0.23)	(0.68)
	no. of obs.	3,918	3,926	2,867	2,891	2,326	2,333	1,230	1,238
dependent variable: productivity 4 years prior to import start in year t									
t=2006	coefficient	0.071	0.193	0.007	0.033	0.068	0.124*	-0.008	-0.043
		(0.66)	(1.67)	(0.11)	(0.44)	(1.34)	(2.02)	(-0.07)	(-0.33)
	no. of obs.	3,308	3,307	2,502	2,517	2,104	2,117	1,164	1,167
t=2007	coefficient	-0.110	-0.123	0.090	-0.061	0.043	0.05	-0.06	0.005
		(-1.21)	(-1.15)	(-1.51)	(-0.82)	(1.12)	(1.11)	(-0.61)	(0.06)
	no. of obs.	3,469	3,470	2,544	2,562	2,129	2,136	1,156	1,157
t=2008	coefficient	0.104	0.156*	0.068	0.101*	0.072	0.123**	0.022	0.06
		(1.76)	(2.5)	(1.62)	(2.29)	(1.96)	(2.86)	(0.42)	(1.17)
	no. of obs.	3,386	3,361	2,466	2,483	2,025	2,029	1,096	1,096

Notes: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.10: Self-selection of Dutch manufacturing firms by size class into goods import markets

The results thus point in the direction of self-selection of more productive manufacturing firms into importing, particularly for firms that did not trade altogether prior to the import start and for time horizons of two and three years.[22] These results align with the findings of Roberts and Tybout (1997)

[22]Tables 3.18 and 3.19 in the appendix present the empirical evidence regarding self-selection of wholesale and retail traders and service firms into goods import markets.

in the sense that the less convincing evidence regarding the time horizon of two years could be at least partially explained by the fact that the group of continuing non-importers may contain firms that recently exited import markets, but did not fully depreciate the beneficial characteristics of being an importer yet.

Table 3.10 presents the results of the self-selection analysis for different size classes.[23] The results should be interpreted with caution, since the numbers of observations for the different size classes, particularly the numbers of import starters, is relatively small. It is possible that no empirical evidence for significant productivity premia is found not because it does not exist but because the variation in the underlying data regarding the numbers of import starters is too small. However, all significant productivity premia are positive again.

Particularly for firms with up to five employees the empirical evidence suggests that import starters incur a productivity premium three years prior to import market entry. Again we see that the empirical evidence is much thinner for shorter and particularly for longer time horizons. Moreover, for firms with 10 to 20 employees there is some evidence pointing towards self-selection into import markets, particularly in terms of labor productivity, whereas for larger firms there is hardly any evidence in favor of self-selection. Note that there is also considerable variation in the results between cohorts of different years. The 2008 cohort of import starters yields significant results for most of the 2 and 3 year time horizons and firms up till 20 employees, whereas the results for other years are much more diffuse. This is possibly due to the inclusion of data from income tax statements since 2006, which particularly increases the number of observations satisfying the constraints for the 2008 cohorts and a 2 year time horizon.

Empirical regularity 3. *More productive manufacturing firms self-select into importing, particularly small firms that did not trade altogether prior to the import start and considering time horizons of two and three years.*

However, there is very little evidence suggesting that firms active in these main sectors are more productive prior to a goods import start, suggesting that firms in wholesale and retail trade and service do not self-select into goods importing.

[23] The size class selection is done in year t-T, irrespective of firm growth across size class borders in the years after. We only present the results for size classes up to 50 employees and for non-traders starting to import, since the number of observations for larger firm size groups and exporters starting to import is too small to infer any useful conclusions from.

3.4.4 Direction of causality II: learning by importing?

The next step is to establish whether import starters incur gains from learning by importing. Presenting evidence that firms starting to import from abroad show higher productivity growth than firms that keep sourcing domestically is not sufficient to conclude that firms learn from importing. After all, in section 3.4.3 we presented evidence suggesting that import starters do indeed outperform continuing non-traders in terms of productivity in the years prior to foreign market entry. If import starters do indeed outperform continuing non-traders already before starting to import, then there would be no valid reason to expect this difference to disappear after the import start, except for a situation where import starters would be catching up with non-traders, but the analysis thus far has shown that this is not the case. On the other hand, it is impossible to check whether import starters would have continuously performed better than non-importers if they also continued their non-importing status, since this scenario is simply unobserved.

A common way to deal with this issue is to adopt propensity score matching (Greenaway and Kneller, 2007b). The objective of this procedure is to construct the non-observed counterfactual by matching each treated firm to a firm from the control group based on similarity of firm characteristics before the treatment. In this particular application the treatment is the import start of the firm. The aim is to analyze whether these matched pairs of firms show diverging productivity growth paths after the import start. We investigate this issue over two time frames, following Vogel and Wagner (2010). The import starting firm could immediately incur a productivity increase because it can benefit from e.g. the availability of more variety, higher quality or cheaper inputs or better technology in its production process. Furthermore, the import starter could continuously learn from importing through e.g. knowledge spillovers from foreign trading partners or competitors and efficiency gains through international competitive pressure. Vogel and Wagner (2010) refer to the former effect as the static learning effect and to the latter as the dynamic learning effect.

We employ propensity score matching to investigate the persistence of both the static and the dynamic learning effects of importing. Firms starting to import in year t are matched to a continuing non-importer from the control group based on similarity of a set of firm characteristics at *t-1*. These characteristics are employed in a probit model to estimate the probability of an import start at time t, the so-called propensity score. The estimated

probit model is thus specified as follows:

$$\begin{aligned} importer_{it} = \alpha + \beta_1 ln(prod_{it-1}) + \beta_2 prodgrowth_{it-1,t-2} \\ +\beta_3 foreigncontrolled_{it-1} + \beta_4 firmsize_{it-1} \\ +\beta_5 sector_{it-1} + \beta_6 region_i + e_{it} \end{aligned} \tag{3.4}$$

The variables in this model are defined in the same way as in equation 3.1; all explanatory variables are lagged one year, except for time-invariant variables and productivity growth, which is defined as the percentage change of productivity between *t-2* and *t-1*.

Productivity growth at the firm-level in our panel, both labor productivity and TFP, turns out to be rather volatile, with a small but considerable number of large positive values driving up average annual productivity growth rates. There is a number of considerations that needs to be taken into account regarding firm-level productivity growth. First of all, productivity growth is only computable conditional on firm survival, that is, firms that exit the market do not get a productivity growth rate of -100 percent assigned in the year after exit, but simply a missing value, since market exit is essentially unobserved. Secondly, in chapter 2 we discussed the overrepresentation of small firms in our panel, especially from 2006 onwards. This implies high volatility in productivity growth, since this appears to decrease in firm size. This is partly due to a relatively large number of start-ups incurring large efficiency gains in the first years of existence. Furthermore, starters are not identifiable as such in our panel. This group is likely to incur large productivity gains from the first partial year after establishment to the second and first full year of operation. These considerations are reflected by the employment weighed average TFP-growth in our panel, which is 4.4 percent compared to an unweighed average of 9.1 percent. Moreover, average TFP-growth in the smallest size class, covering firms with up to 5 employees is 11.3 percent where average productivity growth in the larger size classes does not exceed 4.3 percent. These considerations taken into account, and the fact that the import starters and their continuingly non-importing peers in our analysis are mainly from the lower end of the firm size spectrum, motivate the decision to exclude the per annum top and bottom 5 percent of the relevant productivity growth distribution in our analysis.

Firms from the import-starting cohort are then matched to a peer from the continuingly non-importing control group by minimizing the difference in individual propensity scores; this procedure is referred to as nearest neighbor propensity score matching. The only additional condition that needs to be satisfied is that both treated and matched untreated firms continuously

stay in business throughout the period under investigation. In the final step the productivity growth paths of the matched pairs of import starters and continuing non-importers are compared.[24] The static learning effect is evaluated by comparing productivity growth between *t-1* and *t* and between *t* and *t+1*. The dynamic learning effect is evaluated by comparing productivity growth paths from *t+1* to *t+2* and from *t+2* to *t+3*.[25]

We find no evidence pointing towards the existence of a static learning effect for Dutch import starters in manufacturing sectors (see Table 3.11). For non-trading import starters the number of treated firms ranges from 220 to 280 per year and the estimated average treatment effect on the treated (ATT) varies from -10.4 to +7.2 percent. The estimated treatment effects do not significantly differ from zero, considering the fact that zero lies well within the bootstrapped and bias-corrected 95 percent confidence intervals for all but two of the identified cohorts. This indicates that the productivity growth paths of non-trading import starters and continuing non-traders do not significantly differ. The number of observations regarding exporting import starters ranges from 50 to 90 a year, with an estimated treatment effect varying between -13.1 to +14.9 percent. For all of the estimated treatment effects zero lies inside the constructed confidence intervals, indicating that the average treatment effect on the treated does not significantly differ from zero at the 95 percent significance level.

[24] To evaluate the average treatment effect on the treated (ATT) we construct bias-corrected 95% confidence intervals by bootstrapping the ATT with 1,000 replications. Abadie and Imbens (2008) show that bootstrapping nearest neighbor matching estimators yields invalid standard errors. However, Caliendo and Kopeinig (2008) argue that if propensity scores need to be estimated there is no feasible alternative available. To pursue caution we will however abstain from estimating and evaluating exact p-values and only construct bias-corrected 95% confidence intervals.

[25] The exact conditions underlying the definitions of the cohorts and the corresponding number of firms satisfying these conditions are presented in Table 3.20 and 3.21 in the appendix.

	productivity growth outcome measure	no. of matched treated	mean of matched treated (%)	mean of matched controls (%)	ATT (%)	bias-corrected 95% confidence interval	
non-trader starting to import in year t							
t=2007	TFP_{-06-07}	273	13.5	14.5	-1.1	-7.7	4.7
	TFP_{-07-08}	265	0.6	-2.1	2.8	-3.4	8.8
t=2007	LP_{-06-07}	284	9.0	11.2	-2.3	-11.1	6.1
	LP_{-07-08}	282	4.0	2.8	1.1	-6.3	10.8
t=2006	TFP_{-05-06}	238	13.1	13.9	-0.8	-9.6	5.9
	TFP_{-06-07}	230	12.3	10.7	1.6	-6.0	9.7
t=2006	LP_{-05-06}	246	21.6	14.4	7.2	-5.6	17.6
	LP_{-06-07}	243	4.3	14.7	-10.4*	-22.3	-4.4
t=2005	TFP_{-04-05}	229	9.8	2.6	7.2*	2.0	14.7
	TFP_{-05-06}	220	10.8	17.2	-6.3	-17.7	1.4
t=2005	LP_{-04-05}	242	6.3	5.7	0.6	-8.2	5.7
	LP_{-05-06}	239	8.7	17.8	-9.1	-22.2	2.7
exporter starting to import in year t							
t=2007	TFP_{-06-07}	88	13.4	13.4	0.0	-13.8	15.4
	TFP_{-07-08}	86	-4.2	0.0	-4.2	-15.1	7.2
t=2007	LP_{-06-07}	95	10.7	16.9	-6.2	-20.8	12.7
	LP_{-07-08}	99	-1.6	-3.5	1.9	-13.0	17.1
t=2006	TFP_{-05-06}	59	21.1	15.4	5.7	-9.5	25.2
	TFP_{-06-07}	59	25.3	10.4	14.9	-1.6	30.5
t=2006	LP_{-05-06}	63	29.5	14.8	14.7	-1.4	40.0
	LP_{-06-07}	66	24.2	15.4	8.8	-13.7	30.1
t=2005	TFP_{-04-05}	49	10.9	9.1	1.8	-11.1	15.6
	TFP_{-05-06}	49	12.0	25.1	-13.1	-34.1	3.5
t=2005	LP_{-04-05}	52	8.9	13.9	-5.0	-27.0	14.5
	LP_{-05-06}	53	10.7	21.9	-11.2	-37.2	12.7

Notes: Nearest neighbor propensity score matching was done using Stata 11 and the psmatch2 package developed by Leuven and Sianesi (2003). The common support condition is imposed on the matching procedure, implying that treated firms with a propensity score higher than the maximum of the non-treated control group and lower than the minimum of the control group are taken off support and are not matched to a peer. The balancing property condition, requiring absence of statistically significant differences between the means of the matching characteristics of the firms in the treatment and the control group is fully satisfied in all but one instance. The bias-corrected 95% confidence intervals are generated by bootstrapping the ATT with 1,000 replications. * $p < 0.05$

Table 3.11: Static effect of learning by importing on Dutch manufacturers

Table 3.12 shows the results of the propensity score matching analysis of the dynamic learning by doing effect. Again we do not find compelling evidence for the existence of diverging productivity growth paths of import starters and continuing non-importers. We are able to identify about 100 non-trading import starters per year and estimate treatment effects ranging from -5.6 to +5.8 percent, for all of which zero lies well within the accompanying confidence interval. Exporting importers yield about 30 observations per cohort and estimated treatment effects between -30 and +15.7 percent,

of which only the former significantly differs from zero. Note that the results regarding exporting import starters should be interpreted with caution. Due to the relatively small number of observations the mean treatment effects and the resulting treatment effects are subject to considerable volatility.

Empirical regularity 4. *There is no evidence in favor of the learning by importing hypothesis for SMEs, both in the short run and in the longer run.*

	productivity growth outcome measure	no. of matched treated	mean of matched treated (%)	mean of matched controls (%)	ATT (%)	bias-corrected 95% confidence interval	
non-trader starting to import in year t							
t=2006	TFP_{07-08}	100	-5.0	-3.6	-1.4	-9.4	9.0
t=2006	LP_{07-08}	108	1.0	1.0	0.0	-11.1	15.0
t=2005	TFP_{06-07}	97	6.1	11.7	-5.6	-15.1	4.6
t=2005	TFP_{07-08}	81	3.7	2.1	1.7	-9.8	14.3
t=2005	LP_{06-07}	110	1.6	1.9	-0.3	-13.7	14.7
t=2005	LP_{07-08}	89	7.8	2.0	5.8	-10.7	20.7
exporter starting to import in year t							
t=2006	TFP_{07-08}	29	-20.9	9.1	-30*	-55.7	-5.3
t=2006	LP_{07-08}	31	-16.1	-2.5	-13.7	-49.4	15.3
t=2005	TFP_{06-07}	23	25.2	9.5	15.7	-7.6	46.9
t=2005	TFP_{07-08}	21	-3.1	-7.6	4.5	-18.1	35.7
t=2005	LP_{06-07}	29	25.4	29.0	-3.6	-47.5	30.3
t=2005	LP_{07-08}	26	3.2	18.3	-15.1	-65.6	12.5

Notes: Nearest neighbor propensity score matching was done using Stata 11 and the psmatch2 package developed by Leuven and Sianesi (2003). The common support condition is imposed on the matching procedure, implying that treated firms with a propensity score higher than the maximum of the non-treated control group and lower than the minimum of the control group are taken off support and are not matched to a peer. The balancing property condition, requiring absence of statistically significant differences between the means of the matching characteristics of the firms in the treatment and the control group is fully satisfied in all but two instances. The bias-corrected 95% confidence intervals are generated by bootstrapping the ATT with 1,000 replications. * $p < 0.05$

Table 3.12: Dynamic effect of learning by importing on Dutch manufacturers

3.5 Conclusion and discussion

Constructing a comprehensive data set covering Dutch firms over the years 2002-2008 we investigate the relationship between trade status, firm size and firm-level productivity in the Netherlands. The empirical results are summarized in four empirical regularities. (i) Firms that import and do not export are more productive than non-traders. Firms that only export are more productive than firms that only import. Two-way traders are the most productive group. (ii) Firm size and being controlled by a company located

abroad are positively correlated with firm-level productivity. (iii) The results of the empirical analysis point in the direction of self-selection of more productive manufacturing firms into importing, particularly for firms that did not trade altogether prior to the import start and for time horizons of two and three years. (iv) We do not find evidence supporting the hypothesis that firms become more productive after an import start because of learning effects; import starters do not show significantly different productivity growth paths in the years after the import start compared to continuing non-traders, both in the short and the longer run. The findings regarding the direction of causality align with earlier research.

We find significant importer productivity premia for all firm size classes, but we do not find a clear pattern in the magnitude of the estimated premia by size group. The productivity premia of sole exporters decreases in firm size, even disappearing for the largest firm size classes, whereas two-way traders show a U-shaped productivity premium curve, with the highest premia estimated for firms at both ends of the firm size distribution. These results indicate that compared to larger firms, employing export activities is more complex for small firms than engaging in international sourcing of inputs. This implies that a higher level of productivity is required for smaller firms in order to be able to successfully deal with the apparent complexity of export markets, hence the disappearing significance of exporter premia with increasing firm size, while import premia remain significant and positive throughout the complete firm size distribution.

Although it is by now well-established that importers outperform non-traders in terms of productivity, the evidence regarding the mechanism driving these productivity differences is still quite scarce. Further research will hopefully fill this void and show whether the underlying mechanisms uncovered for Germany by Vogel and Wagner (2010) and the Netherlands by this study are found in other advanced and developing countries as well. In addition, an interesting direction for further research could be the unraveling of the exact mechanisms driving productivity differences between non-traders and importers and the underlying direction of causality by investigating whether importing different types of products from different source countries affects firm performance.

3.A Appendix

Panel A: manufacturing sectors					
	non-trading	only exports	only imports	two-way trading	total
2002	72.3	4.1	7.9	15.7	31,917
2003	71.6	4.1	8.6	15.7	32,228
2004	71.6	4.1	8.6	15.8	32,288
2005	71.7	3.9	8.7	15.7	32,767
2006	90.1	1.3	4.6	4.0	160,588
2007	88.7	1.5	5.5	4.3	166,144
2008	86.4	1.9	7.1	4.7	194,329
total	552,625	13,441	41,217	42,978	650,261
Panel B: wholesale and retail trading sectors					
	non-trading	only exports	only imports	two-way trading	total
2002	48.0	4.7	17.7	29.6	33,569
2003	46.8	4.7	18.1	30.5	33,418
2004	46.8	4.7	18.4	30.2	33,782
2005	46.6	4.7	18.5	30.2	34,291
2006	70.2	2.6	15.7	11.5	130,963
2007	66.1	3.0	18.0	12.9	130,773
2008	59.3	3.7	22.4	14.6	143,733
total	327,225	18,992	100,810	93,502	540,529
Panel C: service sectors					
	non-trading	only exports	only imports	two-way trading	total
2002	89.2	2.9	4.3	3.6	39,855
2003	88.3	2.9	4.8	4.0	40,743
2004	88.6	2.8	4.8	3.9	41,517
2005	88.7	2.6	5.0	3.7	44,199
2006	94.0	1.3	3.3	1.5	174,556
2007	92.8	1.6	3.9	1.6	190,048
2008	91.3	2.0	4.7	2.0	221,442
total	690,231	14,343	31,440	16,346	752,360

Note: The dashed line marks the break in the data due to the inclusion of income tax statements from 2006 onwards.

Table 3.13: Trade status of Dutch manufacturing and service firms by year (%)

	all firms	manufacturing	wholesale and retail trade	services
total factor productivity premia; Table 3.5 cont.				
Groningen	reference	reference	reference	reference
Friesland	0.035***	0.029***	0.017	0.056***
	(6.14)	(4.06)	(1.62)	(4.55)
Drenthe	-0.011	0.016*	-0.018	-0.048***
	(-1.75)	(1.99)	(-1.54)	(-3.56)
Overijssel	0.077***	0.093***	0.044***	0.086***
	(14.55)	(13.76)	(4.51)	(7.66)
Flevoland	0.076***	0.078***	0.058***	0.085***
	(11.06)	(8.64)	(4.42)	(6.39)
Gelderland	0.123***	0.128***	0.090***	0.143***
	(25.55)	(20.55)	(10.01)	(14.30)
Utrecht	0.226***	0.187***	0.189***	0.273***
	(44.38)	(27.84)	(19.66)	(26.92)
Noord-Holland	0.165***	0.149***	0.141***	0.200***
	(35.18)	(24.57)	(15.94)	(20.69)
Zuid-Holland	0.204***	0.207***	0.166***	0.229***
	(43.81)	(34.40)	(19.05)	(23.76)
Zeeland	0.076***	0.116***	0.025*	0.052***
	(11.75)	(14.29)	(2.02)	(3.61)
Noord-Brabant	0.119***	0.150***	0.083***	0.116***
	(25.20)	(24.65)	(9.37)	(11.85)
Limburg	0.015**	0.028***	-0.012	0.025*
	(2.90)	(4.06)	(-1.25)	(2.27)
labor productivity premia; Table 3.6 cont.				
Groningen	reference	reference	reference	reference
Friesland	0.077***	0.069***	0.051***	0.112***
	(12.28)	(8.84)	(4.26)	(8.48)
Drenthe	0.001	0.032***	-0.002	-0.033*
	(0.11)	(3.53)	(-0.19)	(-2.29)
Overijssel	0.098***	0.116***	0.057***	0.118***
	(16.72)	(15.53)	(5.20)	(9.76)
Flevoland	0.085***	0.094***	0.045**	0.104***
	(11.21)	(9.49)	(3.09)	(7.28)
Gelderland	0.141***	0.151***	0.101***	0.165***
	(26.38)	(22.00)	(9.94)	(15.32)
Utrecht	0.218***	0.182***	0.167***	0.270***
	(38.67)	(24.43)	(15.40)	(24.84)
Noord-Holland	0.141***	0.133***	0.101***	0.183***
	(27.19)	(19.85)	(10.11)	(17.72)
Zuid-Holland	0.182***	0.188***	0.134***	0.219***
	(35.29)	(28.30)	(13.59)	(21.25)
Zeeland	0.105***	0.153***	0.049***	0.088***
	(14.60)	(17.06)	(3.56)	(5.66)
Noord-Brabant	0.128***	0.162***	0.080***	0.135***
	(24.43)	(24.22)	(8.07)	(12.79)
Limburg	0.005	0.020**	-0.037***	0.039***
	(0.79)	(2.61)	(-3.41)	(3.31)

Notes: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.14: Productivity premia of Dutch firms: regional dummy variables (pooled OLS, 2002-2008)

	(1)	(2)
trade dummies		
non-trader	reference	reference
only imports	0.037***	0.080***
	(5.56)	(13.70)
only exports	0.163***	0.189***
	(13.07)	(17.53)
two-way trader	0.326***	0.374***
	(36.32)	(43.00)
firm size (FTE, log)	0.256***	
	(241.74)	
1-5 FTE		reference
5-10 FTE		0.414***
		(139.07)
10-20 FTE		0.578***
		(168.50)
20-50 FTE		0.696***
		(146.90)
50-100 FTE		0.817***
		(73.91)
100-250 FTE		0.973***
		(47.63)
only imports * firm size (FTE, log)	0.017***	
	(5.31)	
only exports * firm size (FTE, log)	-0.030***	
	(-5.42)	
two-way trading * firm size (FTE, log)	-0.058***	
	(-18.51)	
*interaction terms size class (rows) * trade status (columns)*		
	only imports	*only exports*	*two-way trading*
1-5 FTE	reference	reference	reference
5-10 FTE	0.032***	-0.080***	-0.177***
	(3.35)	(-4.70)	(-15.55)
10-20 FTE	0.003	-0.108***	-0.223***
	(0.34)	(-6.50)	(-20.52)
20-50 FTE	0.037**	-0.117***	-0.171***
	(3.14)	(-6.22)	(-15.36)
50-100 FTE	0.053*	-0.145***	-0.131***
	(2.06)	(-3.43)	(-7.46)
100-250 FTE	0.032	-0.024	-0.187***
	(0.74)	(-0.29)	(-7.25)
control variables			
domestically controlled	reference	reference	
foreign controlled	0.183***	0.225***	
	(13.10)	(15.79)	
No. of observations	583,234	583,234	
adj. R^2	0.216	0.201	

Notes: All regressions include year, sector and region fixed effects. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.15: Productivity premia of Dutch manufacturing firms (equation 3.2, pooled OLS, 2002-2008)

2002	2003	2004	2005	2006	2007	2008	no. of firms
Non-trader							
NT	NT	NT	NT				13,242
	NT	NT	NT	NT			11,228
		NT	NT	NT	NT		11,181
			NT	NT	NT	NT	10,203
Non-trader starting to import in t+3							
NT	NT	NT	IMP				347
	NT	NT	NT	IMP			344
		NT	NT	NT	IMP		406
			NT	NT	NT	IMP	872
Non-importing exporter (at least exporting once before t+3)							
NT/EXP	NT/EXP	NT/EXP	NT/EXP				1,029
	NT/EXP	NT/EXP	NT/EXP	NT/EXP			831
		NT/EXP	NT/EXP	NT/EXP	NT/EXP		749
			NT/EXP	NT/EXP	NT/EXP	NT/EXP	662
Exporter starting to import in t+3 (at least exporting once before t+3)							
NT/EXP	NT/EXP	NT/EXP	IMP/TWT				92
	NT/EXP	NT/EXP	NT/EXP	IMP/TWT			88
		NT/EXP	NT/EXP	NT/EXP	IMP/TWT		123
			NT/EXP	NT/EXP	NT/EXP	IMP/TWT	166

Note: NT denotes non-trading, *EXP* denotes solely exporting, *IMP* denotes solely importing and *TWT* denotes two-way trading

Table 3.16: Definition of cohorts for self-selection analysis (3 years)

2002	2003	2004	2005	2006	2007	2008	no. of firms
Non-trader							
NT	NT	NT	NT	NT			9,473
	NT	NT	NT	NT	NT		9,606
		NT	NT	NT	NT	NT	8,853
Non-trader starting to import in t+4							
NT	NT	NT	NT	IMP			262
	NT	NT	NT	NT	IMP		338
		NT	NT	NT	NT	IMP	723
Non-importing exporter (at least exporting once before t+4)							
NT/EXP	NT/EXP	NT/EXP	NT/EXP	NT/EXP			841
	NT/EXP	NT/EXP	NT/EXP	NT/EXP	NT/EXP		757
		NT/EXP	NT/EXP	NT/EXP	NT/EXP	NT/EXP	655
Exporter starting to import in t+4 (at least exporting once before t+4)							
NT/EXP	NT/EXP	NT/EXP	NT/EXP	IMP/TWT			70
	NT/EXP	NT/EXP	NT/EXP	NT/EXP	IMP/TWT		90
		NT/EXP	NT/EXP	NT/EXP	NT/EXP	IMP/TWT	153

Note: NT denotes non-trading, *EXP* denotes solely exporting, *IMP* denotes solely importing and *TWT* denotes two-way trading

Table 3.17: Definition of cohorts for self-selection analysis (4 years)

		non-trader starting to import		exporter starting to import	
		TFP	LP	TFP	LP
dependent variable: productivity 2 years prior to import start in year t					
t=2004	coefficient	0.138**	0.149**	0.117	0.119
		(3.39)	(3.23)	(1.28)	(1.23)
	no. of observations	8,413	8,603	1,088	1,098
t=2005	coefficient	0.16***	0.2***	0.163	0.085
		(3.88)	(4.37)	(1.83)	(0.82)
	no. of observations	8,772	8,961	1,094	1,106
t=2006	coefficient	0.006	0.033	0.111	0.072
		(0.13)	(0.67)	(1.37)	(0.85)
	no. of observations	7,147	7,244	932	937
t=2007	coefficient	0.028	0.069	0.091	0.098
		(0.72)	(1.63)	(0.94)	(0.89)
	no. of observations	7,017	7,083	837	841
t=2008	coefficient	0.099***	0.178***	0.175***	0.237***
		(8.43)	(13.48)	(4.24)	(5.18)
	no. of observations	48,512	51,412	2,716	2,803
dependent variable: productivity 3 years prior to import start in year t					
t=2005	coefficient	0.031	0.095	0.206*	0.146
		(0.59)	(1.66)	(2.39)	(1.56)
	no. of observations	7,044	7,192	1,010	1,014
t=2006	coefficient	0.012	0.035	-0.096	-0.112
		(0.26)	(0.66)	(-0.94)	(-0.99)
	no. of observations	5,845	5,892	844	853
t=2007	coefficient	0.004	0.069	0.106	0.108
		(0.1)	(1.5)	(1.12)	(1.04)
	no. of observations	5,859	5,927	829	838
t=2008	coefficient	-0.006	0.026	0.038	0.058
		(-0.18)	(0.77)	(0.59)	(0.83)
	no. of observations	5,353	5,397	771	771
dependent variable: productivity 4 years prior to import start in year t					
t=2006	coefficient	0.108*	0.142**	-0.142	-0.129
		(2.43)	(2.72)	(-1.32)	(-1.1)
	no. of observations	4,766	4,812	779	777
t=2007	coefficient	0.012	0.055	0.162	0.203
		(0.25)	(1.08)	(1.45)	(1.76)
	no. of observations	4,874	4,914	744	754
t=2008	coefficient	0.044	0.083*	0.063	0.069
		(1.41)	(2.48)	(0.96)	(0.98)
	no. of observations	4,536	4,586	760	769

Notes: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.18: Self-selection of Dutch wholesale and retail trading firms into goods import markets

		non-trader starting to import		exporter starting to import	
		TFP	LP	TFP	LP
dependent variable: productivity 2 years prior to import start in year t					
t=2004	coefficient	0.121**	0.188***	0.018	0.12
		(2.61)	(3.69)	(0.19)	(1.16)
	no. of observations	19,431	20,196	978	1,001
t=2005	coefficient	0.03	0.052	0.038	0.104
		(0.62)	(0.92)	(0.45)	(1.16)
	no. of observations	21,168	21,953	1,102	1,110
t=2006	coefficient	-0.006	0.046	-0.11	-0.212
		(-0.13)	(0.97)	(-1.19)	(-1.81)
	no. of observations	17,611	17,999	865	880
t=2007	coefficient	0.014	0.067	-0.099	-0.082
		(0.34)	(1.51)	(-1.05)	(-0.8)
	no. of observations	18,488	18,850	826	835
t=2008	coefficient	-0.048**	0.056**	0.009	0.087
		(-2.67)	(2.86)	(0.16)	(1.49)
	no. of observations	98,340	108,168	2,397	2,522
dependent variable: productivity 3 years prior to import start in year t					
t=2005	coefficient	0.147**	0.163**	0.077	0.143
		(2.85)	(2.71)	(0.78)	(1.34)
	no. of observations	16,910	17,556	1,062	1,078
t=2006	coefficient	-0.02	0.008	0.03	0.013
		(-0.42)	(0.15)	(0.29)	(0.12)
	no. of observations	14,636	14,980	961	967
t=2007	coefficient	-0.035	-0.006	-0.124	-0.138
		(-0.67)	(-0.11)	(-1.26)	(-1.38)
	no. of observations	15,138	15,461	878	889
t=2008	coefficient	0.059	0.094*	-0.06	0.002
		(1.57)	(2.28)	(-0.73)	(0.02)
	no. of observations	15,619	15,933	871	877
dependent variable: productivity 4 years prior to import start in year t					
t=2006	coefficient	-0.061	-0.036	-0.011	-0.002
		(-1.14)	(-0.62)	(-0.1)	(-0.02)
	no. of observations	11,805	12,122	890	909
t=2007	coefficient	0.012	0.06	-0.026	0.046
		(0.22)	(0.99)	(-0.22)	(0.42)
	no. of observations	12,689	12,985	958	960
t=2008	coefficient	0.03	0.074	-0.046	0.006
		(0.67)	(1.59)	(-0.54)	(0.06)
	no. of observations	12,895	13,175	869	877

Notes: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.19: Self-selection of Dutch service firms into goods import markets

2002	2003	2004	2005	2006	2007	2008	no. of firms
Non-trader							
NT	NT	NT	*NT*	*NT*			9,484
	NT	NT	NT	*NT*	*NT*		9,622
		NT	NT	NT	*NT*	*NT*	8,917
Non-trader starting to import in t+3							
NT	NT	NT	*IMP**	*NT/IMP*			273
	NT	NT	NT	*IMP**	*NT/IMP*		282
		NT	NT	NT	*IMP**	*NT/IMP*	329
Non-importing exporter (at least once exporting before t+3)							
NT/EXP	NT/EXP	NT/EXP	*NT/EXP*	*NT/EXP*			721
	NT/EXP	NT/EXP	NT/EXP	*NT/EXP*	*NT/EXP*		661
		NT/EXP	NT/EXP	NT/EXP	*NT/EXP*	*NT/EXP*	557
Exporter starting to import in t+3 (at least once exporting before t+3)							
NT/EXP	NT/EXP	NT/EXP	*IMP/TWT**	*any*			65
	NT/EXP	NT/EXP	NT/EXP	*IMP/TWT**	*any*		77
		NT/EXP	NT/EXP	NT/EXP	*IMP/TWT**	*any*	112

Note: NT denotes non-trading, *EXP* denotes solely exporting, *IMP* denotes solely importing, *TWT* denotes two-way trading and *any* indicates any non-missing trade status is satisfactory. * marks the year of treatment. The years of measurement of the average treatment effect on the treated (ATT) is italicized.

Table 3.20: Definition of cohorts for static learning-by-importing analysis of manufacturing sectors

2002	2003	2004	2005	2006	2007	2008	no. of firms
Non-trader							
NT	NT	NT	NT	NT	*NT*		1,537
NT	NT	NT	NT	NT	*NT*	*NT*	6,627
	NT	NT	NT	NT	NT	*NT*	7,752
Non-trader starting to import in t+3							
NT	NT	NT	IMP*	NT/IMP	*NT/IMP*		21
NT	NT	NT	IMP*	NT/IMP	*NT/IMP*	*NT/IMP*	103
	NT	NT	NT	IMP*	NT/IMP	*NT/IMP*	127
Non-importing exporter (at least once exporting before t+3)							
NT/EXP	NT/EXP	NT/EXP	NT/EXP	NT/EXP	*NT/EXP*		52
NT/EXP	NT/EXP	NT/EXP	NT/EXP	NT/EXP	*NT/EXP*	*NT/EXP*	169
	NT/EXP	NT/EXP	NT/EXP	NT/EXP	NT/EXP	*NT/EXP*	215
Exporter starting to import in t+3 (at least once exporting before t+3)							
NT/EXP	NT/EXP	NT/EXP	IMP/TWT*	any	*any*		2
NT/EXP	NT/EXP	NT/EXP	IMP/TWT*	any	*any*	*any*	31
	NT/EXP	NT/EXP	NT/EXP	IMP/TWT*	any	*any*	41

Note: NT denotes non-trading, *EXP* denotes solely exporting, *IMP* denotes solely importing, *TWT* denotes two-way trading and *any* indicates any non-missing trade status is satisfactory. * marks the year of treatment. The years of measurement of the average treatment effect on the treated (ATT) is italicized.

Table 3.21: Definition of cohorts for dynamic learning-by-importing analysis of manufacturing sectors

Chapter 4

Imports and productivity: the impact of geography and factor intensity

4.1 Introduction[1]

The link between imports and productivity has been widely studied. There remains, however, a gap in this literature, namely the confusion between the impact of the geographic origin of imported goods on productivity and the impact of the intrinsic qualities of the imported goods on productivity. This confusion is most clear in studies where all imports from advanced countries are assumed to be high-technology of nature (and all other imports by implication are low-technology imports), see for example Lööf and Andersson (2010); Castellani, Serti, and Tomasi (2010). We illustrate below (see Figure 4.1) that this assumption is unwarranted and demonstrate in the remainder of this chapter that the distinction is empirically important. As we are analyzing Dutch data, we will eventually be able to answer, from a Dutch firm's point of view, the question what is associated with higher firm-level productivity? Importing (a) textiles (unskilled-labor intensive products) from Germany (a neighboring country), (b) cutlery (human-capital intensive products) from Italy (a Southern EU country), or (c) tools (technology intensive products) from Tanzania (a developing country)?

The initial focus of the firm heterogeneity literature was on the relationship between firm productivity and export status. Later on the analysis also

[1] This chapter is derived from Van den Berg and Van Marrewijk (2013).

included the relationship between firm productivity and import status. In both cases firms engaging in international trade are larger, more productive, more capital intensive, pay higher wages, invest more in R&D and have a higher probability of survival than domestic firms (see Bernard, Jensen, Redding, and Schott (2011) and Wagner (2012b) for recent surveys). Arguably, the channels through which import activities affect firm productivity are more direct than those for export activities (see the next section). It is therefore perhaps not surprising that Amiti and Konings (2007) find that the effect of a fall in import tariffs on productivity is at least twice as high as a fall in output tariffs. Our empirical analysis focuses on importing firms in the Netherlands.

Importing may raise productivity through learning, variety, price and quality effects, for example for imported inputs. Three dimensions play a role, namely the geographical dimension (which country is the import from), the character of the good (what type of good is imported), and the extensive dimension (from how many countries and product markets is being imported). In the first two cases there are two sub-dimensions to consider. The geographical dimension may distinguish between advanced and developing countries or between proximate and remote countries. The character of the good may distinguish between intermediate and final goods or between types of goods based on (factor) intensity during the production process, such as technology intensive goods. Our data are not equipped to distinguish between intermediate and final goods, so regarding the goods characteristics we will focus attention on an intensity classification that identifies five different types of goods, namely primary, natural-resource intensive, unskilled-labor intensive, technology intensive, and human-capital intensive products (Van Marrewijk, 2002). The extensive dimension of imports is relevant to consider, since the fixed cost of foreign (import) market entry may be market specific, which would imply that productivity needs to increase in the degree of diversity of the import portfolio.

To illustrate that geography and intensity are really two different dimensions at the firm level, the scatter plot in Figure 4.1 depicts technology intensive imports on the one hand and imports from advanced countries on the other hand for individual firms. If these two dimensions were more or less synonymous, as some of the literature assumes, there should be a strong positive association. In contrast, some firms import a lot from advanced countries, but these are not technology intensive products, while other firms import a lot of technology intensive products, but not from advanced countries.

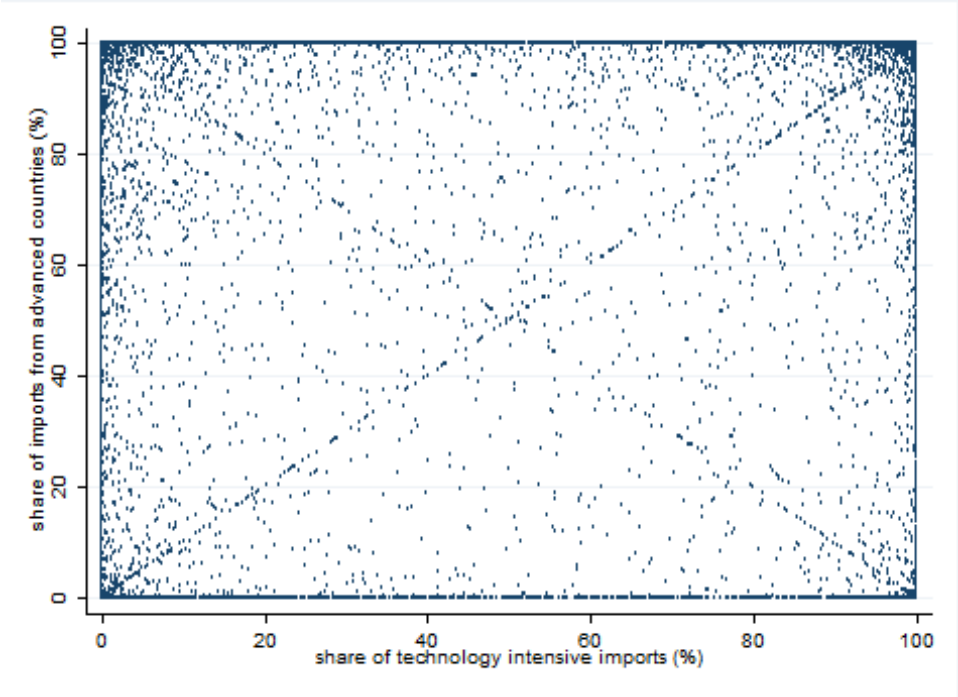

Figure 4.1: Relationship between technology intensive imports and advanced country imports at the firm level (the Netherlands, 2002-2008, n=35,966)

Notes: The share of imports from advanced economies is calculated as the share of imports from neighboring countries, Northern EU-15, Southern EU-15, non-EU Northwestern Europe, advanced Asia, Australia & New Zealand and North America (see Figure 4.2) in total imports of firms for which the full decomposition in terms of country of origin and factor intensity is known. The clustering of observations along the diagonals and the axes of the figure reflects the empirical observation that only a small fraction of the firms reports imports from more than two product groups or regions, which limits the number of observed combinations of import shares.

The objective of this chapter, and our contribution to the literature, is thus fourfold, namely to study the relationship between firm productivity and (i) the geographic dimension of imported goods (both advanced-developing and proximate-remote), (ii) the intensity dimension of imported goods, (iii) the geographic-intensity interaction and (iv) the degree of diversification of the import portfolio. Our results regarding the geographic-intensity interaction will determine, in particular, how harmful it is not to distinguish clearly between these two dimensions. An indication of this was already provided at the macroeconomic level by Coe, Helpman, and Hoff-

maister (1997) when they argued that developing countries can benefit from knowledge spillovers by importing from advanced countries through the interaction with machinery and equipment imports.

The remainder of the chapter is organized as follows. Section 4.2 gives a brief overview of the empirical literature on the relationship between import status and firm performance regarding country of origin and factor intensity as explanatory factors. Section 4.3 discusses the Dutch data from the period 2002-2008 used in the empirical analysis. Section 4.4 analyzes firm productivity and the geographic dimensions of imports. Section 4.5 does the same regarding factor intensity. Section 4.6 analyzes firm productivity and geographic-intensity interaction. Section 4.7 concludes.

4.2 Firm heterogeneity and imports

The literature provides various mechanisms through which importing and firm-level productivity could be causally related. Groundbreaking work in this field was done by Helpman and Grossman (1992), linking international competition, specialization, innovation, variety effects and trade patterns in an integrated analytical framework. The links between importing and productivity are manyfold. Firms could raise productivity by importing R&D intensive intermediate inputs from the forefront of technological developments. Coe and Helpman (1995) and Coe, Helpman, and Hoffmaister (1997) show empirically that productivity gains from R&D are indeed not only considerable in the source country, but that the benefits are also reaped by the importing economy, irrespective of its level of development. Lööf and Andersson (2010) argue that global specialization plays a key role in enhancing firm productivity, since importing enables firms to utilize inputs from the technological frontier. Acharya and Keller (2009) present evidence on this matter suggesting that importing is an important vehicle for technology transfers between countries. Moreover, importing might offer firms the possibility to purchase intermediate inputs at lower cost. The wider variety of intermediate inputs that becomes available through importing, amongst which higher quality inputs, can increase firm-level productivity. In addition to this, importing firms may benefit from spill-over effects and increase productivity by learning from foreign suppliers (Coe, Helpman, and Hoffmaister, 1997). This combination of learning and variety effects is also referred to as the complementarity aspect of importing. Finally, importing final goods increases competition on domestic markets, which forces domestic producers, regardless of their trading status, to operate more efficiently

and thus become more productive (Amiti and Konings, 2007).

A considerable amount of firm level evidence suggests that firms importing inputs in general are more productive than firms that source inputs solely domestically.[2] However, the empirical evidence regarding the differential impact of country of origin and factor intensity of imports on firm performance is much more scarce. Lööf and Andersson (2010) present evidence indicating that productivity increases in the share of imports from G7 countries. They conclude that imports are an important channel for technological learning and knowledge transfers, by assuming, rather crudely, that G7-imports are on average more R&D and knowledge intensive and of better quality than imports from other countries. Serti and Tomasi (2009) and Castellani, Serti, and Tomasi (2010), employing a panel data set of Italian firms, investigate empirically whether the effect of trading on firm performance is related to geographic patterns of trade. Their findings indicate that imports from advanced economies are associated with a higher productivity premium than imports from developing economies. The explanation they provide for this finding is that imports from high-income countries are presumably of higher quality and are more technology intensive than imports from lower income countries. These imports therefore require the presence of a certain amount of absorptive capacity which they associate with the existence of a productivity premium. The empirical evidence presented by Bas and Strauss-Kahn (2013) regarding French firms also suggests that the positive association between productivity and imports is stronger for imports from advanced economies. Silva, Afonso, and Africano (2012) present empirical evidence regarding Portuguese firms, showing that geographical and sectoral diversification, for both imports and exports, is positively correlated with productivity. Furthermore, their findings indicate that trading with nearby and familiar economies is associated with a smaller productivity premium than trading on more 'difficult' markets.

A few general conclusions can be taken from the preceding discussion. A well-known stylized fact is that importers tend to be more productive and perform better in general than non-traders. The empirical evidence regarding the impact of import characteristics in terms of geographical origin and factor intensity on firm performance is still rather scarce. However, the limited amount of evidence available on this matter indicates that imports from advanced countries or technologically advanced imports are associated with larger productivity premia.

[2]Among others see Bernard, Jensen, Redding, and Schott (2007); Muûls and Pisu (2009); Vogel and Wagner (2010); Hagemejer and Kolasa (2011).

4.3 Data

For the empirical analysis we merge data from three main Dutch data sources: (i) the General Business Register (GBR), (ii) the Baseline Database and (iii) the International Trade Database, all provided by Statistics Netherlands into a panel data set covering the years 2002 to 2008.[3] We confine ourselves to discussing some key characteristics of each data source in this chapter, the compilation procedure of the panel data set is detailed in chapter 2.

The GBR is, in principle, exhaustive in the sense that it contains information about every firm in the Netherlands, including a set of basic firm characteristics such as the number of employees in fulltime equivalents, the sector in which the firm operates according to the internationally standardized ISIC Rev. 3.1 sector classification and some general address information.[4] We take from a separate but related database information concerning the ultimate controlling institution of the firm, indicating whether the ultimate controlling owner of the Dutch firm is located abroad.[5] The information taken from the Baseline database contains information about gross output, value added and the value of capital, labor and intermediate inputs. The data regarding input used and output produced are deflated using separate sector level price indices for gross output, value added, labor, capital and intermediate inputs and serve as the basis for the productivity estimations. We calculate two different measures of productivity. Labor productivity (LP) is computed as value added per employee. We estimate total factor productivity (TFP) by adopting the procedure proposed by Levinsohn and

[3]We focus the analysis in this chapter on firms in manufacturing sectors and wholesale & retail trading sectors. This implies that typical service sectors are excluded. We choose *financial intermediation* as the cut-off point for service sectors, which corresponds to ISIC Rev. 3.1 section J, division 65. Manufacturing sectors thus correspond in the analysis to ISIC Rev. 3.1 sections A through I, excluding G. Wholesale & retail traders correspond to ISIC Rev. 3.1 section G and service sectors, defined as sections J to Q, are excluded from the analysis. The OECD and Eurostat recommend to define manufacturing as sections A through F and to include section G to Q in services. However, in terms of goods trade this division is less sensible, since a considerable part of goods trade takes place in trade and transport sectors it is therefore more appropriate to separate these sections from typical (financial and public) service sectors.

[4]The ISIC Rev. 3.1 sector classification equals the SBI'93 2 digit classification employed by Statistics Netherlands

[5]The dummy variable indicating whether a firm is ultimately controlled by a foreign company is not derived from the underlying ownership structure, it indicates whether the controlling entity is effectively located abroad.

Petrin (2003).[6]

Trade data were taken from the International Trade database and includes information on all imports and exports of goods by Dutch firms.[7] Extra-EU trade is recorded by the Customs Authority. These data always include product information at the 8-digit Combined Nomenclature (CN) level and specification of origin and destination country. Intra-EU imports and exports are recorded by the Dutch Tax Authority. Firms with intra-EU import and/or export values larger than a total of 900,000 euro (threshold in 2009) are required to specify their trade transactions at the 8-digit level according to the CN and specify the origin and destination of trade through an additional questionnaire from Statistics Netherlands. Below this threshold firms only need to report the total import and export value of intra-EU trade. Finally, we also include import and export values according to the factor intensity of the goods traded, following Van Marrewijk (2002) and distinguishing between (i) primary products, (ii) natural resource intensive products, (iii) unskilled labor intensive products, (iv) high-tech products and (v) human capital intensive products.

The merging procedure results in an unbalanced panel data set containing a total of 1.2 million observations of 446,000 manufacturing and wholesale & retail trading firms spanning a period of seven years (2002-2008).[8]

4.4 Does geographic origin of imports matter?

Now we turn to our central research question; do the characteristics of imports affect firm-level productivity? We confine the analysis in this and the next sections to the subset of observations for which the complete breakdown of imports along the relevant dimensions is available.[9] That is, we established in section 3.4.1 that non-traders are on average the least pro-

[6] See section 2.3 for further details regarding the estimation procedure.

[7] The trade data also include intra-firm trade, which cannot be distinguished from inter-firm trade. Note also that apart from the import value we do not have information as to whether it concerns imports of capital goods, intermediate inputs or final goods.

[8] This is after eliminating micro-firms (less than one fulltime equivalent) and implausible observations with zero or negative output or exports exceeding gross output. See chapter 2 for details.

[9] Note that the number of observations included in the analysis varies with the import dimension under consideration, since we only include observations for which the complete breakdown of imports along the import dimension under consideration is available. This also implies that importers that source imports exclusively from within the EU with values below the threshold above which firms are required to specify their imports in terms of product group and origin are underrepresented in the data.

ductive, followed by sole importers, sole exporters and two-way traders, in that order. In addition, we showed that the differences between both main sectors in terms of trade premia are limited, although the estimated premia are consistently lower in manufacturing sectors relative to wholesale & retail trade. In the following sections we focus on productivity differences *within* the subset of importers, conditional on being more productive on average than non-traders.[10]

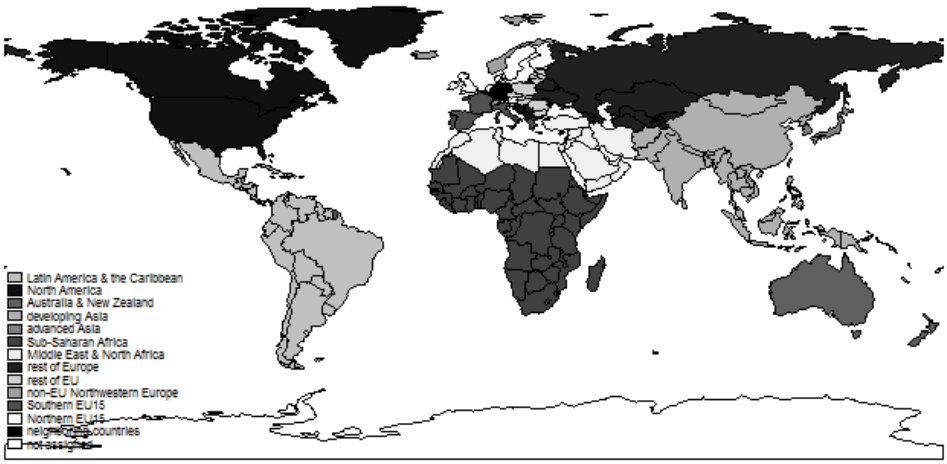

Figure 4.2: Regional aggregation of origin countries

To keep the analysis manageable we aggregate the import data by origin country into 13 mutually exclusive and exhaustive regions which are inspired by the geographical aggregation of countries by the World Bank; (1) neighboring countries to the Netherlands, (2) Northern EU-15, (3) Southern EU-15, (4) non-EU Northwestern Europe, (5) the rest of the EU, (6) the rest of Europe, (7) Middle East & North Africa, (8) sub-Sahara Africa, (9) developing Asia, (10) advanced Asia, (11) Australia & New Zealand, (12) North America and (13) Latin America & the Caribbean (see Figure 4.2).[11]

Table 4.1 shows for each of the identified regions the average productivity of firms that exclusively import from that region in a particular year. Table 4.1 illustrates that firms exclusively importing from the EU-15 in gen-

[10]From this section onwards we only discuss empirical results using TFP as measure productivity, since the findings for labor productivity do not deviate to a noteworthy extent. The results using labor productivity as measure of productivity are available from the authors upon request.

[11]The geographic regions are described in detail in Table 4.10 in the appendix.

eral are on average considerably more productive than firms importing from regions further away. A distinct pattern does not emerge from the productivity distribution of the remaining regions, albeit that firms importing from advanced regions such as non-EU northwestern Europe, advanced Asia and Australia & New Zealand are at the top end.

regional market	no. of obs.	mean	regional market	no. of obs.	mean
neighboring countries	2,768	21,857	Latin America and the Caribbean	616	12,910
Northern EU-15	199	21,091	rest of EU	890	12,787
Southern EU-15	364	20,564	rest of Europe	423	12,496
non-EU Northwestern Europe	1,927	15,050	sub-Sahara Africa	464	11,991
Australia and New Zealand	309	13,692	developing Asia	6,180	10,892
advanced Asia	1,726	13,629	Middle East and North Africa	1,749	10,735
North America	6,542	12,974			
			non-trading		9,723
			total	24,157	13,664

Note: The calculations of the mean firm-level productivity by origin of imports are based on firms that import goods in a particular year exclusively from one single region.

Table 4.1: Productivity (TFP) by geographical import market

Figure 4.3 shows that more than half of the firms (observations) for which the complete geographical composition of imports is available sources inputs internationally from more than one region. The number of observations monotonically decreases in the number of geographical import markets from 17% of the firms importing goods from two regions to 0.1% of the firms sourcing inputs from all (13) international regions.

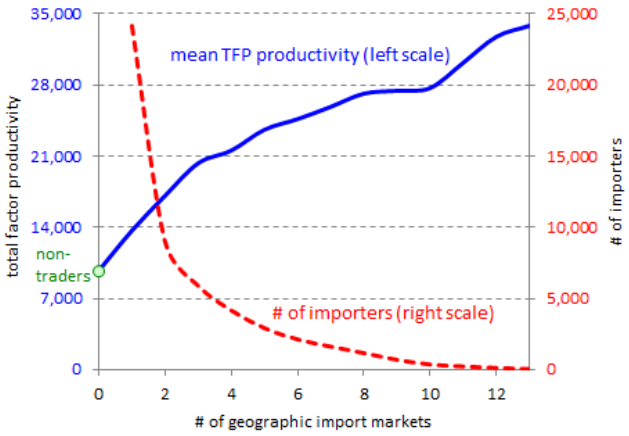

Figure 4.3: TFP and # of importers by # of geographic import markets

Figure 4.3 also shows that productivity increases in the number of geographical markets the firm imports from. Mean productivity peaks at importing from the maximum of 13 geographical markets. Particularly importing from a second, and to a lesser extent a third, geographical market seems to be associated with a considerable productivity premium. The productivity pattern emerging from Figure 4.3 points in the direction of the existence of fixed costs associated with importing from an additional geographical market. That is, not only import starters incur a fixed cost associated with the import start, but firms incur a fixed cost for each additional geographical market as well, although at a decreasing rate. However, the fixed cost of an import start still seems to be higher than the fixed cost of adding a geographical market to the import portfolio, considering the fact that mean productivity of non-traders is well below that of single market importers (see Table 4.1).

The level of concentration of imports is generally high; 93% of the firms imports more than half of their goods exclusively from one region. This decreases to a still considerable 59% of the firms sourcing more than 95% of their imported goods from a single region. Moreover, concentration of imports is more persistent for regions far away than for regions nearby. In other words, firms importing goods from nearby are more likely to increase the number of regions they source goods from than firms importing from regions further away. This could be an EU internal market effect or it could be tied to the underlying product dimension of imports. In addition, it could indicate that distance is an important factor in the degree of concentration of imports. This suggests the existence of a stepping stone strategy regarding imports, where the firm starts importing from a country nearby and gradually expands its import activities to more distant markets in terms of both physical and cultural distance. This strategy regarding export market entry is well-documented, particularly regarding SMEs (see Creusen and Lejour (2011)). This observation is consistent with the hypothesis that fixed costs of importing from regions at great distance are higher than those of sourcing imported goods nearby.

We include the import shares ($importshare_{git}$) of each of the regions of origin separately in the baseline regression model (see equation 3.1). Along with the import shares we include a measure of geographical dispersion of imports, namely the log of the number of regions from which a firm imports ($dispersion_{it}$), as an explanatory variable. This brings us to the following

model to be estimated:

$$\begin{aligned} ln(prod_{it}) = \alpha + \sum_{g=1}^{13} \beta_g importshare_{git} + \beta_{14} dispersion_{it} \\ + \beta_{15} twowaytrader_{it} + \beta_{16} firmsize_{it} + \beta_{17} foreigncontrolled_{it} \\ + \beta_{18} year_t + \beta_{19} sector_{it} + \beta_{20} region_i + e_{it} \end{aligned} \tag{4.1}$$

Note that estimating this model enables us to analyze whether productivity and the geographic origin of imports are associated, however, it does not reveal any causal relationships. In this model the subscript i identifies individual firms, t indexes the year and subscript g identifies geographic regions running from 1 to 13. We choose North America, accounting for the most observations in terms of firms importing from a single geographical import market, to serve as the reference group consistently throughout the analysis. The dependent variable to be estimated ($ln(prod_{it})$) is the natural log of total factor productivity. We also include a series of control variables; a dummy variable identifying firms that also export next to being an importer ($twowaytrader_{it}$), firm size in terms of employment in fulltime equivalents ($firmsize_{it}$), a dummy variable indicating whether the firm is controlled by a company located abroad $foreigncontrolled_{it}$) and a full set of year ($year_t$), 2-digit sector ($sector_{it}$) and region ($region_i$) dummy variables.[12] The region dummies identify the twelve Dutch provinces.[13]

The results of these regressions are presented in Table 4.2 and graphically summarized in Figure 4.4. The impact of the region of origin of imports on firm-level productivity could hypothetically go both ways; the importing firm can benefit from high quality imports from the technological frontier from advanced regions, located relatively nearby for Dutch firms, and thereby increase productivity. But the fixed and variable costs of importing are higher for imports from regions far away or from regions which pose more difficulties for Dutch importers due to various barriers to trade. This would imply that a higher level of productivity is needed to overcome those costs.

[12]Note that the analysis only contains firms that import by definition, implying that non-traders and sole exporters do not need to be accounted for. A firm is considered being an exporter resp. importer in a particular year if it reports an export resp. import value larger than zero in that year.

[13]The Dutch provinces align with the second level of regional aggregation of the Nomenclature of Units for Territorial Statistics (NUTS2) developed by the European Union.

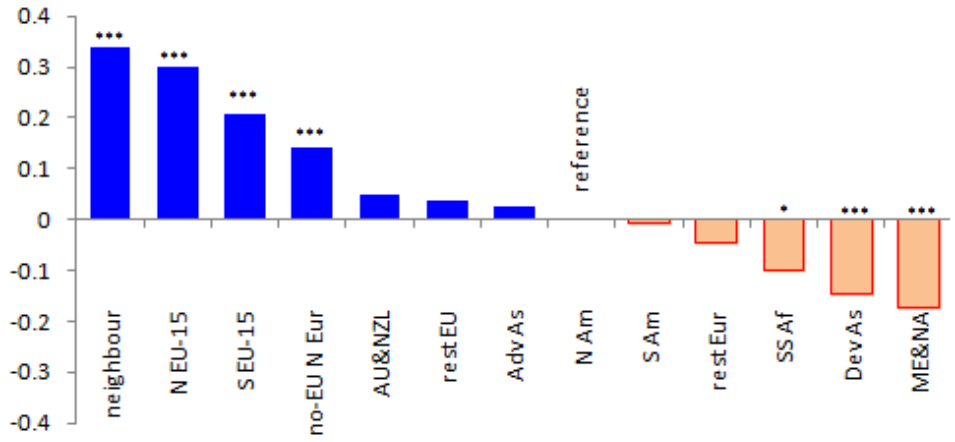

Figure 4.4: Estimated coefficients by geographic import market (derived from Table 4.2, column 2)

Note: Black/blue marks positive coefficients, gray/orange marks negative coefficients. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The regression results point in the direction of both mechanisms playing a role. The results indicate that higher import shares from regions nearby impact positively upon firm-level productivity (Table 4.2, column 1). The estimated premia for imports from advanced regions nearby are significantly positively correlated with firm-level productivity, relative to the reference region, which is North America. The differences between the premia estimated are considerable, with the premium of imports from Northern EU-15 being a good two times larger than the premium on imports from non-EU Northwestern Europe. In terms of distance, geographically, economically, culturally and linguistically, these regions contain the group of countries closest to the Netherlands. The import share from advanced regions further away (Australia & New Zealand, the rest of the EU and advanced Asia) returns relatively small or insignificant productivity premia relative to North America, as does the import share from the rest of Europe and Latin America & the Caribbean. The import share from typical developing regions, such as sub-Saharan Africa, developing Asia and the Middle East & North Africa, has a significantly negative impact on productivity relative to the baseline North America.

Furthermore, a consistent picture emerges regarding the relationship between the degree of dispersion of imports and firm-level productivity; productivity increases in the number of regional import markets on which the

firm sources its inputs (column 2).[14] This finding seems in accordance with the theoretical argument stating that fixed costs of importing are market specific, and each additional market added to the import portfolio implies incurring these fixed cost again. Controlling for the degree of geographical dispersion does not impact heavily upon the estimated premia for the separate regions.

The control variables included in the regressions are all significant and consistently show the hypothesized sign. The separate regressions for manufacturing and wholesale & retail trading sectors show that the estimated coefficients for import shares within the EU and Northwestern Europe are larger for wholesale & retail traders. Analogously, the productivity premium associated with a diversified import portfolio in geographical terms is higher for wholesale & retail trading than for manufacturing firms. This taken together it seems that the pattern of productivity premia by geographic origin is more pronounced for firms in wholesale & retail trading than for manufacturing firms.[15]

Summing up, the empirical results presented in this section show that a geographically diversified import portfolio is positively associated with firm-level productivity. Furthermore, productivity premia associated with imports by geographic origin seem to decrease in distance and increase in the level of development of the origin economy. It seems plausible that these findings are related to the theoretical argument stating that fixed cost of importing are market specific, and each additional market added to the import portfolio implies incurring these fixed cost again. However, productivity hinges positively on concentration of imports within the EU-15. A possible explanation for this phenomenon could be that firms highly focused on imports from nearby countries are an integrated element of a value chain, fostered by the EU internal market and enabling them to incur efficiency gains particularly by being focused in terms of their import portfolio. Furthermore, a partial explanation for the lack of empirical support for the hypothesis that the fixed and variable costs of importing are higher for imports from regions far away or from 'difficult' regions, could be provided

[14] We also experimented with a Herfindahl-like measure of geographical concentration of imports. The findings corroborated the findings using the number of geographical markets as a measure of dispersion and are thus not reported separately for space considerations.

[15] This is also reflected in the standardized coefficient (β-coefficient) of the variable proxying for the degree of dispersion of imports being higher in the subset of wholesale & retail trading sectors (0.09) relative to manufacturing sectors (0.06), indicating that the degree of dispersion of imports as an explanatory variable contributes more to the explanation of productivity in the regression including wholesale & retail trading sectors than in the model concerning manufacturing sectors.

by the nature of the products being imported from those regions. Imports from developing countries contain a relatively high fraction of final goods on average (possibly predestined for re-exporting), compared to imports from advanced countries (nearby) which contain a larger fraction of intermediate inputs.[16] This is in line with Miroudot, Lanz, and Ragoussis (2009) showing that the bulk of intermediate goods trade takes place between advanced countries and Bergstrand and Egger (2010) showing intermediate goods trade is positively associated with equality of the size of the trading economies. In addition, Miroudot, Lanz, and Ragoussis (2009) show that trade between advanced and developing regions is characterized to a larger extent by final goods trade. It makes sense intuitively to expect that the potential for incurring productivity and efficiency gains is larger for intermediate goods imports than for imports of final goods or goods predestined for re-exporting. Unfortunately, it is neither possible at this point to separate between intermediate and final goods imports nor to identify the fraction of imports predestined for re-exporting. However, decomposing imports in terms of the factor intensity embodied in the goods being imported might shed further light on this issue.

[16] Illustrative in this respect are back-of-the-envelope calculations indicating that about 60% of Dutch imports from China are destined for re-exporting, while this fraction is estimated to be about 30% for imports from Belgium and Germany.

	all firms		manufacturing sectors		wholesale and retail trading	
	(1)	(2)	(3)	(4)	(5)	(6)
import shares by geographic region						
neighboring countries	0.361***	0.337***	0.278***	0.255***	0.372***	0.346***
	(26.48)	(24.61)	(12.19)	(11.12)	(21.83)	(20.30)
Northern EU15	0.390***	0.300***	0.270***	0.208***	0.406***	0.300***
	(19.93)	(14.92)	(7.13)	(5.34)	(17.48)	(12.57)
Southern EU15	0.283***	0.208***	0.161***	0.0913*	0.294***	0.213***
	(14.63)	(10.50)	(3.79)	(2.07)	(13.15)	(9.30)
non-EU Northwestern Europe	0.133***	0.140***	0.0976***	0.103***	0.150***	0.155***
	(7.04)	(7.43)	(3.81)	(4.03)	(5.62)	(5.82)
Australia and New Zealand	0.0576	0.0501	0.0785	0.0700	0.0396	0.0342
	(1.31)	(1.13)	(1.29)	(1.15)	(0.66)	(0.57)
rest of EU	0.0538*	0.0361	-0.0369	-0.0507	0.102**	0.0819*
	(2.02)	(1.36)	(-0.91)	(-1.24)	(2.95)	(2.38)
advanced Asia	0.0489*	0.0259	0.0387	0.0271	0.0551*	0.0249
	(2.42)	(1.28)	(1.28)	(0.90)	(2.10)	(0.95)
North America	reference	reference	reference	reference	reference	reference
Latin America and the Caribbean	0.00625	-0.00660	0.0785	0.0614	-0.00886	-0.0186
	(0.19)	(-0.20)	(1.54)	(1.21)	(-0.21)	(-0.45)
rest of Europe	-0.0361	-0.0443	0.0424	0.0347	-0.0899	-0.0985
	(-0.94)	(-1.16)	(0.81)	(0.67)	(-1.67)	(-1.84)
Sub-Sahara Africa	-0.0911*	-0.0983*	0.113*	0.103	-0.166**	-0.170**
	(-2.18)	(-2.36)	(2.00)	(1.82)	(-3.12)	(-3.21)
developing Asia	-0.139***	-0.148***	-0.0813***	-0.0898***	-0.150***	-0.158***
	(-9.42)	(-10.03)	(-3.39)	(-3.74)	(-8.11)	(-8.56)
Middle East and North Africa	-0.173***	-0.175***	-0.0863*	-0.0877*	-0.201***	-0.202***
	(-7.59)	(-7.68)	(-2.25)	(-2.29)	(-7.16)	(-7.22)
degree of geographical dispersion of imports						
number of regional import markets (log)		0.102***		0.0684***		0.123***
		(16.65)		(6.39)		(16.46)
control variables						
non-exporter	reference	reference	reference	reference	reference	reference
exporter	0.208***	0.170***	0.161***	0.136***	0.231***	0.186***
	(22.37)	(17.61)	(10.21)	(8.23)	(20.38)	(15.81)
domestically controlled	reference	reference	reference	reference	reference	reference
foreign controlled	0.164***	0.160***	0.0698***	0.0534**	0.230***	0.240***
	(14.20)	(13.84)	(3.78)	(2.87)	(15.70)	(16.36)
firm size (FTE, log)	0.197***	0.180***	0.184***	0.174***	0.206***	0.185***
	(63.21)	(55.07)	(36.05)	(32.50)	(52.60)	(44.96)
No. of observations	52,397	52,397	15,519	15,519	36,878	36,878
adj. R^2	0.265	0.268	0.274	0.276	0.261	0.266

Notes: All regressions include a full set of year, sector and region dummies.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.2: Import origin, degree of dispersion and total factor productivity (pooled OLS, 2002-2008)

4.5 Does the factor intensity of imports matter?

Next to the geographic origin of imports we have information regarding the factor intensity of the imported goods, following the product classification developed by the International Trade Center into five types of products, see Van Marrewijk (2002).

i Primary products, such as meat, dairy, cereals, fruit, coffee, sand, minerals, oil, natural gas, iron ore, and copper ore.

ii Natural-resource intensive products, such as leather, cork, wood, lime, precious stones, pig iron, copper, aluminum, and lead.

iii Unskilled-labor intensive products, such as various textiles, clothing, glass, pottery, ships, furniture, footwear, and office supplies.

iv Technology intensive products, such as various chemicals, medicaments, plastics, engines, generators, machines, tools, pumps, telecommunications and photo equipment, optical equipment, and aircrafts.

v Human-capital intensive products, such as synthetic colors, pigments, perfumes, cosmetics, rubber and tires, tubes, various types of steel and iron, cutlery, televisions, radio's, cars, watches, and jewelry.

intensity market	no. of obs.	mean
primary products	2,751	17,671
high-tech products	5,305	16,287
natural resource intensive	759	14,378
human capital intensive	5,589	13,717
unskilled labor intensive	4,382	11,692
non-trading		9,723
total	18,786	14,576

Note: The calculations of the mean firm-level productivity by factor intensity of imports are based on firms that exclusively import goods in a particular year from one product group.

Table 4.3: Productivity (TFP) by intensity import market

We follow the same procedure as in section 4.4. Table 4.3 presents the mean productivity of firms that exclusively import products from one of the five distinguished product types. Table 4.3 shows that mean productivity is highest for firms exclusively importing primary products and high-tech

products. Unskilled labor intensive imports are associated with the lowest levels of productivity, although productivity of these firms is still higher on average than that of non-traders.

Analogous to the number of geographical markets a firm imports from firm-level productivity increases in the number of international intensity markets the firm sources its inputs from (Figure 4.5). Almost 60 percent of the firms imports goods exclusively from one class of products. This decreases rapidly to just under two percent of the firms importing from all five intensity groups. Firm-level productivity increases monotonically in the number of intensity markets, with TFP being almost twice as high for firms importing from all five intensity groups compared to firms importing from a single group.

The level of concentration of imports is even higher for imports by factor intensity compared to imports by geographical origin; 98 percent of the firms sources more than half of its inputs from one intensity group, which decreases to 75 percent of the firms importing more than 95 percent of its total imports from a single intensity group. This is an intuitively straightforward observation, since the core business of the firm will most likely be the main determinant of the factor intensity of imports.

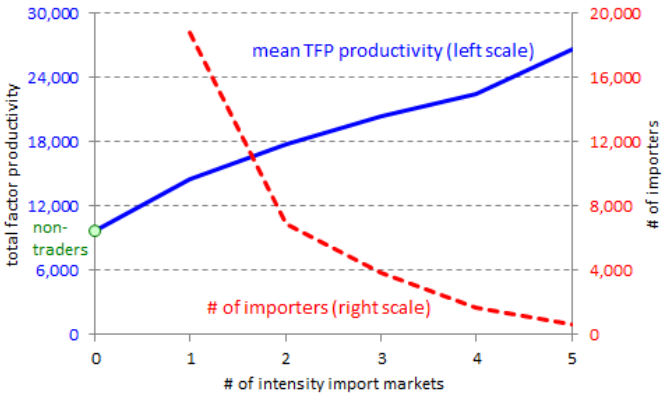

Figure 4.5: TFP and # of importers by # of intensity import markets

The import shares of the types of goods with different factor intensities are included separately in the baseline regression model along with a measure of the degree of dispersion of imports, which is defined as the log of the number of product markets on which the firm sources its inputs. Analogous to the procedure presented in section 4.4 we estimate the following model

with import shares of each of the product groups by factor intensity as the explanatory variables of interest:

$$\begin{aligned} ln(prod_{it}) = \alpha + \sum_{f=1}^{5} \beta_f importshare_{fit} + \beta_6 dispersion_{it} \\ +\beta_7 twowaytrader_{it} + \beta_8 firmsize_{it} + \beta_9 foreigncontrolled_{it} \\ +\beta_{10} year_t + \beta_{11} sector_{it} + \beta_{12} region_i + e_{it} \end{aligned} \tag{4.2}$$

Where subscript f identifies each of the five product classes, distinguished by their factor intensity and running from 1 to 5. Note that estimating this pooled OLS model enables us to investigate whether productivity and the factor intensity of imports are correlated, however, it does not reveal any causal relationships.

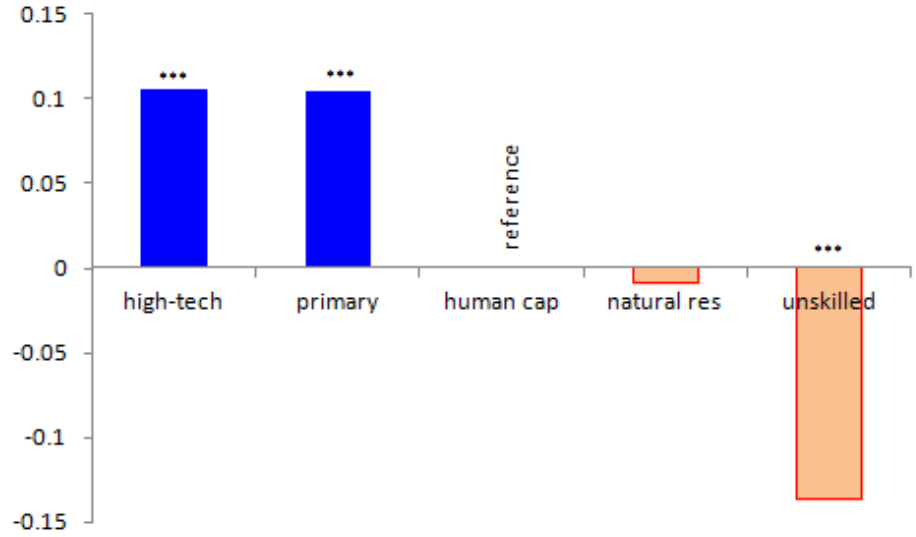

Figure 4.6: Estimated coefficients by intensity import market (Table 4.4, column 2)

Note: Black/blue marks positive coefficients, gray/orange marks negative coefficients. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In terms of import shares, importing high-tech products and primary products shows to be most beneficiary to firm-level productivity (Figure 4.6). With respect to technology intensive products this makes sense intuitively, with the discussion of the mechanisms through which importing

can raise productivity in mind (see section 4.2). Following that same line of reasoning it is intuitively straightforward that importing mainly unskilled-labor intensive products impacts negatively upon firm-level productivity, which holds for both manufacturing and trading sectors. The significantly positive productivity premia for primary products relative to human capital intensive products is a more puzzling finding.

	all firms		manufacturing sectors		wholesale and retail trading	
	(1)	(2)	(3)	(4)	(5)	(6)
import shares by factor intensity						
high-tech products	0.105***	0.106***	0.00537	0.00662	0.140***	0.140***
	(7.24)	(7.31)	(0.25)	(0.30)	(7.50)	(7.55)
primary products	0.0965***	0.104***	0.0522	0.0496	0.109***	0.121***
	(5.12)	(5.50)	(1.47)	(1.40)	(4.93)	(5.42)
natural resource intensive	0.00175	-0.00884	0.0805	0.0723	-0.0242	-0.0371
	(0.06)	(-0.32)	(1.91)	(1.71)	(-0.68)	(-1.04)
human capital intensive	reference	reference	reference	reference	reference	reference
unskilled labor intensive	-0.136***	-0.137***	-0.0894**	-0.0924**	-0.135***	-0.134***
	(-8.32)	(-8.35)	(-3.01)	(-3.11)	(-6.89)	(-6.84)
degree of dispersion of imports by factor intensity						
number of product markets (log)		0.0546***		0.0428*		0.0659***
		(5.17)		(2.40)		(5.13)
control variables						
non-exporter	reference	reference	reference	reference	reference	reference
exporter	0.297***	0.288***	0.221***	0.212***	0.322***	0.313***
	(25.91)	(24.75)	(11.98)	(11.19)	(22.75)	(21.86)
domestically controlled	reference	reference	reference	reference	reference	reference
foreign controlled	0.256***	0.246***	0.131***	0.120***	0.319***	0.310***
	(14.97)	(14.31)	(4.88)	(4.45)	(14.78)	(14.31)
firm size (FTE, log)	0.270***	0.266***	0.221***	0.218***	0.299***	0.294***
	(66.48)	(64.36)	(34.77)	(33.26)	(57.04)	(55.37)
No. of observations	31,814	31,814	9,430	9,430	22,384	22,384
adj. R^2	0.255	0.256	0.276	0.277	0.250	0.251

Notes: All regressions include a full set of year, sector and region dummies.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.4: Factor intensity of imports and total factor productivity (pooled OLS, 2002-2008)

Note that the significantly positive association between productivity and primary and high-tech products is mainly on account of wholesale & retail trading sectors, for which the pattern of estimated premia is more pronounced again (Table 4.4). Natural-resource intensive goods return an in-

significant coefficient relative to the reference group, which contains human capital intensive imports. Manufacturing sectors show a considerable number of insignificant coefficients, which is due to the relatively low number of observations, particularly for specific product groups. Furthermore, firm-level productivity is positively associated with the number of international product markets on which the firm is active. Again, all control variables included are significant and return the expected sign.

4.6 Interacting the geography and factor intensity of imports

The analysis in the previous sections marks the build up to our ultimate goal; interacting the geographical origin and factor intensity of imports and investigate how the two-dimensional characteristics of imports affect firm-level productivity. The analysis in the previous sections has shown that both dimensions of imports separately affect firm-level productivity, the question remaining is whether considering both dimensions simultaneously reveals additional heterogeneity in the relationship between importing and productivity.

In order to keep the analysis manageable, we further aggregate the trade data by geographic origin and factor intensity into 18 two-dimensional product-region combinations, which we will denote *geographical intensity markets*. The decisions regarding aggregation are based on the level of significance of the difference between coefficient estimates of the regressions including import shares by region and product type. The bilateral p-values, resulting from a series of t-tests on the equality of estimated coefficients obtained from the regressions presented in the second column of Tables 4.2 and 4.4, are depicted in Table 4.5 and Table 4.6. The results indicate that importing primary products and high-tech products does not significantly differ in terms of its impact on firm-level productivity. These product groups are thus aggregated into one group for the next step. The same holds for importing natural resource intensive products and human capital intensive products. Regarding the geographical dimension of imports we reduce the number of regions by aggregation from 13 to 6. We pool together imports from neighboring countries and Northern EU-15.[17] In addition, we also pool

[17]Even though the t-test on the equality of the coefficients of these regions is just significant at the 5%-level, we feel that the degree of European integration (EU internal market) within these two regions and the degree of comparability and mutual dependency of the economies allows us to pool these two regions together.

together other advanced countries (comprising of North America, advanced Asia and Australia & New Zealand) and developing countries (pooled over developing Asia, Middle East & North Africa and sub-Sahara Africa). Finally, imports from the rest of the EU (outside the EU-15), the rest of Europe and Latin America & the Caribbean are taken together, forming a group we denote transition countries & South America. This procedure leaves us with $6 \times 3 = 18$ mutually exclusive and exhaustive geographical intensity markets, comprising of 6 regions and 3 product groups.

	neigh. count.	North. EU-15	South. EU-15	non-EU N-W Eur.	Aus. & NZl	adv. Asia	North Am.
neighboring countries	-						
Northern EU-15	0.044	-					
Southern EU-15	0.000	0.000	-				
non-EU Northwestern Europe	0.000	0.000	0.003	-			
Australia and New Zealand	0.000	0.000	0.001	0.049	-		
advanced Asia	0.000	0.000	0.000	0.000	0.601	-	
North America	0.000	0.000	0.000	0.000	0.257	0.199	-
Latin America and the Caribbean	0.000	0.000	0.000	0.000	0.289	0.367	0.844
rest of EU	0.000	0.000	0.000	0.000	0.777	0.733	0.174
rest of Europe	0.000	0.000	0.000	0.000	0.095	0.085	0.247
sub-Sahara Africa	0.000	0.000	0.000	0.000	0.012	0.005	0.018
developing Asia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Middle East and North Africa	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	rest of EU	rest Eur.	Lat. Am. of & Car.	sub-Sah. Afr.	dev. Asia	M-East & N. Afr.
Latin America and the Caribbean	-					
rest of EU	0.286	-				
rest of Europe	0.439	0.071	-			
sub-Sahara Africa	0.077	0.004	0.323	-		
developing Asia	0.000	0.000	0.007	0.231	-	
Middle East and North Africa	0.000	0.000	0.002	0.092	0.251	-

Note: Values represent bilateral p-values obtained from regressions of firm-level productivity on import shares by region with varying baseline regions. The dashed lines identify the aggregation into six regions for the analysis in section 4.6. Dark (light) shading indicates significantly different at 5% (10%).

Table 4.5: Matrix of bilateral significance of estimated productivity premia by region (Table 4.2, column 2)

	primary products	high-tech products	natural resource intensive	human capital intensive	unskilled labor intensive
primary products	-				
high-tech products	0.928	-			
natural resource intensive	0.000	0.000	-		
human capital intensive	0.000	0.000	0.752	-	
unskilled labor intensive	0.000	0.000	0.000	0.000	-

Note: Values represent bilateral p-values obtained from regressions of firm-level productivity on import shares by product group with varying baseline products. The dashed lines identify the aggregation into three product groups for the analysis in section 4.6. Dark (light) shading indicates significantly different at 5% (10%).

Table 4.6: Matrix of bilateral significance of estimated productivity premia by factor intensity (Table 4.4, column 2)

geographical intensity market	no. of obs.	mean	geographical intensity market	no. of obs.	mean
primary & high-tech products			*unskilled labor intensive*		
Northern EU-15 (incl. neighb. count.)	804	23,066	Northern EU-15 (incl. neighb. count.)	226	19,656
Southern EU-15	104	20,896	Southern EU-15	54	16,240
non-EU Northwestern Europe	605	16,041	non-EU Northwestern Europe	182	12,420
other advanced countries	2,364	14,177	other advanced countries	684	10,637
transition count. and S. America	542	13,113	transition count. and S. America	339	10,918
developing countries	1,618	12,497	developing countries	2,138	9,811
natural resource and human capital intensive					
Northern EU-15 (incl. neighb. count.)	699	20,814			
Southern EU-15	68	19,779			
non-EU Northwestern Europe	540	13,399			
other advanced countries	2,234	11,794			
transition count. and S. America	393	13,172			
developing countries	1,482	10,594			
			non-trading		9,723
			total	15,076	13,343

Note: The calculations of the mean firm-level productivity by geographical intensity market are based on firms that import goods in a particular year exclusively from one single region.

Table 4.7: Productivity (TFP) by geographical intensity market

Table 4.7 shows that the mean productivity of firms exclusively importing from the EU-15 is the highest, irrespective of the product type. In addition, productivity is consistently higher for firms exclusively importing from Northern EU-15 compared to Southern EU-15, followed by non-EU Northwestern Europe. Importing primary and high-tech products from advanced countries outside Europe is also associated with relatively high levels of productivity. Importing from developing countries is consistently associated with productivity levels at the lower end of the distribution. Within sourcing regions, importing primary and high-tech products is consistently associated with the highest productivity levels, followed by natural resource & human capital intensive products. Exclusively importing unskilled labor intensive products is consistently associated with the lowest levels of productivity irrespective of the sourcing region. Unskilled labor intensive imports

from developing countries is associated with the lowest level of firm-level productivity, although the mean productivity of firms in this group is still (slightly) higher compared to non-traders.

None of the firms in the panel sources inputs from all 18 geographical intensity markets; the largest number of markets on which a firm is active is 17. Productivity increases monotonously in the number of markets on which the firm sources its inputs. Comparable to the picture emerging from Figure 4.3 it seems that adding a second, third and fourth geographical intensity market to the import portfolio is particularly associated with a productivity threshold, which points in the direction of the existence of fixed costs associated with importing from an additional geographical intensity market. The degree of concentration of imports in geographical intensity markets is high with 96 percent of the firms sourcing the majority of its imports on a single market. This decreases to a still considerable 63 percent of the firms importing more than 95 percent of its total import value exclusively from a single two-dimensional market.

Analogous to the proceedings in the previous sections we include the import shares of each of the 18 geographical intensity markets in the baseline regression model, in addition to the log of the number of two-dimensional import markets on which the firm is active, as a measure of import dispersion. This leads to the following regression model to be estimated:

$$\begin{aligned} ln(prod_{it}) = &+ \sum_{h=1}^{18} \beta_h importshare_{hit} + \beta_{19} dispersion_{it} \\ &+ \beta_{20} twowaytrader_{it} + \beta_{21} firmsize_{it} + \beta_{22} foreigncontrolled_{it} \\ &+ \beta_{23} year_t + \beta_{24} sector_{it} + \beta_{25} region_i + e_{it} \end{aligned} \tag{4.3}$$

Subscript h identifies each of the geographical intensity markets running from 1 to 18. Each variable is defined in the same way as in equation 4.1 and again we note that estimating this regression model enables us to analyze whether productivity and imports expressed in terms of the geographical intensity markets are correlated, however, it does not reveal any causal relationships. We choose to exclude the most prominent geographical intensity market to serve as the reference group, which is primary & high-tech imports from advanced countries outside Europe.

The result of these regressions is presented in Table 4.8, the significance of the bilateral differences between estimated productivity premia is presented in Table 4.9. In order to gain an understanding of the importance of including the interaction between geographic origin and factor intensity of imports we also present the regressions with both dimensions separately

without interaction term. Comparing the results from the three separate regressions we see that controlling for both dimensions simultaneously is important, since the estimated premia for both dimensions separately show to be neither additive nor multiplicative. The geographic-intensity markets are largely unique and cannot be lumped together: no less than 119 out of 144 possible combinations (or 83 percent of all combinations) are statistically significantly different at the 10 percent level, while 116 (or 81 percent) are statistically significantly different at the 5 percent level.

Importing from the EU-15 in general is most positively associated with productivity at the firm-level, with Northern EU-15 returning consistently larger coefficients than Southern EU-15. Relative to the reference group the coefficient for all three product groups are significantly positive, with the impact of primary & high-tech product being the largest, before, in that order, natural resource intensive & human capital intensive imports and unskilled labor intensive imports. Compared to the reference group, imports from all three product groups from non-EU Northwestern Europe show a small, significant and positive productivity premium. The same holds for imports from transition countries & South America, except for unskilled labor intensive imports. The dispersion within imports from other advanced countries is considerable. With human capital & natural resource intensive imports representing the reference group we find high-tech and primary products returning a significant positive productivity premium and unskilled labor intensive imports a significant negative premium. Finally, the estimated coefficients are negative and significant for human capital & natural resource intensive and unskilled labor intensive imports from developing regions.

The results thus indicate that in the Netherlands the productivity premium of importing generally increases in the import share of nearby and advanced regions. Within regions, productivity decreases in the share of unskilled labor intensive imports, although in relative terms, importing goods from this group from the nearby regions still correlates relatively positively with productivity. In addition, the measure of dispersion of imports shows that productivity increases in the number of geographical intensity markets on which the firm is active. Finally, the control variables perform well in the sense that they are all significant and show the expected sign.

The separate regressions for manufacturing and wholesale & retail trading sectors (Table 4.11 in the appendix) show that the results regarding the full sample are mainly driven by wholesale & retail trading sectors, which we thus do not discuss separately. The separate regressions for manufacturing sectors yield relatively many insignificant coefficients, which is due to the small numbers of observations underlying some of the distinguished geo-

graphical intensity markets. Relative to the reference group, importing from Northern EU-15 shows significant productivity premia for all three product groups. In addition, importing all but human capital & natural resource intensive imports from non-EU Northwestern Europe and human capital & natural resource intensive products from Southern EU-15 and transition countries & South America is associated with a productivity premium. Unskilled labor intensive imports from developing countries yield a negative productivity premium. Finally, productivity significantly increases in the number of import markets on which the manufacturing firms is active.

The empirical evidence presented in this section shows that the use of the country of origin of imports as a proxy for the factor intensity of the imported goods is too general, since both the origin of imports, in terms of proximity and the level of development, and the factor intensity turn out to be associated with firm-level productivity, but not necessarily follow the same patterns. This shows that the relationship between importing and productivity is shaped simultaneously by all the dimensions of imports identified in section 4.1, that is, distance, the level of development of the source country and the type of product imported. As Keller (2004) argues, there is no such thing as a global pool of technology, since geography still turns out to play an important role in the diffusion of technologies, for which importing is proven to be a relevant vehicle. The empirical findings align with this argument. Illustrative for this is that high-tech imports from nearby EU-15 have a significantly more beneficial effect on productivity than do high-tech imports from advanced countries outside Europe like the U.S. or Japan. Miroudot, Lanz, and Ragoussis (2009) present empirical evidence showing that trade flows of intermediate inputs are more sensitive to trade costs associated with e.g. distance than is trade in final goods. This aligns with our findings showing that the productivity premium of importing is negatively correlated with distance, and provides preliminary evidence for the hypothesis that unskilled labor intensive imports and imports from developing regions contain a relatively large fraction of final goods, as opposed to imports from nearby economies which contain a larger fraction of intermediate inputs providing a more generous source for productivity gains.

	(1)	(2)	(3)	(4)	(5)	(6)
import shares by geographic import market						
Northern EU-15 (incl. neighboring countries)	0.418***			0.394***		
Southern EU-15	0.351***			0.290***		
non-EU Northwestern Europe	0.128***			0.130***		
transition countries & South America	0.0212			0.00858		
other advanced countries	reference			reference		
developing countries	-0.143***			-0.143***		
import shares by intensity market						
high-tech & primary products		0.104***			0.107***	
human capital and natural resource intensive		reference			reference	
unskilled labor intensive		-0.125***			-0.127***	
import shares by geographic intensity market						
Northern EU15 incl. neighboring countries						
high-tech & primary products			0.510***			0.489***
human capital & natural resource intensive			0.473***			0.459***
unskilled labor intensive			0.407***			0.384***
Southern EU15						
high-tech & primary products			0.452***			0.414***
human capital & natural resource intensive			0.453***			0.406***
unskilled labor intensive			0.295***			0.264***
non-EU Northwestern Europe						
high-tech & primary products			0.230***			0.237***
human capital & natural resource intensive			0.140***			0.144***
unskilled labor intensive			0.141*			0.146**
transition countries & South America						
high-tech & primary products			0.117**			0.110**
human capital & natural resource intensive			0.119**			0.114**
unskilled labor intensive			-0.0492			-0.0561
other advanced countries						
high-tech & primary products			0.153***			0.154***
human capital & natural resource intensive			reference			reference
unskilled labor intensive			-0.139***			-0.147***
developing countries						
high-tech & primary products			0.0170			0.0140
human capital & natural resource intensive			-0.128***			-0.136***
unskilled labor intensive			-0.151***			-0.153***
degree of dispersion of imports						
number of geographic markets (log)				0.102***		
number of intensity markets (log)					0.0635***	
number of geographic intensity markets (log)						0.0688***
control variables						
non-exporter	reference	reference	reference	reference	reference	reference
exporter	0.204***	0.287***	0.193***	0.183***	0.280***	0.175***
domestically controlled	reference	reference	reference	reference	reference	reference
foreign controlled	0.223***	0.286***	0.219***	0.217***	0.276***	0.207***
firm size (FTE, log)	0.227***	0.274***	0.225***	0.219***	0.271***	0.218***
No. of observations	29,878	29,878	29,878	29,878	29,878	29,878
adj. R^2	0.267	0.244	0.271	0.269	0.245	0.273

Notes: All regressions include a full set of year, sector and region dummies.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.8: Import origin, factor intensity, degree of dispersion and total factor productivity (pooled OLS, 2002-2008)

		A 1	A 2	A 3	B 1	B 2	B 3	C 1	C 2	C 3	D 1	D 2	D 3	E 1	E 2	E 3	F 1	F 2	F 3
A	1	-																	
A	2	0.18	-																
A	3	0.00	0.02	-															
B	1	0.04	0.23	0.50	-														
B	2	0.06	0.27	0.67	0.89	-													
B	3	0.00	0.00	0.04	0.01	0.03	-												
C	1	0.00	0.00	0.00	0.00	0.00	0.65	-											
C	2	0.00	0.00	0.00	0.00	0.00	0.05	0.03	-										
C	3	0.00	0.00	0.00	0.00	0.00	0.11	0.13	0.97	-									
D	1	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.46	0.56	-								
D	2	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.55	0.62	0.94	-							
D	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-						
E	1	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.78	0.89	0.24	0.34	0.00	-					
E	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.23	0.00	-				
E	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	-			
F	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.14	0.00	0.59	0.00	-		
F	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.76	0.00	-	
F	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.87	0.00	0.53	-

Geography

A	Northern EU-15	D	Transition countries & South America
B	Southern EU-15	E	Other advanced countries
C	Non-EU Northwestern Europe	F	Developing countries

Intensity

1	High-technology intensive and primary products
2	Human-capital intensive and natural resource intensive products
3	Unskilled-labor intensive products

Note: Values represent bilateral p-values obtained from regressions of firm-level productivity on import shares by geographic intensity market with varying baseline regions. Dark (light) shading indicates significantly different at 5% (10%).

Table 4.9: Overview of bilateral significance of geographic-intensity productivity premia (Table 4.8, column 6)

4.7 Conclusion and discussion

Combining three comprehensive data sets covering Dutch firms over the years 2002-2008 we investigate the relationship between imports and firm-level productivity, clearly distinguishing between the geographic dimension of the imports (where are the imports from), the goods dimension of the imports (what is imported), and the extensive dimension of the imports (from how many countries and product markets is being imported).

First, our empirical evidence shows that the use of the country of origin of imports as a proxy for the factor intensity, as is frequently done in the literature, is too general, since both the origin of imports and the factor intensity of imported goods turn out to be associated with firm-level productivity. The analysis shows that distance and the level of development of the origin economy are factors affecting the diffusion of efficiency gains embodied in imported goods, indicating that geography still plays an important role in this process. Illustrative for this finding is that technology intensive imports from nearby EU-15 countries are significantly more positively as-

sociated with firm-level productivity than are technology intensive imports from advanced countries outside Europe, like the U.S. or Japan. The observed premia patterns are comparable for manufacturing and wholesale & retail trading sectors, but are generally more pronounced in trading sectors.

Second, our findings show that productivity generally decreases in the share of unskilled-labor intensive imports and rises in the share of technology intensive and primary products. We also show that the geographic-intensity markets are largely unique and cannot be lumped together. We are now able to answer the question raised in the introduction to this chapter whether, from a productivity point of view, it is better to import (a) textiles from Germany, (b) cutlery from Italy, or (c) tools from Tanzania? The point estimates in Table 4.8, column 6, provide the following order in terms of rising productivity: $c < a \approx b$. Note that the difference between a and b is not statistically significant (see Table 4.9).

Third, we show that dispersion, that is a diversified import portfolio in terms of the number of geographical intensity markets on which the firm is active, is positively associated with firm-level productivity. Our findings provide support for the theoretical argument that the fixed cost of importing are market-specific. Adding a new market, either in geographical terms or in terms of product type, to the import portfolio implies incurring this fixed cost again. Note that productivity depends positively on imports within the EU-15, irrespective of the type of product being imported. A possible explanation for this phenomenon is that firms highly focused on imports from nearby countries are an integrated element of a value chain, fostered by the EU internal market and enabling them to incur efficiency gains.

The empirical evidence presented in this chapter thus does not favor the hypothesis that the fixed and variable costs of importing are higher for imports from regions far away or from 'difficult' regions. The nature of the products being imported from these regions could provide an explanation for this, namely that imports from developing countries tend to contain a larger fraction of final goods, compared to imports from advanced countries which contain a larger fraction of intermediate inputs. The potential for incurring productivity and efficiency gains is thought to be larger for intermediate goods imports than for imports of final goods or goods predestined for re-exporting. This suggests that unskilled labor intensive imports contain a relatively large fraction of final goods. In addition, existing empirical evidence, suggesting that trade flows of intermediate inputs are more sensitive to trade costs associated with e.g. distance than is trade in final goods, could explain the pattern of productivity premia observed in our analysis.

Some suggested avenues for further research follow naturally from the

preceding discussion and mainly include deeper investigation of the impact of the characteristics of imports on firm-level productivity by accounting for additional dimensions of imports along the lines of capital goods, intermediate goods and final goods. The product classification in terms of broad economic categories (BEC) provided by the United Nations could provide a useful starting point to this purpose. In addition, the role of goods imports destined for re-exporting in the relationship between imports and productivity is not yet well understood. Finally, the direction of causality between importing and productivity also needs to be analyzed more closely along the different dimensions (geography, intensity, and dispersion). That is, self-selection into importing and potential productivity gains emanating from learning-by-importing could crucially hinge on the underlying characteristics of the imported goods.

4.A Appendix

region	remarks
neighboring countries	Germany and Belgium
Northern EU15	Luxembourg, United Kingdom, Ireland, Denmark, Finland, Sweden, Austria
Southern EU15	France, Greece, Italy, Portugal and Spain
non-EU Northwestern Europe	Norway, Switzerland and Iceland,
rest of EU	EU27 except EU15
rest of Europe	includes Russia and non-EU Central and Eastern Europe
Middle East and North Africa	includes Turkey and Israel
Sub-Sahara Africa	includes South Africa
advanced Asia*	Japan, South Korea, Singapore, Hong Kong, Taiwan, Brunei D. and Macao
developing Asia*	Asia and Pacific except advanced Asia
Australia and New Zealand	except Pacific
North America	includes United States and Canada
Latin America and the Caribbean	includes Brazil and Mexico

*The advanced Asian countries are identified by GDP per capita levels of at least $ 25,000 (2008 PPP-values in constant 2005$).

Table 4.10: Regional aggregation of origin countries (description)

	manufacturing sectors			wholesale and retail trading		
	(1)	(2)	(3)	(4)	(5)	(6)
import shares by geographic import market						
Northern EU-15 (incl. neighboring countries)	0.247***			0.419***		
Southern EU-15	0.103			0.300***		
non-EU Northwestern Europe	0.0786**			0.161***		
transition countries & South America	0.0201			0.00546		
other advanced countries	reference			reference		
developing countries	-0.0694**			-0.160***		
import shares by intensity market						
high-tech & primary products		0.001			0.142***	
human capital & natural resource intensive		reference			reference	
unskilled labor intensive		-0.100***			-0.119***	
import shares by geographic intensity market						
Northern EU-15 incl. neighboring countries						
high-tech & primary products			0.244***			0.536***
human capital & natural resource intensive			0.317***			0.511***
unskilled labor intensive			0.249***			0.403***
Southern EU-15						
high-tech & primary products			0.127			0.452***
human capital & natural resource intensive			0.242**			0.439***
unskilled labor intensive			-0.0767			0.291***
non-EU Northwestern Europe						
high-tech & primary products			0.120**			0.306***
human capital & natural resource intensive			0.0523			0.194***
unskilled labor intensive			0.166*			0.144*
transition countries & South America						
high-tech & primary products			0.0195			0.147**
human capital & natural resource intensive			0.115*			0.102
unskilled labor intensive			-0.0543			-0.0386
other advanced countries						
high-tech & primary products			0.0441			0.202***
human capital & natural resource intensive			reference			reference
unskilled labor intensive			-0.026			-0.187***
developing countries						
high-tech & primary products			0.000378			0.0179
human capital & natural resource intensive			-0.0443			-0.170***
unskilled labor intensive			-0.132**			-0.133***
degree of dispersion of imports						
number of geographical markets (log)	0.0626***			0.124***		
number of intensity markets (log)		0.0503*			0.0764***	
number of geographical intensity markets (log)			0.0362*			0.0913***
control variables						
non-exporter	reference	reference	reference	reference	reference	reference
exporter	0.148***	0.206***	0.149***	0.201***	0.304***	0.189***
domestically controlled	reference	reference	reference	reference	reference	reference
foreign controlled	0.126***	0.147***	0.129***	0.271***	0.342***	0.254***
firm size (FTE, log)	0.202***	0.223***	0.203***	0.233***	0.299***	0.230***
No. of observations	8,869	8,869	8,869	21,009	21,009	21,009
adj. R^2	0.280	0.271	0.280	0.265	0.238	0.270

Notes: All regressions include a full set of year, sector and region dummies.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.11: Import origin, factor intensity, degree of dispersion and total factor productivity (pooled OLS, 2002-2008)

Chapter 5

Exporting and profitability: empirical evidence from the Netherlands

5.1 Introduction[1]

The assumption of profit maximization is at the heart of economic theory regarding firm behavior. While the notion that internationally competing firms are on average more productive than domestically competing firms is well-demonstrated (Wagner, 2012b), the evidence whether this productive advantage translates into higher profitability is less conclusive (Wagner, 2012a). Theoretical models regarding the behavior of individual firms on international markets are generally developed from the notion that a firm starts exporting if expected profits derived from international markets at least equal the expected profits derived from only serving domestic markets (Clerides, Lach, and Tybout, 1998; Melitz, 2003; Egger and Kreickemeier, 2012). However, the cost level of internationally competing firms is generally higher than that of firms focusing on domestic markets. In order to start exporting a firm faces additional fixed costs associated with e.g. market research, locating foreign trade partners or modifying products to comply with local regulations and preferences. In addition, internationally operating firms generally have a higher skilled and more productive workforce, which requires paying higher wages compared to domestically operating firms (Egger and Kreickemeier, 2012). The combination of higher revenues associated

[1]This chapter is derived from Tamminen, Van den Berg, and Van Marrewijk (2014).

with access to a larger market and higher costs renders the net effect on firm-level profitability ambiguous.

The fact that the empirical literature concerning the relationship between profitability and internationalization of firm activities is still rather small seems to stem mainly from limited availability of profit data. However, the question whether exporting affects firm level profitability is important. Financial analysts generally assess firm performance based on information provided in financial statements in which profitability indicators play a particularly important role (Robinson, van Greuning, Henry, and Broihahn, 2008). This implies that information regarding firm profitability is crucial in the decision making process of investors and thus affects the availability of funds to the firm and the survival of the firm. In addition, low profitability levels have been found to spark layoffs and downsizing (Marques, Suárez González, Cruz, and Portugal Ferreira, 2011). This illustrates that profitability indicators are an important performance measure in business life. Productivity is correlated with profitability, but various other factors affect profitability as well. Therefore, we cannot unconditionally extend the findings of the huge empirical literature regarding the relationship between productivity and internationalization to include profitability. The leading theoretical models regarding firm heterogeneity, such as Melitz (2003) and Egger and Kreickemeier (2012), include profit levels and do not explicitly consider profit rates. Nonetheless, the empirical literature dealing with the relationship between productivity and profitability, surveyed in Wagner (2012b), yields inconclusive results thus far. Empirical research concerning this relationship generally seems to start from the implicit expectation that the productivity premia of exporters translate into exporter premia on profitability as well, although these expectations are not derived from the theoretical models at hand.

We add to the still small literature dealing with the relationship between profitability and internationalization both theoretically and empirically. We aim to theoretically accommodate the potentially differential impact of internationalization on profit levels and profit margins. First, we derive predictions from existing theoretical models of the effect of exporting on profit margins. While existing models generally provide the necessary ingredients for this analysis, profit margins have not been made explicit yet. Second, we empirically investigate the relationship between internationalization and profit rates. In our analysis, we separate between firms from different size classes and we distinguish between the key sectors manufacturing and wholesale & retail trading. We investigate four different profitability measures to gain an understanding of the robustness of our findings to the choice of a

particular profitability measure. We analyze gross profit margins, net profit margins, return on assets (ROA) and gross profits per employee as profitability measures.[2]

This chapter is organized as follows. Section 5.2 provides a brief discussion of the existing empirical literature regarding the relationship between exporting and profitability. Section 5.3 provides a theoretical framework for the empirical investigation of the relationship between profit margins and trade. Section 5.4 briefly introduces the data set employed in the analysis. In section 5.5 we discuss the measurement of profitability and the methodology adopted in the empirical analysis. In section 5.6 we present our empirical findings. Section 5.7 concludes and provides some directions for further research.

5.2 Firm heterogeneity and profitability

In recent years a few empirical studies dealing with profitability and internationalization, recently reviewed in Wagner (2012b), have been added to the firm heterogeneity literature. The topic has been studied more intensively in the international business literature. However, as we will see, the available evidence is rather diffuse and fragmented in terms of profitability measures and research methodologies employed. Overall, the relationship between internationalization and profitability is still not well-established and contradictory results are common.

Various theoretical and empirical studies implicitly or explicitly start from the expectation that productivity premia of exporters translate into profitability premia for exporters as well. As Wagner (2012b, p.253) phrases it: *"Often profitability is viewed both in theoretical models of market selection and in empirical studies on firm entry and exit as a positive monotonic function of productivity, and selection on profits then is equivalent to selection on productivity."* However, Wagner (2012b, p. 253) also emphasizes that: *"As of today, a big picture has not emerged"* regarding the relationship between exporting and profitability. We briefly discuss the empirical literature relating export status and profitability in the firm heterogeneity field thus far, heavily drawing on the literature survey of Wagner (2012b).[3]

[2]Throughout this chapter we use the terms profit margins and profit rates interchangeably. Both terms express exactly the same, that is, profit levels *relative to* some other quantity such as revenues or assets. In addition, the term profitability refers exclusively to profit margins and profit rates.

[3]For an overview of the empirical studies on this topic see Table 5 of Wagner (2012b, p. 257-258).

Girma, Görg, and Strobl (2004), employing a series of Kolmogorov-Smirnov tests, find no significant difference between domestic non-exporters and domestic exporters on the profit level per employee. Grazzi (2012) finds no significant relationship between exporting and profit margins in Italy, similar to the findings of Temouri, Vogel, and Wagner (2013) for British service exporters and Wagner (2012a) for Germany. Temouri, Vogel, and Wagner (2013) find a positive relationship between service exporting and profit margins in France and a negative relationship in Germany. In addition, Fryges and Wagner (2010) document a small exporter premium on profit margins for German manufacturing firms. They show that being an exporter as such does not increase profit margins, and present evidence suggesting an inverted U-shaped correlation between the export share and profit margins. For firms with a sufficiently small share of exports in total sales they even find a negative export premium. Kox and Rojas-Romagosa (2010) present evidence for the Netherlands indicating that profits per employee in exporting firms are higher and that more profitable firms seem to self-select into exporting.

In the field of international business management the relationship between internationalization and firm performance has been heavily debated over the past decennia. In a meta-analysis of the internationalization-performance relationship, Bausch and Krist (2007, p. 320) summarize the current state of affairs in this field of research in a series of citations as: *"inconsistent", "mixed", "decidedly mixed", "contradictory", "inconsistent and contradictory", "inconclusive and contradictory", and "conflicting"*. Nonetheless, in their meta-analysis of 36 studies from 25 years of research (41 samples, n=7,792), Bausch and Krist (2007) present empirical evidence suggesting that internationalization fosters firm performance, albeit that this relationship is heavily moderated by various other firm characteristics, such as firm size and age. Reviewing 43 empirical papers published between 1998 and 2004, Sousa (2004) argues that little consensus has been reached in the field, which has produced contradictory and fragmented findings thus far.

An important objection against the way in which the relationship between exporting and firm performance is generally analyzed in the field of international business management is that the performance of exporters is not related to that of importers, two-way traders and domestically oriented firms. This makes it difficult to claim that exporting in itself does or does not foster firm performance, since a benchmark against which the performance of exporters is evaluated is lacking. Furthermore, many studies are survey-based and contain relatively small samples, which, combined with employing various methodologies and measures of internationalization and

profitability, renders generalization of the findings a delicate process.

The main lesson we learn from the discussion in this section is that no consensus has been reached thus far regarding the question whether internationalization fosters firm profitability. That is, neither in the field of economics and international trade, nor in the field of international business management has this question been decidedly answered.

5.3 Theoretical framework

In order to gain a theoretical understanding of the relationship between trade status and profitability we start by taking on the theoretical models developed by Melitz (2003) and Egger and Kreickemeier (2012). In both models firm total profits π are an integral part of the firm profit maximization problem. However, the profit margin $\frac{\pi}{r}$, the key parameter of interest in our empirical analysis with r representing firm revenue, is not explicitly considered. Profit margins are an important indicator of the degree of competitiveness and market power of the firm. They indicate to which extent the firm is able to behave as a price setter and to operate efficiently, not only on the production side, but also as a seller on domestic and foreign markets. In addition, by expressing profits in relative terms the size component is removed, enabling investigation of the relationship between profitability and exporting along the firm size distribution. In this section we will investigate to what extent these two theoretical models yield empirically testable predictions regarding the relationship between trade status, productivity and profit margins.

5.3.1 Profit margins in the Melitz (2003) model

Figure 5.1 shows that in the Melitz (2003) model the profit margin increases in firm productivity along the productivity distribution for both exporters and non-exporters. In Figure 5.1 φ^* refers to the marginal productivity level required to operate and φ_x^* to the marginal productivity level required to export, where φ refers to firm-level productivity. In order to ensure partitioning of firms by export status, Melitz (2003) assumes that $\tau^{\sigma-1} f_x > f$, where $f > 0$ refers to fixed costs of operations, $\tau > 1$ to the per-unit iceberg variable trade costs and f_x to the fixed costs of exporting. In addition, it is assumed that the marginal exporter with productivity φ_x^* generates total revenues approximately equal to the marginal non-exporter just below the threshold productivity level: $r_e(\varphi_x^*) = r_d(\varphi_x^* - \epsilon)$, where subindex e denotes

the exporting firm and subindex d denotes the domestic firm.[4] See appendix 5.A.1 for a more detailed explanation of the derivation of profit rates in the Melitz (2003) model.

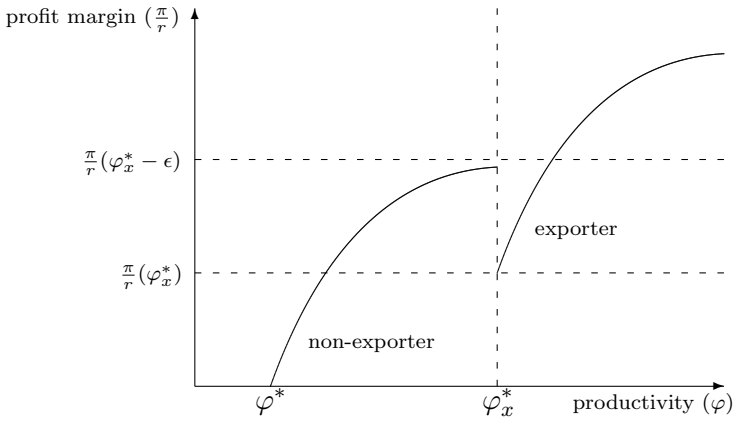

Figure 5.1: Relating profit margins and productivity in the Melitz (2003) model

These assumptions imply that, as equation 5.2 shows, the profit margin, $\pi_e(\varphi_x^*)/r_e(\varphi_x^*)$, of the marginal exporter will be lower than the profit margin of a domestic firm, $\pi_d(\varphi_x^* - \epsilon)/r_d(\varphi_x^* - \epsilon)$, with productivity level $\varphi_x^* - \epsilon$, where ϵ is positive, but arbitrarily small and approaching zero. The profit margin of the non-exporter with productivity level $\varphi_x^* - \epsilon$ is larger than the profit margin of the exporter with productivity φ_x^* as equation 5.2 shows, since:

$$\lim_{\epsilon \to 0} r_d(\varphi_x^* - \epsilon) = r_d(\varphi_x^*) \tag{5.1}$$

and $\tau > 1$. In this equation r refers to firm revenue, parameter $\sigma > 1$ to the elasticity of substitution between any two goods, and $n \geq 1$ to the number of countries where the firm exports to.

$$\lim_{\epsilon \to 0} \frac{\pi_d(\varphi_x^* - \epsilon)}{r_d(\varphi_x^* - \epsilon)} = [\frac{1}{\sigma} - \frac{f}{r_d(\varphi_x^*)}] > \frac{1}{1 + n\tau^{1-\sigma}} \left[\frac{1}{\sigma} - \frac{f}{r_d(\varphi_x^*)}\right] = \frac{\pi_e(\varphi_x^*)}{r_e(\varphi_x^*)} \tag{5.2}$$

These analytical results yield the relationship between firm-level productivity and profit margins as depicted in Figure 5.1. However, deriving testable

[4]Since the profit margin does not directly depend on firm-level revenues, only indirectly through productivity, the relationship between firm-level revenue and profit margins mirrors that between productivity and profit margins.

predictions from this model of the relationship between trade status and profitability is not feasible, since every outcome is possible, depending on the distribution of profit margins along the productivity dimension for different trade statuses. In addition, contrary to what is being observed in the real economy (see Figure 3.1 and Mayer and Ottaviano (2008)), it is assumed in the Melitz (2003) model that there is no overlap between the productivity levels of domestic firms versus exporting firms.

5.3.2 Profit margins in the Egger and Kreickemeier (2012) model

In addition to the Melitz (2003) model we consider the model developed by Egger and Kreickemeier (2012) in which wages are endogenized in a fair wage framework. This model is equipped to accommodate the well established empirical fact that exporting firms pay higher wages than non-exporters. See appendix 5.A.2 for a detailed explanation of the derivation of the profit margins in the Egger and Kreickemeier (2012) model.

Figure 5.2 shows that the profit margin of firms that focus solely on domestic markets is independent of firm-level productivity and thus constant along the productivity distribution up to the productivity level φ_x^*. In addition, the profit margin of the marginal exporter with productivity level φ_x^* is, analogous to the Melitz (2003) model, lower than that of the marginal non-exporter with a productivity level just below φ_x^*. Firms with productivity levels higher than φ_x^* are active on foreign markets in addition to domestic markets and experience profit margins increasing in firm-level productivity. However, a crucial analytical implication of the Egger and Kreickemeier (2012) model is that profit margins of exporters never exceed that of non-exporters; at the limit of the firm-level productivity distribution the profit margin of exporters approaches that of non-exporters. This becomes immediately clear from the functional forms of the profit margin of domestic firms and the profit margin of exporters presented in equation 5.3. The individual terms in both parts of the inequality are all consistently positive. Therefore, the domestic firms profit margin, $\pi_d(\varphi)/r_d(\varphi)$ with any given productivity level φ, is always larger than the profit margin of the exporting firm, $\pi_e(\varphi)/r_e(\varphi)$.[5]

$$\frac{\pi_d(\varphi)}{r_d(\varphi)} = \frac{1}{\sigma} > \frac{1}{\sigma} - \lambda = \frac{\pi_e(\varphi)}{r_e(\varphi)} \tag{5.3}$$

[5]See appendix 5.A.2 for a detailed explanation of the model and for an explanation of the parameters of equation 5.3 which have not been explained yet.

From these analytical results we derive the expectation that the exporting firm will face profit margins lower than or equal to the profit margin of the domestic firm. Particularly if exporting firms show to have high productivity levels relative to domestic firms, it is likely that no statistical difference will be found between the exporters and domestic firms profit margin.

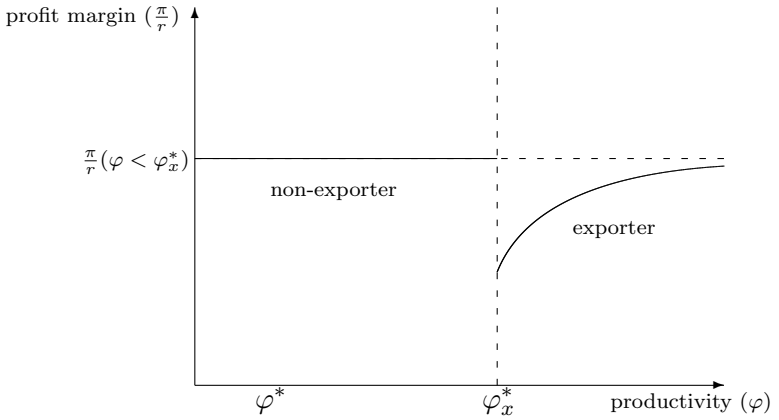

Figure 5.2: Relating profit margins and productivity in the Egger and Kreickemeier (2012) model

Given the analytically diverging results of both models and the strong evidence regarding the existence of wage premia of exporting, we consider the Egger and Kreickemeier (2012) model to be better equipped to provide testable predictions for the empirical analysis (especially in labor intensive sectors). The empirical analysis does however enable us to compare the merits of both theoretical models in the sense that a positive profit margin premium of exporting would only be consistent with the Melitz (2003) model. In addition, deriving testable predictions from the analytical results from the Melitz (2003) model of the relationship between trade status and profitability is not feasible, since every outcome is possible, depending on the distribution of profit margins along the productivity dimension for different trade statuses. The analytical results regarding the relationship between profitability and export status that can be derived from the theoretical models discussed in this section bring us to the following hypotheses that will be empirically tested in section 5.6:[6]

[6]The theoretical models discussed in this section thus far focus solely on the role of exporting, and ignores the role of importing. Kasahara and Lapham (2008) explicitly include

Hypothesis 1. *Profit margins of exporting firms are lower than or equal to those of non-exporting firms*

Hypothesis 2. *Firm-level profit margins increase in productivity*

The logical implications from deriving profit margins from the theoretical models developed in Melitz (2003) and Egger and Kreickemeier (2012) might seem puzzling at first in the sense that they raise the question why a firm would start exporting at all if it is confronted with lower profit margins after foreign market entry. However, it is crucial to explicitly distinguish between profit margins and total profits at the firm-level. Exporters are on average considerably larger than non-exporters and show to have a higher probability of survival. This leaves the possibility open for exporters to generate higher annual firm-level profits and a higher net present value of future profits relative to non-exporters, even though profit margins might be lower. In addition, competition on international markets is generally fiercer than competition on domestic markets, which is likely to be reflected in a lower profit margin for exporters relative to domestic firms.

5.4 Data

For the empirical analysis we merge data from three main data sources: (i) the General Business Register (GBR), (ii) the Baseline Database and (iii) the International Trade Database, all provided by Statistics Netherlands into a panel data set covering the years 2002 to 2010.[7]

The GBR is, in principle, exhaustive in the sense that it contains information about every firm in the Netherlands, including a set of basic firm characteristics such as the number of employees in fulltime equivalents and the sector in which the firm operates according to the internationally standardized ISIC Rev. 3.1 sector classification[8]. We eliminate firms with less

importing in a Melitz-type model. Their analytical findings suggest that the profit margins of importing firms will be larger than the profit margins of domestic firms. However, empirical results of e.g. Machin and van Reenen (1993) show that the sector level import intensity has a negative impact on profit margins. As the issue of importing and profit margins is sparsely researched theoretically, we leave the derivation of empirically testable expectations from theoretical research concerning the relationship between importing and profit margins as a direction for further research.

[7]We confine ourselves to discussing some key characteristics of each data source in this chapter. For details regarding the merging procedure see chapter 2.

[8]The ISIC Rev. 3.1 sector classification equals the SBI'93 2 digit classification employed by Statistics Netherlands

than 4 employees from the analysis because of specific tax incentives applying to small firms in the Netherlands.[9] We take from a separate but related database information concerning the ultimate controlling institution of the firm, indicating whether the ultimate controlling owner of the Dutch firm is located abroad. The Baseline database contains a wealth of financial information collected from both corporate tax declarations and income tax declarations of entrepreneurs, which is merged to the GBR. The Baseline database contains information about profits, gross output, value added and the value of capital, labor and intermediate inputs, which are deflated using separate sector level price indices. Because of their fundamentally different nature, we separate the data into two main sectors; manufacturing, and wholesale & retail trading sectors.[10]

Trade data are taken from the International Trade database and includes information on all imports and exports of goods by Dutch firms. Extra-EU trade is recorded by the Customs Authority and intra-EU imports and exports are recorded by the Dutch Tax Authority. The trade data available at the firm level covers more than 80% of annual aggregate trade in terms of value in the Netherlands.[11] The merging procedure results in an unbalanced panel data set containing a total of 501,769 observations of 139,160 firms spanning a period of nine years (2002-2010).[12]

[9]The analysis excludes firms with less than 4 employees. Dutch tax legislation provides an incentive for owners of small firms to artificially increase the pre-tax profits of the firm in order to obtain lower taxation on their income, since profits are taxed less heavily than wages. This renders the profit information of the smallest firms difficult to compare with larger firms. However, most micro-firms have an equal incentive to do so which renders comparing domestic and exporting micro-firms still feasible.

[10]We focus the analysis on manufacturing and wholesale & retail trading, thereby excluding service sectors, since firm-level data regarding trade in services are not yet sufficiently available for the Netherlands. We choose *financial intermediation* as the cut-off point for service sectors, which corresponds to ISIC Rev. 3.1 section J, division 65. Manufacturing sectors correspond in the analysis to ISIC Rev. 3.1 sections A through I, excluding G. Wholesale & retail traders correspond to ISIC Rev. 3.1 section G. The OECD and Eurostat recommend to define manufacturing as sections A through F and to include section G to Q in services. However, in terms of goods trade this division is less sensible, since a considerable part of goods trade takes place in trade and transport sectors it is therefore more appropriate to separate these sections from typical (financial and public) service sectors.

[11]The trade data are recorded on VAT-numbers. Connection to the firm identification key used by Statistics Netherlands leads to a merging loss of about 20% of annual trade values. See chapter 2 for details.

[12]This is after eliminating four sectors with eight observations or less, micro-firms (less than four fulltime equivalents) and implausible observations with zero or negative output or exports exceeding gross output. See chapter 2 for details.

5.5 Empirical methodology

5.5.1 Measuring profitability

The definition of profit (π) per employee (E) is presented in equation 5.4 and shows that the profit rate results from two factors: a scale effect ($\frac{R}{E}$) and a margin effect ($\frac{\pi}{R}$), where R represents annual revenue. The scale effect refers to the level of revenue and productivity and the margin effect to the cost structure, i.e. to the margin of profits over revenues. Gross profit per employee is calculated according to the following equation, where the definition of the gross profit is derived in equation 5.5:

$$\frac{\pi_G}{E} = \frac{R * (\frac{\pi_G}{R})}{E} \tag{5.4}$$

Let R represent annual revenue (or sales), VC variable costs (or costs of goods sold), FC fixed costs of production that do not depend on the size of production in the short run, FC_X the fixed cost of exporting (which is zero for companies operating only on the domestic market), and A total asset value.[13] A few of the most common profitability indicators, derived from the International Financial Reporting Standards (IFRS), can be expressed in terms of these parameters and include (but are not limited to):

Gross profit margin:

$$\frac{\pi_G}{R} = \frac{R - VC}{R} = 1 - (\frac{VC}{R}) \tag{5.5}$$

Net profit margin:

$$\frac{\pi_N}{R} = \frac{R - VC - FC - FC_X}{R} = 1 - (\frac{VC}{R}) - (\frac{FC}{R}) - (\frac{FC_X}{R}) \tag{5.6}$$

Return on assets (ROA):

$$ROA = (\frac{R - VC - FC - FC_X}{A}) = (\frac{R}{A}) - (\frac{VC}{A}) - (\frac{FC}{A}) - (\frac{FC_X}{A}) \tag{5.7}$$

Investors typically analyze margin and return based indicators to assess profitability, performance and attractiveness of a firm as an investment rather than per employee profit measures (Robinson, van Greuning, Henry, and Broihahn, 2008). In addition, the operating margin (return on sales) and return on equity are well-established profitability indicators in financial

[13] The total asset value is defined as the book value of total assets at the end of the year.

analysis (Robinson, van Greuning, Henry, and Broihahn, 2008). Investors typically use indicators defined *per dividend* or *per share* as well, but most of the commonly available financial statements and balance sheets do not include that information. Therefore, we restrict our analysis to the four profitability indicators (equations 5.4, 5.5, 5.6 and 5.7) discussed above.

5.5.2 Empirical methodology

We start the empirical analysis by investigating the correlation between export status and profitability with fixed effects panel regressions. The existing empirical evidence suggesting that highly productive firms self-select into exporting is compelling (Wagner, 2012b). This implies that there is the threat of endogeneity arising in any regression of profitability on export status, due to a sample selection bias. The purpose of the regressions in the first stage is thus to provide an indication of the correlation between export status and the various profitability measures we employ.

The fixed effects panel regressions are of the following form[14]:

$$\frac{\pi_{Xijt}}{R_{ijt}} or \frac{\pi_{Xijt}}{A_{ijt}} = \alpha + Y'_{ijt}\beta + Z'_{ijt}\gamma + \mu_i + \epsilon_{ijt}, \tag{5.8}$$

where $\frac{\pi_{Xijt}}{R_{ijt}}$ refers to the profit margin of firm $i \in I$ from sector $j \in J$ in year $t \in T$ relative to the mean profit margin over sales in sector j. Analogously, $\frac{\pi_{Xijt}}{A_{ijt}}$ represents the firms return on assets (A_{ijt}) relative to the sector mean. Y_{ijt} refers to a set of firm specific explanatory variables that include a set of dummy variables indicating the trade status of the firm and a set of control variables. The control variables included are the export share in total sales, (the log of) firm size in terms of employment, a dummy variable indicating whether the firm is under foreign control and (the log of) labor productivity (defined as value added per employee).[15] Non-trading firms mark the reference group, implying that α captures the general correlation of being a non-trader with the different profit measures. In addition, as investors generally demand a risk premium when supplying

[14] As a starting point we estimated basic pooled OLS-models without firm-specific fixed effects, which yield only an indication of the direction of the relationship between profitability and trade status. Unobservable firm characteristics are likely to effect both the export decision and profit rates of the firm. As the results of the OLS-models do not yield insights additional to the fixed effects findings, they are not further discussed. Results are available from the authors upon request.

[15] The dummy variable indicating whether a firm is ultimately controlled by a foreign company is not derived from the underlying ownership structure, it indicates whether the controlling institution is effectively located abroad.

capital to start-ups, we would like to control for firm age. Unfortunately, this information is not available, but firm size generally correlates with firm age, so it is in that vein that age is indirectly controlled for. Albuquerque (2009) argues that size and industry specific groups provide the best view on the comparative performance of firms, since business cycles are mostly industry specific and firm size significantly affects the firms ability to respond to shocks. Therefore, a full set of industry and year specific dummy variables, represented by Z_{ijt}, has been included in the regressions. μ_i represents the firm fixed effect, which captures firm specific factors, such as the quality of management, that affect both the decision to export and profitability of the firm. Finally, the error term is denoted ϵ.

Due to the expected sample selection bias, it is difficult to identify a fully exogenous instrument for export status. To deal with this problem, and in line with existing literature (Greenaway and Kneller, 2007b), we employ propensity score matching (PSM) to investigate if export starters convert to a different profitability growth path relative to continuing non-exporters. The objective of this procedure is to construct the non-observed counterfactual by matching each export starter (a 'treated' firm) to a firm from the control group (continuing non-trader, an 'untreated' firm) based on similarity of firm characteristics before the treatment. In this particular application the 'treatment' is the export start of the firm. Matching is done based on the estimated probability of becoming an exporter. This probability is estimated by means of a probit-model of the export status on a set of firm characteristics prior to export start (equation 5.9).[16]

$$Pr(exp_{ijt} = 1) = \alpha + Y'_{ijt-1}\beta + Z'_{ijt-1}\gamma + \epsilon_{ijt-1}, \tag{5.9}$$

The predicted values from this regression serve as the propensity score, based on which export starters and continuing non-exporters are paired up for the next step. The explanatory variables included in the probit-model are the import status, a dummy variable indicating whether the firm is under foreign control, the relative net profit margin, (the log of) labor productivity, labor productivity growth, (the log of) assets per employee, (the log of) wages per employee and two sets of dummy variables representing size class and sector. All explanatory variables are lagged one year, in order to pair treated and untreated firms based on the similarity of their characteristics one year prior to treatment. The variable selection and methodology is inspired by the procedure followed by Ilmakunnas and Nurmi (2010) and Arnold and

[16] A firm is considered an exporter in a particular year if it generates an export value larger than zero in that year.

Hussinger (2005) who find that firm size, productivity, labor quality, price-cost margins and foreign ownership status affect the decision to export. As the data do not contain information on the skill level of the employees, we use the logarithm of the wage bill over employment as a proxy. Since an export start is expected to imply incurring additional export related fixed costs, the lagged net profit margin relative to the sector mean is included in the probit-regressions to account for differences in cost structures.

We define a firm as an export starter in case it reports exports larger than zero in year t and export values of zero in *t-1* and *t-2* (see Table 5.7 in the appendix for the exact definition of the various cohorts that serve as input for the PSM-analysis). Firms that remain non-exporting for the full three years represent the control group. The probit-regressions are run separately for each combined cohort of export starters and continuing non-exporters.

Firms from the export-starting cohort are then matched to a peer from the continuingly non-exporting control group by minimizing the difference in individual propensity scores; this procedure is referred to as nearest neighbor propensity score matching, where we also employ a caliper to avoid the matching of export starters for which a sufficiently similar peer is not available in the control group. In addition, we force matching only to be allowed between firms from the same sector. The only additional condition that needs to be satisfied is that both treated and matched untreated firms continuously stay in business throughout the period under investigation. In the final step the profitability growth paths of the matched pairs of export starters and continuing non-exporters are compared.[17]

5.6 Empirical findings

Table 5.1 provides an insight in the panel size by firm size class and the persistence of exporting. The table shows that the number of observations available decreases rapidly with firm size in both key sectors. The persistence of exporting increases in firm size, which is an intuitively straightforward observation. In addition, the fraction of exporters is considerably larger in wholesale & retail trading. For a discussion of the persistence of trade in

[17] To evaluate the average treatment effect on the treated (ATT) we construct bias-corrected 95% confidence intervals by bootstrapping the ATT with 200 replications. Abadie and Imbens (2008) show that bootstrapping nearest neighbor matching estimators yields invalid standard errors. However, Caliendo and Kopeinig (2008) argue that if propensity scores need to be estimated there is no feasible alternative available. To pursue caution we will however abstain from estimating and evaluating exact p-values and only construct bias-corrected 95% confidence intervals.

the Netherlands in international perspective see section 2.2.

firm size class	micro		small	medium	large	all
(FTE)	0-3	4-9	10-49	50-249	≥ 250	firms
manufacturing						
no. of observations	excluded	149,983	111,976	14,276	1,384	277,619
share exporting (%)	excluded	13.2	26.0	51.0	71.1	20.6
wholesale & retail trade						
no. of observations	excluded	143,968	70,759	7,405	728	222,860
share exporting (%)	excluded	28.9	46.4	61.0	79.4	35.7

Table 5.1: Panel size and persistence of goods exporting (the Netherlands, 2002-2010)

5.6.1 Fixed effects regression results

Table 5.2 shows the results from the fixed effects regressions on the four profit rate measures, where the fixed effects dimension of the model enables us to control for non-observed firm-specific heterogeneity. The picture emerging is mixed. Manufacturing sectors show significantly negative premia for both sole importers, sole exporters and two-way traders, except when gross profits per employee serve as the profit rate measure under investigation in which case only sole exporters experience a significantly negative trade premium. The results regarding the relative gross profit margin per employee show both the scale effect of exporting and the margin effect (see section 5.5.1). In wholesale & retail trading sectors a comparable picture emerges. The only deviation regards net profit rates which only yield a significant (and negative) coefficient for two-way traders.

For manufacturing sectors, and similar to the findings of Fryges and Wagner (2010) regarding Germany, we generally find a significant and positive coefficient for export share in total sales. This indicates that exporting per se does not foster profitability rather than the extent to which foreign markets add to firm sales. This observation makes sense in the context of the fixed costs associated with exporting, which thus renders exporting profitable once a certain threshold share of exports in turnover is reached. In addition, we find a consistently positive and significant correlation between firm size and profitability measures other than the gross profit per employee. The correlation between firm size and profitability turns negative and significant in manufacturing sectors when we consider profit rates per employee. This finding is most likely related to the variable definition of the profit rates per employee, in addition to the endogeneity problem. Gross profits

per employee hinge directly on our measure of firm size. This implies that if employment increases, the profits per employee go down in the short run if wages and other costs are rigid. Furthermore, productivity is an important indicator for profitability in the fixed effects regressions, considering the relatively large, positive and significant coefficients, which is an intuitively straightforward finding and in line with theoretical expectations.

	manufacturing sectors				wholesale & retail trading sectors			
	rel. GPM	rel. NPM	rel. ROA	rel. GPPE	rel. GPM	rel. NPM	rel. ROA	rel. GPPE
trade dummies								
non-trader	reference	reference	reference	reference	reference	reference	reference	reference
only exports	-0.004**	-0.005**	-0.008***	-515.5**	-0.003*	-0.002	-0.007**	-511.3*
	(-3.12)	(-3.20)	(-3.96)	(-3.12)	(-2.54)	(-1.08)	(-3.15)	(-2.26)
only imports	-0.002*	-0.002*	-0.005**	-175.2	-0.002**	-0.002	-0.007***	-197.6
	(-2.40)	(-2.11)	(-3.17)	(-1.54)	(-2.91)	(-1.83)	(-4.65)	(-1.71)
two-way trader	-0.004**	-0.005***	-0.008***	-181.3	-0.005***	-0.003**	-0.013***	-280.8
	(-3.28)	(-3.70)	(-3.93)	(-1.09)	(-4.48)	(-2.79)	(-6.80)	(-1.51)
control variables								
export share	0.022***	0.016**	0.030***	829.6	0.005	0.006	-0.008	-1982.7*
	(4.24)	(2.77)	(4.33)	(1.07)	(1.09)	(1.23)	(-1.39)	(-2.36)
firm size (FTE, log)	0.054***	0.069***	0.047***	-1008.6***	0.044***	0.053***	0.057***	84.4
	(41.69)	(47.78)	(25.04)	(-6.37)	(38.10)	(42.00)	(30.01)	(0.40)
domestically controlled	reference	reference	reference	reference	reference	reference	reference	reference
foreign controlled	0.006	0.008	0.012*	348.1	0.001	0.000	0.009*	1126.8*
	(1.75)	(1.88)	(2.19)	(0.61)	(0.43)	(-0.03)	(2.10)	(2.13)
labor productivity (log)	0.089***	0.111***	0.104***	10497.1***	0.069***	0.083***	0.110***	14549.5***
	(64.05)	(71.82)	(59.49)	(66.01)	(61.25)	(64.83)	(65.55)	(71.13)
No. of observations	269,122	269,362	266,520	269,594	214,651	214,796	213,518	212,476
R^2 - *within*	0.253	0.285	0.176	0.241	0.232	0.264	0.219	0.302
R^2 - *between*	0.003	0.011	0.002	0.191	0.027	0.051	0.004	0.291
R^2 - *overall*	0.015	0.030	0.002	0.210	0.044	0.075	0.020	0.317

Notes: *GPM* identifies the gross profit rate, *NPM* the net profit rate, *ROA* the return on assets and *GPPE* the gross profit per employee. All regressions include a full set of year-sector dummies and fixed effects at firm level. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.2: Profit rate premia in the Netherlands (fixed effects panel regressions, 2002-2010)

In the next step we run our baseline fixed effects model (equation 5.8) separately for different firm size classes, since inclusion of firm size in terms of employment in fulltime equivalents does not allow for any nonlinearities in the relationship with profit rates.[18] The estimation results concerning the profit margin premia are robust to the profit measures employed, and we thus confine the discussion in this section to the fixed effects regressions

[18]Firm size is less likely to affect access to capital and capital costs, since access to capital markets for SMEs is relatively easy in the Netherlands. Specifically in developing countries capital market frictions tend to be larger, which is particularly problematic for smaller firms (Foellmi and Oechslin, 2010). Variation in results between firm size classes is therefore less likely to stem from differences in access to capital.

with the gross profit rate as the profitability measure under investigation (see Table 5.3 for the results).[19]

	manufacturing sectors					wholesale and retail trading sectors				
	all	micro	small	medium	large	all	micro	small	medium	large
trade dummies										
non-trader	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
only exports	-0.004**	-0.008***	0.001	-0.007	-0.019	-0.003*	-0.003	-0.003	0.002	-0.035
	(-3.12)	(-3.42)	(0.31)	(-1.32)	(-1.07)	(-2.54)	(-1.61)	(-1.32)	(0.42)	(-1.11)
only imports	-0.002*	-0.003*	-0.001	-0.001	-0.002	-0.002**	-0.002	-0.005**	0.006	-0.022
	(-2.40)	(-2.02)	(-1.05)	(-0.22)	(-0.21)	(-2.91)	(-1.78)	(-3.15)	(1.35)	(-0.55)
two-way trader	-0.004**	-0.005*	-0.001	-0.005	-0.020	-0.005***	-0.004**	-0.007***	0.007	-0.018
	(-3.28)	(-2.29)	(-0.81)	(-1.05)	(-1.57)	(-4.48)	(-2.64)	(-3.75)	(1.30)	(-0.40)
control variables										
export share	0.022***	0.003	0.020**	0.053***	0.109	0.005	-0.010	0.021**	0.022	-0.025
	(4.24)	(0.30)	(2.75)	(3.68)	(1.54)	(1.09)	(-1.48)	(3.02)	(1.12)	(-0.20)
firm size (FTE, log)	0.054***	0.064***	0.044***	0.036***	0.012	0.044***	0.048***	0.039***	0.029***	-0.006
	(41.69)	(30.30)	(20.87)	(5.64)	(0.61)	(38.10)	(26.80)	(17.96)	(3.95)	(-0.41)
dom. controlled	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
foreign controlled	0.006	0.015	0.006	0.007	-0.006	0.001	-0.005	0.003	0.013	-0.001
	(1.75)	(1.96)	(1.19)	(0.89)	(-0.38)	(0.43)	(-0.74)	(0.88)	(1.51)	(-0.08)
labor prod. (log)	0.089***	0.104***	0.076***	0.053***	0.025***	0.069***	0.073***	0.064***	0.045***	0.014*
	(64.05)	(49.90)	(33.61)	(10.31)	(3.31)	(61.25)	(49.94)	(30.44)	(8.15)	(2.13)
No. of observations	269,122	144,467	109,596	13,810	1,249	214,651	138,255	68,613	7,095	688
R^2 - *within*	0.253	0.265	0.249	0.216	0.449	0.232	0.238	0.227	0.175	0.221
R^2 - *between*	0.003	0.017	0.055	0.065	0.000	0.027	0.047	0.119	0.096	0.036
R^2 - *overall*	0.015	0.026	0.105	0.080	0.006	0.044	0.064	0.158	0.101	0.066

Notes: All regressions include a full set of year-sector dummies and fixed effects at firm level. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.3: Relative gross profit margin premia (the Netherlands, fixed effects panel regressions, 2002-2010)

The significantly negative profit rate premia we find in manufacturing sectors pooled over all firms again turns out to be mainly on account of micro-firms. Analogously, the results in wholesale & retail trading are most prominently shaped by small, and, to a lesser extent, micro-sized firms and particularly persistent for two-way trading. The sub-sample covering large firms shows insignificant trade premia. This finding should be interpreted with caution; it could be tied to the relatively small sample sizes, compared to the sample sizes of especially micro-sized and small firms. Labor productivity is an important indicator in all country-sector-size combinations with a consistently positive and significant profit rate premium. This premium does however generally decrease in firm size class.

We draw a number of conclusions from the regression results presented in this section:

Empirical regularity 1. *The profit rate premia of trading are insignificant*

[19] The regression results regarding the other profit rate measures are presented in appendix 5.A.3.

or significantly negative, but never positive and significant.

Empirical regularity 2. *The decision to enter foreign import or export markets is not heavily correlated with profit rates.*

This finding stems from the largely insignificant or significantly negative but relatively small trade premia that we find. This empirical result aligns with the hypothesis inferred from the Egger and Kreickemeier (2012) model in section 5.3 stating that profit margins of exporting firms are lower than or equal to that of non-exporting firms. In addition, the negative profit rate premia patterns are more pronounced for micro-, small- and medium-sized firms than for larger firms.

Empirical regularity 3. *Negative profit rate premia are tied to exporting rather than to importing.*

Although the relationship between trade status and profit rates is not strong, the empirical results do indicate that the negative premia patterns are more pronounced for exporting than for importing. In addition, in manufacturing sectors we generally find a significantly positive relationship between the export share in sales and profit margins, indicating that exporting per se does not seem to foster profitability rather than the extent to which foreign markets add to firm sales.

Empirical regularity 4. *Productivity is an important indicator for firm-level profitability*

This empirical finding is also in line with the hypothesis derived from the Egger and Kreickemeier (2012) model. Furthermore, the empirical results show that profitability tends to increase in the share of exports in total sales. In addition, we find that the choice for the profit measure under investigation does not heavily affect the findings. The overall quality and performance of the fixed effects regressions indicate that the relative gross and net profit margins and return on assets yield the most consistent and robust results.

Exporter churning might also provide a partial explanation for the negative or insignificant profitability premia for exporters. If a relatively large fraction of firms starts exporting or switches trade status frequently, the relative impact of the fixed costs associated with an export start will be high, which can drive down profits relative to non-exporters. We further look into this issue in section 5.6.2. Since we explicitly investigate export *starters* versus continuing non-exporters there, the subset of firms included in the analysis is purged from firms that repeatedly switch their export status in a short period of time.

5.6.2 Propensity score matching results

Corroborating the fixed effects regression results, the propensity score matching analysis shows no discernible difference between export starters and firms that keep their focus on domestic markets in terms of profitability in the years following foreign market entry. Table 5.4 presents the summary statistics of the propensity score matching procedures. The table outlines the number of individual PSM-procedures which yielded either: (i) no difference between the treated firms and continuing non-exporters, (ii) profit margin premia for exporters, or (iii) profit margin premia for the control group. The results are separated for static (immediate) and dynamic (longer-term) effects and for tests on profit margin levels and profit margin growth. Table 5.5 and Table 5.6 present the detailed results including the average treatment effects on the treated.

	manufacturing sectors				wholesale & retail trading				total no.
result	static effect	t+1	t+2	t+3	static effect	t+1	t+2	t+3	of cases
levels									
no difference	21	17	12	12	21	18	15	8	124
higher prof. for exporters	0	1	2	0	0	0	0	3	6
lower prof. for exporters	0	0	1	0	0	0	0	1	2
growth									
no difference	-	16	12	8	-	18	13	12	79
higher prof. for exporters	-	0	3	4	-	0	2	0	9
lower prof. for exporters	-	2	0	0	-	0	0	0	2

Table 5.4: Summarized propensity score matching results

Out of 222 investigated cohort-outcome variable combinations we find just 19 significant treatment effects. Although the majority of the estimated treatment effects is insignificant, we do find some evidence in manufacturing sectors suggesting that export starters materialize higher profit growth rates two to three years after foreign market entry, on several occasions resulting in significantly higher profit levels as well. Particularly for the 2008-cohort these findings seem relatively robust, which is most likely mainly due to the relatively large number of available treated cases. Wholesale & retail trading sectors show less pronounced profitability patterns. Only for the 2006-cohort do we find noteworthy treatment effects, particularly for profit growth in year two and profit levels in year three after foreign market entry. However, despite the fact the we do find a few significant results, as said, the majority of the estimated treatment effects remains insignificant. These isolated cases provide no solid basis supporting the claim that firms entering export markets convert to a different profitability path, neither lower nor

higher, than firms that keep focusing solely on domestic markets. This result aligns with the expectations derived from the theoretical analysis, stating that profit margins of exporters are either lower than or equal to the profit margins of domestic firms.

		rel. gross profit margin		rel. net profit margin		rel. return on assets	
export start in year t	outcome variable	no. of matched treated	ATT (%)	no. of matched treated	ATT (%)	no. of matched treated	ATT (%)
2004	$profitlevel$ at time t	280	0.7	282	-0.18	283	0.76
	$profitgrowth_{t,t+1}$ (perc. pt. change)	94	-0.88	96	-0.41	99	-0.11
	$profitlevel$ at time $t+1$	103	0.49	104	0.29	102	1.83
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	47	-1.61	47	-0.89	47	-1.22
	$profitlevel$ at time $t+2$	49	-1.87	49	-2.2	49	-2.57
	$profitgrowth_{t+2,t+3}$ (perc. pt. change)	34	0.32	35	-0.82	35	-1.55
	$profitlevel$ at time $t+3$	36	0.58	36	-0.12	36	-0.5
2005	$profitlevel$ at time t	280	-0.24	280	1.65	278	0.75
	$profitgrowth_{t,t+1}$ (perc. pt. change)	84	0.68	86	0.5	88	2.3
	$profitlevel$ at time $t+1$	94	0.61	95	1.81	95	1.43
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	51	0.16	50	0.38	53	1.01
	$profitlevel$ at time $t+2$	55	3.4	55	3.56	55	1.49
	$profitgrowth_{t+2,t+3}$ (perc. pt. change)	42	-0.63	42	-1.12	42	2.06
	$profitlevel$ at time $t+3$	43	2.57	43	1.42	43	3.24
2006	$profitlevel$ at time t	233	-0.93	232	-0.78	232	-0.89
	$profitgrowth_{t,t+1}$ (perc. pt. change)	87	-0.51	87	-0.62	90	-1.93
	$profitlevel$ at time $t+1$	94	-1.79	94	-1.04	93	0.14
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	47	0.34	45	0.11	49	-0.71
	$profitlevel$ at time $t+2$	51	1.56	51	0.3	51	0.91
	$profitgrowth_{t+2,t+3}$ (perc. pt. change)	24	4.85*	26	2.76	28	4.51*
	$profitlevel$ at time $t+3$	31	3.49	31	3.34	31	1.91
2007	$profitlevel$ at time t	244	-0.33	244	0.69	244	-1.08
	$profitgrowth_{t,t+1}$ (perc. pt. change)	117	-0.55	117	-0.91	120	-1.88
	$profitlevel$ at time $t+1$	128	-2.19	128	-1.65	128	-1.74
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	52	-0.47	55	-0.46	58	0.38
	$profitlevel$ at time $t+2$	66	-1.83	66	-2.16	66	-3.73*
	$profitgrowth_{t+2,t+3}$ (perc. pt. change)	40	2.97*	41	1.44	45	4.62*
	$profitlevel$ at time $t+3$	48	2.01	48	0.48	48	-2.88
2008	$profitlevel$ at time t	983	0.42	983	-0.22	984	-1.25
	$profitgrowth_{t,t+1}$ (perc. pt. change)	442	-0.51	437	-1.11*	465	-0.97*
	$profitlevel$ at time $t+1$	503	0.39	502	0.53	502	-0.08
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	332	1.28*	320	1.44*	347	2.18*
	$profitlevel$ at time $t+2$	366	2.46*	367	2.25*	367	1.68
2009	$profitlevel$ at time t	405	0.54	405	0.12	404	0.37
	$profitgrowth_{t,t+1}$ (perc. pt. change)	146	0.29	144	0.58	153	1.74
	$profitlevel$ at time $t+1$	169	3.43	169	3.22*	168	2.74
2010	$profitlevel$ at time t	995	-0.51	995	-0.24	988	0.12

Notes: Nearest neighbor propensity score matching was done using Stata 11 and the psmatch2 package developed by Leuven and Sianesi (2003). The common support condition is imposed on the matching procedure, implying that treated firms with a propensity score higher than the maximum of the non-treated control group and lower than the minimum of the control group are taken off support and are not matched to a peer. The balancing property condition, requiring absence of statistically significant differences between the means of the matching characteristics of the firms in the treatment and the control group is fully satisfied in all instances. The bias-corrected 95% confidence intervals are generated by bootstrapping the ATT with 200 replications. * $p < 0.05$

Table 5.5: The effect of exporting on profitability in manufacturing sectors in the Netherlands

export start in year t	outcome variable	rel. gross profit margin no. of matched treated	rel. gross profit margin ATT (%)	rel. net profit margin no. of matched treated	rel. net profit margin ATT (%)	rel. return on assets no. of matched treated	rel. return on assets ATT (%)
2004	$profitlevel$ at time t	236	-0.79	237	-0.5	238	-0.07
	$profitgrowth_{t,t+1}$ (perc. pt. change)	93	-0.68	95	-1.02	98	-0.46
	$profitlevel$ at time *t+1*	99	0.45	99	0.18	99	1.95
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	44	0.08	44	-0.46	43	-2.3
	$profitlevel$ at time *t+2*	45	1.9	45	2.67	46	3.98
	$profitgrowth_{t+2,t+3}$ (perc. pt. change)	31	1.74	31	1.77	32	0.84
	$profitlevel$ at time *t+3*	32	-1.05	32	-0.45	32	-1.46
2005	$profitlevel$ at time t	294	-0.14	294	0.43	293	-0.05
	$profitgrowth_{t,t+1}$ (perc. pt. change)	92	-0.84	92	-0.63	91	-1.93
	$profitlevel$ at time *t+1*	98	-0.99	98	-1.15	98	-1.72
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	50	-0.25	50	-0.36	49	-0.11
	$profitlevel$ at time *t+2*	52	0.6	52	1.02	52	-2.68
	$profitgrowth_{t+2,t+3}$ (perc. pt. change)	38	-0.42	37	-0.45	36	-1.93
	$profitlevel$ at time *t+3*	41	-3.12*	41	-2.18	41	-3.43
2006	$profitlevel$ at time t	217	-1.17	217	-0.6	216	1
	$profitgrowth_{t,t+1}$ (perc. pt. change)	93	0.12	91	0.27	90	2.08
	$profitlevel$ at time *t+1*	93	-0.42	93	0.22	92	0.87
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	62	1.76*	62	1.31*	65	0.49
	$profitlevel$ at time *t+2*	68	0.7	68	1.05	68	4.18
	$profitgrowth_{t+2,t+3}$ (perc. pt. change)	44	0.8	44	0.8	44	-0.24
	$profitlevel$ at time *t+3*	45	5.68*	45	6.48*	45	5.77*
2007	$profitlevel$ at time t	243	0.41	242	0.76	243	0.71
	$profitgrowth_{t,t+1}$ (perc. pt. change)	126	0.42	128	0.03	126	0.35
	$profitlevel$ at time *t+1*	130	-0.24	130	-0.09	129	-1.16
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	80	-0.34	80	-0.44	81	-0.26
	$profitlevel$ at time *t+2*	85	0.1	85	1.08	85	-1.19
	$profitgrowth_{t+2,t+3}$ (perc. pt. change)	64	1.37	64	1.08	65	1.47
	$profitlevel$ at time *t+3*	67	2.79	67	3.82	67	3.38
2008	$profitlevel$ at time t	822	-0.83	822	-0.17	822	-0.55
	$profitgrowth_{t,t+1}$ (perc. pt. change)	401	0.01	402	-0.16	397	-0.64
	$profitlevel$ at time *t+1*	418	0.38	418	0.97	419	0.49
	$profitgrowth_{t+1,t+2}$ (perc. pt. change)	312	-0.06	316	0.11	313	0.39
	$profitlevel$ at time *t+2*	321	-0.54	321	0.34	321	1.24
2009	$profitlevel$ at time t	357	-0.28	357	0.16	355	0.55
	$profitgrowth_{t,t+1}$ (perc. pt. change)	149	-0.27	150	-0.2	150	0.37
	$profitlevel$ at time *t+1*	161	1.78	161	1.72	159	-0.45
2010	$profitlevel$ at time t	569	0.44	569	0.01	570	0.28

Notes: Nearest neighbor propensity score matching was done using Stata 11 and the psmatch2 package developed by Leuven and Sianesi (2003). The common support condition is imposed on the matching procedure, implying that treated firms with a propensity score higher than the maximum of the non-treated control group and lower than the minimum of the control group are taken off support and are not matched to a peer. The balancing property condition, requiring absence of statistically significant differences between the means of the matching characteristics of the firms in the treatment and the control group is fully satisfied in all instances. The propensity score for the 2005-cohort is estimated with the control variable for sectors included as a numerical variable instead of a categorical variable, since the model presented in equation 5.9 does not converge for this cohort. The bias-corrected 95% confidence intervals are generated by bootstrapping the ATT with 200 replications. * $p < 0.05$

Table 5.6: The effect of exporting on profitability in wholesale & retail trading sectors in the Netherlands

The main conclusion we draw from the propensity score matching procedures discussed in this section is in line with the previously mentioned empirical regularities.

Empirical regularity 5. *Export starters do not convert to a different profitability growth path compared to continuing non-exporters*

We find a few cases where the profit rates of exporting firms are lower or higher than that of the control group. However, the majority of the cases

yields no significant difference between the profit rates of export starters and continuing non-exporters.

5.7 Conclusion

Compiling an extensive panel data set covering firms in the Netherlands over the years 2002-2010, we investigate the relationship between trade status, firm size and profitability. We proceed in three steps. We start by deriving empirically testable predictions regarding the relationship between profit margins and exporting from existing well-established theoretical models by making profit margins an explicit parameter. We then proceed with the empirical analysis by establishing the relationship between exporting and profitability, irrespective of the direction of causality, by means of regression analysis and by employing four different profit measures. Ultimately we resort to propensity score matching to investigate whether firms entering foreign markets convert to a different profitability path compared to firms that persist in their focus on domestic markets.

From the theoretical model of Egger and Kreickemeier (2012) we derive the hypothesis that profit margins of exporting firms are lower than or equal to that of non-exporting firms. In addition, we hypothesize that profit margins increase in productivity of exporting firms. We also investigate the possibility to derive testable hypothesis from the Melitz (2003) model. However, this proved to be not feasible, since depending on the distribution of profit margins along the productivity dimension for different trade statuses every relationship between profit rates and export status is possible. The empirical findings are particularly consistent with the Egger and Kreickemeier (2012) framework and align less well with the Melitz (2003) model.

The results from the regression analysis suggest that internationalization of firm activities is not heavily correlated with profitability. We find largely insignificant or significantly negative trade premia of small magnitude, but never positive and significant trade premia, which aligns with earlier empirical research and the theoretical expectations. The negative trade premia seem to be tied mainly to exporting rather than to importing and particularly to micro-, small- and medium-sized firms. The choice of profit rate measure does not heavily affect the findings regarding the relationship with trade status. Gross profits per employee do return slightly deviating profitability premia compared to the other three profitability measures employed, which generally yield mutually consistent results. The results concerning per em-

ployee profits indicate that the 'scale effect' of exporting could be positive or insignificant, while the 'margin effect' is negative or insignificant based on the gross margin and net margin results. Regarding the control variables our findings indicate that particularly productivity is an important indicator for firm-level profitability in line with theoretical expectations. In addition, we show that profit rates tend to increase in the share of exports in total sales.

Exporter churning might also provide a partial explanation for the negative and insignificant profitability premia for exporters. If a relatively large fraction of firms starts exporting or switches trade status frequently, the relative impact of the fixed costs associated with an export start will be high, which can drive down profits relative to non-exporters.

Using propensity score matching we analyze whether export starters convert to a different profitability growth path relative to firms that keep focus on domestic markets. The results provide support to the theoretical hypothesis that exporting either decreases profitability or does not affect profit margins. We find little evidence suggesting that export starters convert to a different profitability path relative to continuing non-traders. Although there is some evidence suggesting that export starters in manufacturing sectors materialize higher profit rates in the longer run, that is, two to three years after foreign market entry. The results indicate that new exporters seem to be willing to fully explore the possibilities that foreign markets provide even at the cost of (temporarily) materializing lower profit rates. In addition, the export share in total sales could increase over time relative to the first years of foreign market entry. Since the export share of sales is shown to correlate positively with profitability, this could drive up profit margins in the longer run, albeit through a different mechanism.

An interesting avenue for future research would be to further explore the profitability path of export starters and investigate whether they convert to a different profitability path in the longer run, say, three to five years, when export skills are fully internalized by the export starter. The data requirements tied to investigating this hypothesis are however considerable, since a sufficiently sizeable balanced panel of export starters and continuing non-exporters over a period of at least five to seven years would be needed. An important note we should finally make is that it is well established that internationalization positively affects the probability of firm survival. This implies that the discounted value of future profits is likely to be higher for trading firms compared to non-traders, irrespective of the insignificant premia we find in our analysis regarding annual profit rates. Unfortunately we are unable to factor in the impact of trading on firm survival in the

relationship between exporting and profitability at this point. This would also be an interesting line of research to further explore in the future.

5.A Appendix

5.A.1 Appendix: Profit margins in the Melitz (2003) model

Profit margins are not explicitly considered in the Melitz (2003) model, but they can be derived from the information provided in the model. The profit margin $\frac{\pi(\varphi)}{r(\varphi)}$ of non-exporting firms in the Melitz (2003) model can be derived from equations 4 and 5 in Melitz (2003, p. 1699):

$$\frac{\pi_d(\varphi)}{r_d(\varphi)} = \frac{\frac{R}{\sigma}(P\rho\varphi)^{\sigma-1} - f}{R(P\rho\varphi)^{\sigma-1}} = \frac{1}{\sigma} - \frac{f}{R(P\rho\varphi)^{\sigma-1}} = \frac{1}{\sigma} - \frac{f}{r_d(\varphi)} \tag{5.10}$$

Subscript d denotes variables regarding domestic firms. R represents the total output of the economy, P the price level, r firm-level revenues, π profits, $f > 0$ the fixed cost of production, φ firm-level productivity and ρ the CES utility function love-of-variety parameter. Parameter $\sigma \equiv \frac{1}{1-\rho} > 1$ represents the elasticity of substitution between any two goods. In the Melitz (2003) model the assumption is that firms that operate only in domestic markets always have a lower productivity than firms operating both in domestic and in foreign markets. The profit margin increases in the productivity level. The derivative of the profit margin function with respect to productivity in equation 5.11 shows this. Similarly, the markup increases in firm size, measured by firm-level revenue, as function 5.12 shows.

$$\frac{\partial \frac{\pi_d(\varphi)}{r_d(\varphi)}}{\partial \varphi} = \frac{-f * -(\sigma - 1)}{R(P\rho)^{\sigma-1}\varphi^{\sigma}} = \frac{f * (\sigma - 1)}{R(P\rho)^{\sigma-1}\varphi^{\sigma}} > 0 \tag{5.11}$$

$$\frac{\partial \frac{\pi_d(\varphi)}{r_d(\varphi)}}{\partial r_d(\varphi)} = \frac{-f * (-1)}{r_d(\varphi)^2} = \frac{f}{r_d(\varphi)^2} > 0 \tag{5.12}$$

A firm at the marginal productivity level φ_x^* required to export, has a profit margin defined by equations 15 and 16 in Melitz (2003, p. 1708-1709):

$$\begin{aligned} \frac{\pi_e(\varphi)}{r_e(\varphi)} &= \frac{\pi_d(\varphi) + n * \pi_x(\varphi)}{r_d(\varphi) + n * r_x(\varphi)} \\ &= \frac{\frac{r_d(\varphi)}{\sigma} - f + n\left(\frac{\tau^{1-\sigma} r_d(\varphi)}{\sigma} - f_x\right)}{(1 + n\tau^{1-\sigma}) r_d(\varphi)} = \frac{1}{\sigma} - \frac{f + n f_x}{(1 + n\tau^{1-\sigma}) r_d(\varphi)} \end{aligned} \tag{5.13}$$

Where $f_x > 0$ denotes the per-period fixed cost of exporting, $\tau > 1$ the per-unit iceberg variable trade costs and $n \geq 1$ equals the number of countries the firm exports to. The export profits of a firm with exactly the marginal productivity level φ_x^* equals $\pi_x(\varphi_x^*) = 0$. In addition, in order to induce the partitioning of firms into domestic and exporting firms Melitz (2003) makes the additional assumption that $\tau^{\sigma-1} f_x > f$. This implies that when a firm has exactly the marginal productivity level for exporting φ_x^*, its profit margin will equal:

$$\frac{\pi_e(\varphi_x^*)}{r_e(\varphi_x^*)} = \frac{\pi_d(\varphi_x^*) + n * 0}{r_d(\varphi_x^*) + n * r_x(\varphi)} = \frac{1}{1 + n\tau^{1-\sigma}} \left[\frac{1}{\sigma} - \frac{f}{r_d(\varphi_x^*)} \right] \tag{5.14}$$

In other words, the profit margin of the marginal exporter will be lower than the profit margin of a domestic firm with productivity level $\breve{\varphi} = \varphi_x^* - \epsilon$, where ϵ is positive, but arbitrarily small and approaching zero. The profit margin at $\breve{\varphi}$ is larger than the profit margin at φ_x^* since $\tau > 1$ as equation 5.15 shows, and $\lim_{\epsilon \to 0} r_d(\varphi_x^* \pm \epsilon) = r_d(\varphi_x^*)$.

$$\frac{1}{\sigma} - \frac{f}{r_d(\breve{\varphi})} > \frac{1}{1 + n\tau^{1-\sigma}} \left[\frac{1}{\sigma} - \frac{f}{r_d(\varphi_x^*)} \right] \tag{5.15}$$

An exporting firm with productivity level $\widehat{\varphi} = \varphi_x^* + \epsilon$ will also have a lower profit margin than the domestic firm with productivity level $\breve{\varphi} = \varphi_x^* - \epsilon$. This is due to the restriction $\tau^{\sigma-1} f_x > f$, as is derived in equation 5.16, and due to the limit on the revenue. In other words, in the Melitz (2003) model, the profit margin is lower for the exporting firm with productivity just above the threshold productivity required to export in comparison to domestic firms with a productivity level just below the threshold φ_x^*.

$$\frac{1}{\sigma} - \frac{f}{r_d(\breve{\varphi})} > \frac{1}{\sigma} - \frac{f + nf_x}{(1 + n\tau^{1-\sigma}) r_d(\widehat{\varphi})}$$

$$\rightarrow \frac{1}{\sigma} - \frac{f}{r_d(\varphi_x^*)} > \frac{1}{\sigma} - \frac{f + nf_x}{(1 + n\tau^{1-\sigma}) r_d(\varphi_x^*)}$$

$$f < \frac{(f + f_x)}{(1 + \tau^{1-\sigma})}$$

$$f[1 - \frac{1}{(1 + \tau^{1-\sigma})}] < \frac{f_x}{(1 + \tau^{1-\sigma})}$$

$$f < f_x \tau^{\sigma-1} \tag{5.16}$$

Beyond the threshold productivity level for exporting, the profit margin of exporting firms increases in both productivity and firm size, which is demonstrated by the derivatives of exporters profit margin with respect to productivity in equation 5.17 and with respect to total revenue in equation 5.18.

$$\frac{\partial \frac{\pi_e(\varphi)}{r_e(\varphi)}}{\partial \varphi} = \frac{-(f+nf_x)*-(\sigma-1)}{R(P\rho)^{\sigma-1}\varphi^{\sigma}} = \frac{(f+nf_x)(\sigma-1)}{R(P\rho)^{\sigma-1}\varphi^{\sigma}} > 0 \tag{5.17}$$

$$\frac{\partial \frac{\pi_e(\varphi)}{r_e(\varphi)}}{\partial r_e(\varphi)} = \frac{-(f+nf_x)(-1)}{r_d(\varphi)^2} = \frac{f+nf_x}{r_d(\varphi)^2} > 0 \tag{5.18}$$

Figure 5.1 in the main text summarizes the findings of this appendix in a graphical form.

5.A.2 Appendix: Profit margins in the Egger and Kreickemeier (2012) model

The Melitz (2003) model does not take in to account the empirically well established fact that exporters generally pay higher wages than domestic firms. Naturally, this could affect profit margin differences between exporting and domestic firms. In order to analyze the profit margin differences in a theoretical framework that takes these wage differences into account, we employ the Egger and Kreickemeier (2012) model. Analogous to Melitz (2003), in this model the relationship between trade status and profit margins are not considered explicitly. However, profit margins can be derived from the information provided.

The production technology in Egger and Kreickemeier (2012) model requires two types of labor: one manager/owner and many workers. The productivity of the individual determines whether he will become a manager or a worker. Workers are paid a fair wage $\hat{w}$, with the wage depending on the profits of the firm and on a firm-external point of reference, which is defined as the employment share times the average wage. If firm profits increase, unemployment decreases or the average wage increases (ceteris paribus), the fair wage increases. In doing so, firm profits are shared between managers and workers.

$$\hat{w} = \left(\frac{r(\varphi)}{\sigma}\right)^{\theta} \left[(1-U)\,\bar{w}\right]^{1-\theta} \tag{5.19}$$

Where $r(\varphi)$ equals total firm revenue with productivity level φ, ρ equals the CES love-of-variety parameter in autarky, $\sigma \equiv 1/(1-\rho) > 1$ the demand

elasticity, $\theta \in (0,1)$ a rent sharing parameter, U the unemployment level and $\bar{w}$ the average wage of employed production workers.

The revenue of domestic firms with productivity level $\varphi^* < \varphi < \varphi_x^*$ equals:

$$r_d(\varphi) = \frac{Y}{M}(\frac{c(\varphi)}{\rho})^{1-\sigma} \tag{5.20}$$

Where φ^* is the marginal productivity level required to operate, φ_x^* the marginal productivity level required to export, Y total output of the economy, M the number of firms/managers, and $c(\varphi) = w(\varphi)/\varphi$ the marginal cost. Constant markup over marginal cost pricing is assumed. In other words, the firm specific price equals: $p(\varphi) = c(\varphi)/\rho$. The quantity sold at each productivity level equals:

$$q_d(\varphi) = \frac{Y}{M}p(\varphi)^{-\sigma} = \frac{Y}{M}(\frac{c(\varphi)}{\rho})^{-\sigma}$$

Due to this pricing mechanism, the profits of the domestic firm equal:

$$\pi_d(\varphi) = r_d(\varphi) - c_d(\varphi)q_d(\varphi) = (1-\rho)\, r_d(\varphi) = \frac{r_d(\varphi)}{\sigma}$$

Therefore, the gross profit margin of domestic firms is always constant and does not depend on the productivity level of the firm, as equation 5.21 shows.

$$\frac{\pi_d(\varphi)}{r_d(\varphi)} = \frac{1}{\sigma} \tag{5.21}$$

The calculation of the gross profit margin of exporting firms is slightly more complicated. Therefore, we choose a stepwise approach. First, the total revenue of an exporting firm equals:

$$r_E = \Omega r^e(\varphi) = \Omega^{1-\theta\eta} r_d(\varphi) \tag{5.22}$$

Where subscript e refers to the exporting firm, $r^e(\varphi)$ equals the domestic revenues of the exporting firm, $\tau > 1$ represents per-unit iceberg variable trade costs and $1 < \Omega \equiv 1+\tau^{1-\sigma} \leq 2$. Parameter $\eta \equiv (\sigma-1)/\left[1+\theta(\sigma-1)\right]$ depends on the parameters discussed above and $r_d(\varphi)$ refers to the revenue of a domestic firm with productivity level φ as defined in equation 5.20. The total profits of an exporter thus equal:

$$\pi_E(\varphi) = \frac{\Omega r^e(\varphi)}{\sigma} - s = \frac{\Omega^{1-\theta\eta} r_d(\varphi)}{\sigma} - (1-U)\,\bar{w}$$

$$\pi_E(\varphi) = \frac{\Omega^{1-\theta\eta} r_d(\varphi)}{\sigma} - \frac{\rho Y}{L} = \frac{\Omega^{1-\theta\eta} r_d(\varphi)}{\sigma} - \frac{(1-\rho)Y}{(1+\chi)M}\left(\frac{k-\eta}{k}\right) \quad (5.23)$$

Where s refers to the fixed cost of exporting, which need to equal the average expected wage based on equation (8') of Egger and Kreickemeier (2012, p. 190). The average expected wage is $(1-U)\,\bar{w} = \frac{\rho Y}{L}$ and based on the modified labor indifference condition we have $\frac{\rho Y}{L} = \frac{(1-\rho)Y}{(1+\chi)M}\left(\frac{k-\eta}{k}\right)$ (Egger and Kreickemeier, 2012, p. 191). The parameter k hinges on the Pareto-distribution of productivity φ, with $k > \eta$. The share of exporting firms out of all firms is measured by $\chi \geq 0$. Taking the ratio of exporter profit over revenue and accounting for equation 5.20, we arrive at the following solution for the gross profit margin of exporters:

$$\frac{\pi_E(\varphi)}{r_E(\varphi)} = \frac{1}{\sigma} - \frac{\frac{(1-\rho)Y}{(1+\chi)M}\left(\frac{k-\eta}{k}\right)}{\Omega^{1-\theta\eta} r_d(\varphi)} = \frac{1}{\sigma} - \frac{\frac{(1-\rho)Y}{(1+\chi)M}\left(\frac{k-\eta}{k}\right)}{\Omega^{1-\theta\eta}\frac{Y}{M}(\frac{w_d(\varphi)/\varphi}{\rho})^{1-\sigma}}$$

All the terms after the minus-sign in this equation are positive. It is thus immediately obvious that the profit margin of exporting firms is lower than the profit margin of domestic firms, irrespective of the individual productivity level of the exporter.

Based on equation 6 of Egger and Kreickemeier (2012) we have $w_d(\varphi) = \left(\frac{\varphi}{\tilde{\varphi}}\right)^{\theta\eta} w_d(\tilde{\varphi})$. In addition, the calculations presented in Egger and Kreickemeier (2012, p. 189-190) and appendix A allow us to define $w_d(\tilde{\varphi}) = \frac{\rho r_d(\tilde{\varphi})}{l_d(\tilde{\varphi})} = \frac{\rho r_d(\tilde{\varphi})}{q_d(\tilde{\varphi})/\tilde{\varphi}} = \rho\tilde{\varphi}$ With these additional definitions, the gross profit margin of exporters is defined in equation 5.24 to equal:

$$\begin{aligned}\frac{\pi_d(\varphi)}{r_d(\varphi)} &= \frac{1}{\sigma} - \frac{\frac{(1-\rho)}{(1+\chi)}\left(\frac{k-\eta}{k}\right)}{\Omega^{1-\theta\eta}(\frac{w_d(\varphi)/\varphi}{\rho})^{1-\sigma}} \\ &= \frac{1}{\sigma} - (1-\rho)(1+\chi)^{-1}\left(\frac{k-\eta}{k}\right)\Omega^{\theta\eta-1}\tilde{\varphi}^{(1-\theta\eta)(\sigma-1)}\varphi^{(\theta\eta-1)(\sigma-1)} \quad (5.24)\end{aligned}$$

For notational purposes we define:

$$\lambda = (1-\rho)(1+\chi)^{-1}\left(\frac{k-\eta}{k}\right)\Omega^{\theta\eta-1}\tilde{\varphi}^{(1-\theta\eta)(\sigma-1)}\varphi^{(\theta\eta-1)(\sigma-1)}$$

For exporters the profit margin increases in productivity. However, profit margins remain below the profit margin of domestic firms. Unit production

costs decrease with increasing productivity. Due to the constant markup pricing, the price per unit will therefore also decrease and revenue increases. This is demonstrated by the derivative of the gross profit margin with respect to productivity. The derivative 5.25 is positive, since $(\theta\eta - 1) = \frac{\theta(\sigma-1)}{1+\theta(\sigma-1)} - 1 = \frac{-1}{1+\theta(\sigma-1)} < 0$.

$$\frac{\partial \frac{\pi_e(\varphi)}{r_e(\varphi)}}{\partial \varphi} = -(\theta\eta - 1)(\sigma - 1)\varphi^{(\theta\eta-1)(\sigma-1)-1} \\ * (1-\rho)(1+\chi)^{-1}\left(\frac{k-\eta}{k}\right)\Omega^{\theta\eta-1}\tilde{\varphi}^{(1-\theta\eta)(\sigma-1)} > 0 \quad (5.25)$$

Similarly, if the revenue of the firm increases, also its profit margin will increase as equation 5.26 shows.

$$\frac{\partial \frac{\pi_e(\varphi)}{r_e(\varphi)}}{\partial r_d(\varphi)} = -(-1)\frac{\frac{(1-\rho)Y}{(1+\chi)M}\left(\frac{k-\eta}{k}\right)}{\Omega^{1-\theta\eta} r_d(\varphi)^2} > 0 \quad (5.26)$$

Figure 5.2 in the main text summarizes the findings of this appendix in a graphical form.

5.A.3 Appendix: Additional tables

2002	2003	2004	2005	2006	2007	2008	2009	2010
continuing non-trader								
NT	NT	$NT*$ $prof_t$	NT $prof_{t+1}$ $prof.gr_{t,t+1}$	NT $prof_{t+2}$ $prof.gr_{t+1,t+2}$	NT $prof_{t+3}$ $prof.gr_{t+2,t+3}$			
	NT	NT	$NT*$ $prof_t$	NT $prof_{t+1}$ $prof.gr_{t,t+1}$	NT $prof_{t+2}$ $prof.gr_{t+1,t+2}$	NT $prof_{t+3}$ $prof.gr_{t+2,t+3}$		
		NT	NT	$NT*$ $prof_t$	NT $prof_{t+1}$ $prof.gr_{t,t+1}$	NT $prof_{t+2}$ $prof.gr_{t+1,t+2}$	NT $prof_{t+3}$ $prof.gr_{t+2,t+3}$	
			NT	NT	$NT*$ $prof_t$	NT $prof_{t+1}$ $prof.gr_{t,t+1}$	NT $prof_{t+2}$ $prof.gr_{t+1,t+2}$	NT $prof_{t+3}$ $prof.gr_{t+2,t+3}$
				NT	NT	$NT*$ $prof_t$	NT $prof_{t+1}$ $prof.gr_{t,t+1}$	NT $prof_{t+2}$ $prof.gr_{t+1,t+2}$
					NT	NT	$NT*$ $prof_t$	NT $prof_{t+1}$ $prof.gr_{t,t+1}$
						NT	NT	$NT*$ $prof_t$
export starter								
NT	NT	$EXP*$ $prof_t$	EXP $prof_{t+1}$ $prof.gr_{t,t+1}$	EXP $prof_{t+2}$ $prof.gr_{t+1,t+2}$	EXP $prof_{t+3}$ $prof.gr_{t+2,t+3}$			
	NT	NT	$EXP*$ $prof_t$	EXP $prof_{t+1}$ $prof.gr_{t,t+1}$	EXP $prof_{t+2}$ $prof.gr_{t+1,t+2}$	EXP $prof_{t+3}$ $prof.gr_{t+2,t+3}$		
		NT	NT	$EXP*$ $prof_t$	EXP $prof_{t+1}$ $prof.gr_{t,t+1}$	EXP $prof_{t+2}$ $prof.gr_{t+1,t+2}$	EXP $prof_{t+3}$ $prof.gr_{t+2,t+3}$	
			NT	NT	$EXP*$ $prof_t$	EXP $prof_{t+1}$ $prof.gr_{t,t+1}$	EXP $prof_{t+2}$ $prof.gr_{t+1,t+2}$	EXP $prof_{t+3}$ $prof.gr_{t+2,t+3}$
				NT	NT	$EXP*$ $prof_t$	EXP $prof_{t+1}$ $prof.gr_{t,t+1}$	EXP $prof_{t+2}$ $prof.gr_{t+1,t+2}$
					NT	NT	$EXP*$ $prof_t$	EXP $prof_{t+1}$ $prof.gr_{t,t+1}$
						NT	NT	$EXP*$ $prof_t$

Notes: NT denotes non-trading, EXP denotes exporting. $*$ marks the year t of treatment. The years of measurement of the average treatment effect on the treated (ATT) are italicized. The outcome variables employed for measurement of the ATT are presented below the trade status in the relevant years, with $prof_t$ denoting the profit level in year t and $prof.gr_{t,t+1}$ denoting profit growth from year t to $t+1$.

Table 5.7: Definition of cohorts for PSM-analysis of export starters

	manufacturing sectors					wholesale and retail trading sectors				
	all	micro	small	medium	large	all	micro	small	medium	large
trade dummies										
non-trader	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
only exports	-0.005**	-0.008**	-0.000	-0.006	-0.029	-0.002	-0.001	-0.001	0.004	-0.009
	(-3.20)	(-3.18)	(-0.17)	(-1.03)	(-1.41)	(-1.08)	(-0.27)	(-0.61)	(0.68)	(-0.26)
only imports	-0.002*	-0.003	-0.002	0.001	-0.010	-0.002	-0.001	-0.004**	0.007	0.010
	(-2.11)	(-1.72)	(-1.12)	(0.19)	(-0.71)	(-1.83)	(-0.60)	(-2.72)	(1.24)	(0.26)
two-way trader	-0.005***	-0.007**	-0.002	-0.001	-0.027	-0.003**	-0.002	-0.006**	0.006	0.019
	(-3.70)	(-3.06)	(-1.26)	(-0.13)	(-1.75)	(-2.79)	(-1.04)	(-2.97)	(1.07)	(0.44)
control variables										
export share	0.016**	-0.002	0.009	0.049**	0.184	0.006	-0.003	0.018*	0.001	-0.168
	(2.77)	(-0.20)	(1.14)	(3.08)	(1.36)	(1.23)	(-0.47)	(2.29)	(0.06)	(-0.75)
firm size (FTE, log)	0.069***	0.081***	0.059***	0.042***	0.021	0.053***	0.059***	0.047***	0.036***	-0.007
	(47.78)	(34.00)	(25.96)	(5.99)	(1.02)	(42.00)	(30.82)	(19.56)	(4.50)	(-0.41)
dom. controlled	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
foreign controlled	0.008	0.011	0.008	0.007	-0.006	-0.000	-0.009	0.004	0.007	-0.010
	(1.88)	(1.19)	(1.43)	(0.81)	(-0.28)	(-0.03)	(-1.14)	(1.09)	(0.81)	(-0.59)
labor prod. (log)	0.111***	0.127***	0.101***	0.066***	0.027**	0.083***	0.089***	0.079***	0.061***	0.011
	(71.82)	(52.91)	(41.44)	(10.81)	(2.96)	(64.83)	(52.86)	(33.43)	(7.65)	(1.42)
No. of observations	269,362	144,558	109,727	13,830	1,247	214,796	138,327	68,684	7,097	688
R^2 - *within*	0.285	0.294	0.293	0.233	0.442	0.264	0.270	0.264	0.209	0.178
R^2 - *between*	0.011	0.024	0.100	0.089	0.003	0.051	0.074	0.167	0.104	0.006
R^2 - *overall*	0.030	0.038	0.160	0.106	0.018	0.075	0.095	0.204	0.127	0.026

Notes: All regressions include a full set of year-sector dummies and fixed effects at firm level. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.8: Relative net profit margin premia (the Netherlands, fixed effects panel regressions, 2002-2010)

	manufacturing sectors					wholesale and retail trading sectors				
	all	micro	small	medium	large	all	micro	small	medium	large
trade dummies										
non-trader	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
only exports	-0.008***	-0.008*	-0.003	-0.015	-0.084	-0.007**	-0.005	-0.008*	-0.007	-0.057
	(-3.96)	(-2.24)	(-1.15)	(-1.55)	(-1.79)	(-3.15)	(-1.78)	(-2.45)	(-0.69)	(-0.91)
only imports	-0.005**	-0.005*	-0.003	-0.006	-0.024	-0.007***	-0.006**	-0.005	-0.006	-0.024
	(-3.17)	(-2.04)	(-1.24)	(-0.73)	(-0.95)	(-4.65)	(-2.87)	(-1.89)	(-0.72)	(-0.33)
two-way trader	-0.008***	-0.007*	-0.004	-0.020*	-0.044	-0.013***	-0.013***	-0.011***	-0.003	-0.023
	(-3.93)	(-1.97)	(-1.53)	(-2.35)	(-1.63)	(-6.80)	(-5.05)	(-3.59)	(-0.28)	(-0.30)
control variables										
export share	0.030***	0.004	0.033***	0.041*	0.084	-0.008	-0.007	-0.001	-0.006	-0.063
	(4.33)	(0.31)	(3.32)	(2.53)	(1.61)	(-1.39)	(-0.88)	(-0.12)	(-0.31)	(-0.47)
firm size (FTE, log)	0.047***	0.065***	0.030***	0.032***	0.009	0.057***	0.063***	0.049***	0.056***	0.034
	(25.04)	(17.80)	(9.67)	(3.37)	(0.31)	(30.01)	(20.39)	(14.18)	(5.52)	(1.17)
dom. controlled	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
foreign controlled	0.012*	0.024	0.006	0.014	-0.004	0.009*	0.005	0.015**	0.016	0.024
	(2.19)	(1.92)	(0.75)	(1.67)	(-0.14)	(2.10)	(0.48)	(2.88)	(1.61)	(0.96)
labor prod. (log)	0.104***	0.125***	0.086***	0.070***	0.033***	0.110***	0.122***	0.098***	0.076***	0.037**
	(59.49)	(47.07)	(33.14)	(12.19)	(3.78)	(65.55)	(54.25)	(31.96)	(12.07)	(3.32)
No. of observations	266,520	142,162	109,301	13,812	1,245	213,518	137,193	68,545	7,094	686
R^2 - *within*	0.176	0.155	0.205	0.210	0.351	0.219	0.200	0.264	0.307	0.341
R^2 - *between*	0.002	0.000	0.028	0.084	0.073	0.004	0.008	0.123	0.144	0.032
R^2 - *overall*	0.002	0.001	0.082	0.117	0.093	0.020	0.017	0.194	0.201	0.100

Notes: All regressions include a full set of year-sector dummies and fixed effects at firm level. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.9: Relative return on assets premia (the Netherlands, fixed effects panel regressions, 2002-2010)

	manufacturing sectors					wholesale and retail trading sectors				
	all	micro	small	medium	large	all	micro	small	medium	large
trade dummies										
non-trader	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
only exports	-515.546**	-886.631**	-22.634	-573.621	-1815.836	-511.339*	-636.691*	-142.324	-1092.674	-8920.504
	(-3.12)	(-3.20)	(-0.11)	(-0.94)	(-0.71)	(-2.26)	(-2.10)	(-0.41)	(-1.21)	(-1.50)
only imports	-175.208	-291.999	-23.593	-462.473	974.935	-197.577	-185.351	-106.724	-753.026	-12544.983
	(-1.54)	(-1.69)	(-0.15)	(-0.73)	(0.52)	(-1.71)	(-1.31)	(-0.53)	(-1.13)	(-1.70)
two-way trader	-181.327	-78.548	-35.233	-1294.702	-3256.853	-280.766	-57.864	-485.841	-630.935	-11141.696
	(-1.09)	(-0.28)	(-0.16)	(-1.85)	(-1.76)	(-1.51)	(-0.23)	(-1.68)	(-0.79)	(-1.38)
control variables										
export share	829.641	-779.890	1214.827	3699.775	5602.568	-1982.706*	-2807.367*	-360.304	2870.545	18411.557
	(1.07)	(-0.54)	(1.17)	(1.57)	(0.80)	(-2.36)	(-2.32)	(-0.28)	(0.80)	(1.31)
firm size (FTE, log)	-1008.612***	-1717.211***	-987.365***	-1528.525	-6123.684	84.438	-586.861	78.190	165.317	-5419.311
	(-6.37)	(-6.88)	(-3.84)	(-1.57)	(-1.69)	(0.40)	(-1.94)	(0.20)	(0.12)	(-1.61)
dom. controlled	reference	reference	reference	reference	reference	reference	reference	reference	reference	reference
foreign controlled	348.086	1313.471	-524.750	796.355	1405.490	1126.807*	2147.512*	814.504	2427.024	995.267
	(0.61)	(0.83)	(-0.59)	(0.89)	(0.64)	(2.13)	(2.08)	(1.22)	(1.43)	(0.37)
labor prod. (log)	10497.125***	11748.085***	8868.796***	9272.986***	7127.940***	14549.537***	14815.894***	14128.063***	12594.467***	6132.424***
	(66.01)	(51.02)	(37.47)	(13.99)	(3.35)	(71.13)	(59.38)	(35.32)	(12.90)	(3.35)
No. of observations	269,594	145,404	109,289	13,685	1,216	212,476	137,040	67,833	6,930	673
R^2 - *within*	0.241	0.269	0.202	0.189	0.367	0.302	0.310	0.278	0.242	0.207
R^2 - *between*	0.191	0.224	0.196	0.132	0.002	0.291	0.301	0.339	0.249	0.139
R^2 - *overall*	0.210	0.229	0.216	0.154	0.041	0.317	0.313	0.367	0.246	0.145

Notes: All regressions include a full set of year-sector dummies and fixed effects at firm level. t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.10: Relative gross profit per employee premia (the Netherlands, fixed effects panel regressions, 2002-2010)

Chapter 6

Free lunch or vital support? Export promotion in the Netherlands

6.1 Introduction

The merits of export promotion efforts by governments have been fiercely debated over the years and no consensus has been reached thus far. Economists generally take a rather skeptical attitude towards the public provision of this type of assistance, or, as Van Bergeijk (2009, pg. 89) phrases it: *"the provision and/or involvement of the government is rather dubious."* Compelling empirical evidence for self-selection into exporting raises the question which group of potential exporters a government might aim to support when developing export promotion programs. Participation criteria for these programs usually do not include productivity, even though the empirical evidence suggests that this would be an informative indicator of the export potential of the firm. Provided that firms self-select into exporting, governments should ideally focus on supporting the group of non-exporters that already possesses the preferable set of characteristics attributed to exporters, but would not engage in exporting without the support of an export promotion program. Risk aversion or perceived barriers to foreign market entry of individual entrepreneurs provide an explanation for the existence of firms that are ready for an export start in terms of self-selection, but stay focused on domestic markets. Entering an export promotion program could reduce the fixed costs of foreign market entry or reduce the perceived risk of internationalization by just enough to give a firm that last nudge into foreign markets.

In that case, government support is justified, providing the final push into exporting, while the firm already inherently possessed the necessary characteristics. In all other cases such programs would support firms that do not need assistance because they would otherwise have internationalized their activities without government support, or firms participate that do not possess the preferable set of characteristics, which would imply that chances are substantial that they fail on international markets and fall back to serving solely the domestic market eventually. In that case, the government would tackle an existing market failure and replace it with a government failure (Van Bergeijk, 2009).

We analyze the Dutch export promotion program prepare2start, which aims to support small businesses in the early stages of their export endeavors.[1] In the setting of a social cost-benefit analysis, de Nooij, van den Berg, Garretsen, and de Groot (2010) present evidence suggesting that this program adds to Dutch welfare. The net positive welfare effect mainly stems from three sources of benefits outweighing the (mainly public) cost; (1) productivity gains, (2) additional exports and (3) additional consumer surplus stemming from variety effects. Program participants were asked to what extent their export decision hinged upon their participation in the export promotion program, separating between participants that start exporting earlier than they would have done without support from the program and participants that indicate that they would not have exported altogether or less than they export with support from the program (Van Elk, Overweel, and Prince, 2007). The self-reported additivity of exports served as the foundation for the calculation of the additional exports generated through program participation. Since the assumptions regarding the additivity of exports generated are thus derived from subjective and possibly biased information we aim to evaluate to what extent the program generated additional exports drawing solely on objective micro-data sources. We contribute to the still relatively small literature dealing with the impact of governmental export promotion instruments on export performance employing firm-level micro-data. In addition, we investigate an instrument that specifically targets small businesses, a group that is not frequently considered separately in this respect. Most research on this topic thus far focuses on export promotion in developing countries; an addition to the literature of this study is that it concerns export promotion in an advanced economy.

[1] In earlier years the program was denoted "Programma Starters op Buitenlandse Markten" or "Program Starters on Foreign Markets". The general setup of the program remained unchanged.

We merge participation records from the Dutch export promotion program prepare2start with firm-level micro-data and investigate the effect of export promotion program participation on export performance. The support provided to beginning exporters consists of two elements: (i) supervision of and guidance in the development and deployment of an international business plan (which can be considered an immaterial subsidy) and (ii) limited financial support for the execution of specific elements of that plan. The material subsidy amounts to 50 percent of the costs of the subsidizable activities with a maximum of 11,500 euro per project. Some examples of subsidizable activities are product presentation, partner selection, hiring an export manager and trade fair participation. The participating firm needs to put in a considerable effort as well, since it is required to develop an international business plan during program participation and it bears the other 50 percent of the costs of executing subsidizable activities from the plan plus any additional non-subsidizable expenses. The main participation criteria of this program are relatively non-discriminatory; the applicant cannot employ more than 100 employees and the export share in sales cannot exceed 25 percent unless total turnover does not exceed 100,000 euro.[2]

We start by detailing the characteristics of participating firms and their submitted export projects. Employing propensity score matching we investigate whether the export performance of participants significantly differs from that of comparable firms that are at the same stages of export market entry only without support from an export promotion program. We consider three dimensions of export performance; the export value and export share in sales generated by the beginning exporter and the probability of becoming a permanent exporter.

Utilizing propensity score matching techniques, we find no convincing evidence that program participants are able to increase exports more rapidly than their counterparts that are at the same stage of export involvement, but that did not participate in the program. Mean and cumulative exports generated by participants do generally rise in the years after program entry. Export growth, however, does not outpace that of comparable, but unsupported firms. There is some evidence suggesting that export shares in sales rise faster among program entrants, particularly in the first and second year after participation. Furthermore, we present evidence that suggests that the probability of becoming a permanent exporter is higher for participants relative to beginning exporters that did not receive support from the program.

[2]There are no requirements regarding the age of the firm; a new business venture is allowed to participate in the program right away.

We proceed as follows. Section 6.2 discusses the empirical literature on the relationship between export promotion and exports and on perceived export barriers by entrepreneurs. Section 6.3 presents the data regarding participation records and the additional micro-data employed. Section 6.4 introduces the export promotion program prepare2start and its participants. Section 6.5 discusses the empirical results, with the first part detailing the characteristics of program entrants and their export projects and the last part discussing the results from the propensity score matching procedure. Section 6.6 concludes.

6.2 Exporting and export promotion

Several strands of literature are relevant to consider when addressing the impact of export promotion programs on export performance. The aim of most empirical studies is to assess the impact of export promotion agencies or export promotion programs on the probability that firms change their export status from non-exporter to exporter and on the extensive and intensive margins of exports. This analysis is generally performed at two levels of aggregation. At the micro-level by analyzing firm-level data and investigating the impact of specific export promotion activities on the export involvement of individual firms. And at the macro-level, for example by estimating gravity models in which the effect of export promotion is captured by dummy variables accounting for the presence of an agency or foreign representation of one country in the other. In this respect, Moons and Bergeijk (2013) show in a meta-analysis that studies that investigate export promotion agencies as an expression of economic diplomacy are relatively less likely to find a significant effect on aggregate exports compared to studies that use embassies and consulates as an explanatory variable. In addition, the literature on export barriers perceived by small businesses is also relevant to consider.

Governments generally consider international trade to be beneficial for economic growth and welfare. To stimulate firms to engage in international trade many governments establish export promotion agencies. The services provided by these agencies, including export promotion programs, mainly aim at decreasing the fixed costs associated with entering foreign markets (Greenaway and Kneller, 2007a). By doing so, firms for which exporting is not profitable at first are provided with the opportunity to start exporting because the fixed costs associated with an export start are reduced below some break-even point through participation in such a program. Lederman, Olarreaga, and Payton (2010) divides the services offered by export pro-

motion agencies into four categories: (i) country image building through e.g. advertising; (ii) export support, such as exporter training (e.g. through issuing how-to-export manuals), capacity building and assisting in partner selection; (iii) marketing, such as organizing trade shows and missions; (iv) market research. Lederman, Olarreaga, and Payton (2010) accumulate data on virtually all export promotion agencies worldwide to test whether the budget per capita affects country exports. Their findings suggest that a 10% budget increase at the mean leads to export growth in the range of 0.6% to 1%. However, Van Bergeijk (2009); Van Veenstra, Yakop, and Van Bergeijk (2011) show, combining and extending studies of Rose (2007) and Lederman, Olarreaga, and Payton (2010), that separating high and low income countries in the analysis yields a more differentiated picture. Their results indicate that there is no significant effect of export promotion efforts of high income countries on exports to low income countries, but there is a small but significantly negative impact on exports to high income countries.

Since the mid-1990s a vast body of empirical literature has presented compelling evidence suggesting that exporting firms generally perform better on multiple dimensions and that firms seem to self-select into exporting rather than improve performance through learning-by-exporting. The literature shows that exporters are on average larger, more productive, more innovative, more capital-intensive, paying higher wages and have a higher probability of survival than firms focusing on domestic markets. This implies that firms most likely already possess these beneficial characteristics before they start exporting in order to be able to overcome the fixed costs associated with entering foreign markets (see Bernard, Jensen, Redding, and Schott (2011) and Wagner (2012b) for recent surveys of the empirical literature).

In their seminal paper, Roberts and Tybout (1997) present evidence showing that past export experience is the most important predictor of current export status, but that the effect of export experience depreciates fairly quickly. Roberts and Tybout (1997) suggest export promotion policies aimed at the extensive margin (establishing new export relations in terms of products exported or foreign markets served) might be more effective in expanding exports than policies aimed at the intensive margin (increasing the intensity of existing export relations). In a broader perspective, Moons (2012) corroborates this notion through a review of the empirical literature concerning Latin America and the OECD. Alvarez and Crespi (2000); Alvarez (2004) show that Chilean export promotion programs initially have a positive impact on the number of foreign markets that are being served, however, participating in such programs is not shown to unambiguously increase

the probability of becoming a permanent exporter. In a series of empirical papers Volpe Martincus and Carballo (2008, 2010a,b,c); Volpe Martincus, Carballo, and Garcia (2012) consider various dimensions of export performance in multiple Latin-American countries, presenting evidence suggesting that export promotion programs mainly promote exports along the extensive margin, both in terms of the number of products exported and the number of destination countries, and particularly for exports of heterogeneous goods and for smaller firms. The latter finding confirms the hypothesis that smaller firms generally perceive barriers to exporting more strongly than do larger firms.

The success of an export promotion program hinges upon the extent to which it successfully lowers the perceived trade barriers for participants. Leonidou (1995, 2004) reviews the literature on perceived export barriers, focusing on survey research among managers of small businesses. A key point from these literature reviews is that lack of information concerning foreign markets is one of the most important perceived barriers inhibiting the development of export activities. In addition to this, barriers associated with cultural differences, price competition and political and economic conditions of foreign markets frequently appear to frustrate export ambitions of small businesses, even though the extent to which these factors pose an actual barrier to trade are highly firm-specific, depending on managerial and organizational abilities.[3] Suarez-Ortega (2003); Kneller and Pisu (2011) show that trade barriers tend to be lower, the larger the export experience of the firm.

The empirical evidence discussed in this section can be summarized by the notion that export promotion efforts seem to be most effective when they are aimed at smaller firms, exporting heterogeneous goods and increasing exports along the extensive margins (both in terms of entering new export markets and in terms of exporting new products). In addition, the perceived trade barriers are diverse in nature, but are generally found to be more inhibiting to small businesses.

[3]These findings are largely corroborated by the results of an evaluation of another Dutch export promotion program, 2g@there (see PWC (2012)). Survey results show that participating firms generally perceive foreign rules and regulations, competition on foreign markets and cultural and lingual differences to be the most frustrating.

6.3 Data

6.3.1 Export promotion program

We take a closer look at the characteristics of exporters participating in export promotion programs compared to non-traders and unsupported exporters by analyzing participants in an export promotion program called prepare2start. This program is developed by the Dutch government and executed by the Dutch export promotion agency (RVO.nl). The program was first established in 1999 and terminated in 2012.

The participation data concerning the export promotion program were provided by RVO.nl. The data cover the years 2000 to 2010, which is almost the full length of existence of the program.[4] The participation records contain a variety of characteristics of the supported project such as the destination of the export project in terms of country and industry and information about the subsidization of specific activities from the internationalization plan. Over the course of 11 years (2000-2010) a total of 5,787 prepare2start-applications by 4,929 unique firms have been accepted and executed. Repeated participation is thus allowed (even within the same year), but the larger part of the firms, 86%, only participates once. The largest number of executed projects by a single firm is 6, the largest number within one year is 3.

The number of program entries that we can include in the analysis is however smaller. This has four main reasons. First, since the firm-level data cover the years 2002-2010 we will focus on program participation in those years in the empirical analysis, thereby excluding participation records of the years 2000 and 2001. Second, the program is open to firms from any sector, including service sectors. However, since the trade data only contain data regarding goods trade, we confine the analysis to manufacturing and wholesale & retail trading sectors, thereby excluding service sectors. Third, program participation is registered on a different registration number than the registry system employed by Statistics Netherlands for tracking individual firms. Merging participation records to the micro-data panel of Statistics Netherlands is a challenging procedure, since for most years merging could only be done through a third, intermediate registration key. This results in multiple participation records of different firms merging to one unique firm in the Statistics Netherlands records, or vice versa. In order to be absolutely certain that the unit of measurement for our analysis comprises of exactly

[4]The participation records of the year 1999, 551 projects in total, do not include a registry key, which renders them impossible to merge to additional firm-level data.

the same economic activity in both the participation records and the micro-data sets, we only allow the merge for unique firms from the participation records that could be tied uniquely to a single firm in the micro-data from Statistics Netherlands. Fourth, and finally, program participation is not limited to exporting endeavors; also importing and engaging in foreign direct investment (FDI) projects are eligible for support by prepare2start. However, we focus our analysis on the impact of participation on exporting and thus exclude importing and FDI projects from the analysis.[5] The merging procedure ultimately results in a total of 1,053 projects by 905 unique firms being successfully matched to our micro-data set. We will elaborate on the specifics of program participation entries that are successfully merged to the micro-data panel and the characteristics of participating firms in section 6.4.

6.3.2 Additional micro-data

The firm-level micro-data are provided by Statistics Netherlands. For the empirical analysis we merge data from three main Dutch data sources: (i) the General Business Register (GBR), (ii) the Baseline Database and (iii) the International Trade Database into a panel data set covering the years 2002 to 2010.[6] The data from the three different sources are merged using a unique identification number which is assigned by Statistics Netherlands to each individual firm in the General Business Register.

The GBR is, in principle, exhaustive in the sense that it contains information about every firm in the Netherlands, including a set of basic firm characteristics such as the number of employees in fulltime equivalents and the sector in which the firm operates according to the internationally standardized ISIC Rev. 3.1 sector classification.[7] We take from a separate but related database information concerning the ultimate controlling institution of the firm, indicating whether the ultimate controlling owner of the Dutch firm is located abroad.

The Baseline database contains a wealth of financial information collected from both corporate tax declarations and income tax declarations of entrepreneurs. The Baseline database contains information about profits, gross output, value added and the value of capital, labor and intermediate

[5]The impact of this last elimination step is negligible; a total of 39 projects (or 0.7 percent of the number of available observations after merging) concerned support of other projects than exporting.

[6]We confine ourselves to discussing some key characteristics of each data source in this chapter. For details regarding the merging procedure see chapter 2.

[7]The ISIC Rev. 3.1 sector classification equals the SBI'93 2 digit classification employed by Statistics Netherlands

inputs, where the data regarding input used and output produced are deflated using separate sector level price indices for gross output, value added, labor, capital and intermediate inputs. We employ the data from tax declarations to estimate total factor productivity (TFP) by using the procedure proposed by Levinsohn and Petrin (2003).[8]

Trade data are taken from the International Trade database and includes information on all imports and exports of goods by Dutch firms. Extra-EU trade is recorded by the Customs Authority and intra-EU imports and exports are recorded by the Dutch Tax Authority. The trade data available at the firm level cover more than 80% of annual aggregate trade in terms of value in the Netherlands.[9]

The merging procedure results in an unbalanced panel data set containing a total of 1,848,789 observations of 511,044 firms spanning a period of nine years (2002-2010).[10] Because of their fundamentally different nature, we separate the data into two main sectors, manufacturing, and wholesale & retail trading sectors.[11]

6.4 The export promotion program

6.4.1 Prepare2start participation

Prepare2start is an export promotion program specifically targeting small businesses with limited export experience.[12] The annual budget of the pro-

[8] See section 2.3 for details regarding the estimation procedure.

[9] The trade data are recorded on VAT-numbers. Connection to the firm identification key used by Statistics Netherlands leads to a merging loss of about 20% of annual trade values.

[10] This is after eliminating two sectors with eight observations or less, micro-sized firms (less than one fulltime equivalent) and implausible observations with zero or negative output or exports exceeding gross output. See chapter 2 for details.

[11] We focus the analysis of Dutch firms on manufacturing and wholesale & retail trading, thereby excluding service sectors, since data regarding trade in services are not yet sufficiently available for the Netherlands. We choose *financial intermediation* as the cut-off point for service sectors, which corresponds to ISIC Rev. 3.1 section J, division 65. Manufacturing sectors correspond in the analysis to ISIC Rev. 3.1 sections A through I, excluding G. Wholesale & retail traders correspond to ISIC Rev. 3.1 section G. The OECD and Eurostat recommend to define manufacturing as sections A through F and to include section G to Q in services. However, in terms of goods trade this division is less sensible, since a considerable part of goods trade takes place in trade and transport sectors (CBS, 2013) it is therefore more appropriate to separate these sections from typical (financial and public) service sectors.

[12] From this points onwards the acronym *P2S* for prepare2start is used in tables, figures and equations to avoid notational clutter.

gram varied over the years, up to around 11 million euro annually (in nominal terms) in recent years. The aim of the program is to support small businesses in the internationalization of their activities. Even though the specifics have varied over the years, the general framework of the program has been fairly unchanged. After an introduction period in which the program needed to establish its name the annual budget was generally fully depleted following a 'first-come-first-serve' regime in later years.[13]

	firm participation within year		
	single	double	total
2002	57	0	57
2003	84	0	84
2004	67	2	69
2005	79	0	79
2006	126	0	126
2007	149	0	149
2008	177	2	179
2009	217	6	223
2010	85	2	87
total	1,041	12	1,053

Table 6.1: P2S-participation by year (2002-2010)

Table 6.1 shows that program participation increased steadily over the years, which is due to e.g. budget increases and promotion efforts by the EPA.[14] Firms are allowed to revisit the program with a different export program, for example when they want to enter an additional export market. The records show that repeated participation with separate export projects within the same year is rare (see Table 6.1). However, over the years about 25 percent of the firms participate in the program more than once (see Table 6.2).

[13]Because of the first-come-first-serve regime the empirical results are not expected to depend on the budget being fully depleted, since there is no procedure in place selecting the most promising export projects.

[14]Note that the participation numbers discussed in this section regard program participation after merging the participation records to the panel data, implying that the number of records available for analysis is lower than the total annual participation. See section 6.3.1 for details. However, the trends discussed do reflect the general trends regarding the program. The low number of projects in 2010 reflects the fact that projects are only registered once they have been finished and financially settled. A number of projects started in 2010 were not closed by the time the data set was prepared in 2011.

	firms		projects	
	#	%	#	%
1	676	74.7	676	56.6
2	180	19.9	360	30.2
3	39	4.3	117	9.8
4	9	1.0	36	3.0
5	1	0.1	5	0.4
total	905	100.0	1,194	100.0

Table 6.2: P2S-projects per firm (2000-2010)

6.4.2 Prepare2start-participants

About one third of the participants did not export at all in the year before participation (Table 6.3). In addition, export shares in sales are modest among those firms that do already export with a conditional mean export share of about 10 percent. The incidence of exporting and the accompanying export shares of prepare2start-participants increase steadily over the years surrounding program participation. The fraction of firms that exports increases from 66 percent in the year before program participation to 76 percent in the year after. Analogously, the mean export share increases from 6.5 percent to 10.7 percent over the same period. However, that also implies that 25 percent of the program participants still has been unable to successfully enter export markets one year after program participation. In addition, the distribution of export shares in sales is rather skewed, considering the fact that the median export share before program participation is a mere 1.8 percent and increases to a still modest 4.3 percent in the year after. The last column of Table 6.3 shows the export shares that participating firms report in their program application. The self-reported mean and median values lie well between the values derived from the trade statistics in the year before and the year of program participation, which makes sense intuitively.

Firms participating in the program prepare2start are generally small considering the mean employment of about 11 FTE and a median of just 4 FTE. At first sight mean firm size seems to decrease in the year of program participation as the lower part of Table 6.3 shows. However, the mean values are biased towards larger firms being observed more consistently over the three year period than smaller firms. Looking at the balanced mean, that is, at the subset of firms that we observe consistently over the three years surrounding program participation, we see that mean firm size gradually increases. In addition, just as export shares, the firm sizes' distribution is

considerably skewed, with the balanced median being about half the balanced mean of 12 FTE. Finally, in line with what is considered a stylized fact in the empirical literature, exporting firms that participate in the export promotion program are considerably larger than participants that end up serving solely domestic markets.

	program participation			self-reported
	year before	year of	year after	in program application
number of firms				
% non-exporting participants	33.9	28.9	24.5	32.7
% exporting participants	66.1	71.1	75.5	67.3
total no. of firms	555	804	642	768
export share in sales				
mean	6.5	9.2	10.7	7.1
conditional mean	9.8	13.0	14.1	10.5
balanced mean (n=449)	6.2	7.9	10.1	7.1
median	1.8	3.1	4.3	2.3
balanced median (n=449)	1.9	3.4	4.1	3.0
firm size (FTE)				
mean	11.3	10.9	11.7	
balanced mean (n=449)				
◦ all firms	11.5	12.0	12.2	
◦ non-exporters	5.8	6.9	7.1	
◦ exporters	13.4	13.7	13.9	
median	5.0	4.0	5.0	
balanced median (n=449)				
◦ all firms	5.0	6.0	6.0	
◦ non-exporters	2.0	2.0	3.0	
◦ exporters	6.0	7.0	8.0	

Note: Except for the balanced mean and the balanced median the figures in this table are not derived from a balanced panel and the underlying numbers of observations between years might thus vary. The conditional mean and median concerns the mean resp. median of only non-zero observations. The balanced mean and median is the mean resp. median of the subset of participants consistently observed in all three years surrounding program participation (balanced panel).

Table 6.3: Firm characteristics of first-time program participants (2002-2010)

Wholesale trading is by far the most prominent provider of program participants with a participation share of almost half, followed by retail trade with a share of 9 percent (see Table 6.4). In addition, only three of the manufacturing sectors provide more than five percent of the prepare2start-participants; manufacturers of machinery and equipment, furniture resp. fabricated metal products.

	# of firm-year program participations	%
wholesale and comm. trade	490	46.8
retail trade	94	9.0
man. of machinery and eq.	74	7.1
man. of furniture	61	5.8
man. of fabricated metal prod.	56	5.3
man. of med. and optical instr.	29	2.8
publishing, printing and repro	23	2.2
man. of electrical machinery	22	2.1
man. of other transport eq.	22	2.1
man. of food products	21	2.0
construction	21	2.0
man. of rubber and plast. prod.	17	1.6
man. of motor vehicles	14	1.3
man. of chemical products	12	1.1
man. of non-metallic min. prods.	11	1.1
sale, maint., rep. of motor veh.	10	1.0
manufacture of textiles	10	1.0
man. of wearing apparel	8	0.8
man. of radio, TV and comm. eq.	8	0.8
tanning and dressing of leather	7	0.7
other sectors	37	3.5
total	1,047	100.0

Note: Due to confidentiality issues sectors with five or less program participants are bundled in the table, but have not been dropped from the analysis. Since firm-sector combinations are constant within years, multiple within year participation has been ignored here.

Table 6.4: Program participation by sector

	financial support received	
	first time participants	all participants
mean	7,179	7,475
median	7,326	7,868
% with max. fin. sup.	23.3	24.5

Note: No information regarding financial support is available for 2002. From 2003 onwards the maximum financial support is 11,500 euro for financing specific elements from the internationalization plan. Not all activities are eligible for support.

Table 6.5: Financial support received by prepare2start-participants (2003-2010, nominal, in euro)

Table 6.5 shows that about one fourth of the program participants ultimately receives the maximum financial support of 11,500 euro for the execution of certain elements of the internationalization plan. There is little

difference between first time participants and repeaters, suggesting that repeating participants do not use their program experience to work the system and maximize support. The mean amount of financial support received by program participants amounts to about 7,500 euro, or 65 percent of the maximum with the median at about 7,900 euro.

	participation					
	all		first		repeated	
	#	%	#	%	#	%
Germany	397	37.7	345	42.6	52	21.3
United Kingdom	129	12.3	91	11.2	38	15.6
Belgium	103	9.8	79	9.8	24	9.8
oth EU-15 north	95	9.0	69	8.5	26	10.7
France	82	7.8	54	6.7	28	11.5
oth EU-15 south	58	5.5	38	4.7	20	8.2
eastern Europe	51	4.8	37	4.6	14	5.7
USA, Can & Aus	49	4.7	35	4.3	14	5.7
non-EU NW Eur	28	2.7	14	1.7	14	5.7
M-East & N-Af	28	2.7	21	2.6	7	2.9
dev Asia	18	1.7	15	1.9	3	1.2
adv Asia	7	0.7	5	0.6	2	0.8
Lat-Am & Car	4	0.4	3	0.4	1	0.4
S-S Africa	4	0.4	3	0.4	1	0.4
total	1053	100.0	809	100.0	244	100.0

Table 6.6: Prepare2start-participation by destination country (2002-2010)

Germany is by far the most important destination country for firms participating in prepare2start with 38 percent of the export projects aiming at entering the German market (see Table 6.6). This is followed by the UK (12 percent), Belgium (10 percent), the rest of the northern EU-15 countries (9 percent) and France (8 percent).[15] The focus of beginning exporters is clearly on nearby countries with Western Europe accounting for 85 percent of all export projects. The destination distribution for first time participants and repeaters reveals an interesting pattern; repeating participants seem to focus their export plans on markets further away within Western Europe. The combined participation share of Belgium, UK and Germany among first time participants is 64 percent and for repeaters 47 percent. Repeaters

[15]other EU-15 north refers to Sweden, Finland, Denmark, Luxembourg, Ireland and Austria.

seem to shift their focus to the rest of the EU-15 and non-EU Northwestern European countries. The combined participation share of these countries increases from 22 percent among first time participants to 36 percent among repeaters. The participation share of regions outside Europe do not differ dramatically between first time participants and repeaters.

6.5 Empirical findings

6.5.1 Relative performance of prepare2start-participants

In order to gain an understanding of the development of firm performance of prepare2start-participants relative to non-participating exporters we start by identifying a subset of firms from both groups that we consistently observe over the years surrounding program participation. The focus of the analysis in this section will be on firms that we observe for (at least) five consecutive years, with the window of analysis starting two years before program entry up to at least two years after program participation.[16] We only consider first-time participants in the analysis, thereby excluding entrants that already participated in the program before the observed period of five consecutive years under investigation. If a firm participated in the program before, in any year of existence of the program except 1999 for which we are unable to merge participation records to the panel data, it will be excluded from the analysis altogether.

In our analysis we will distinguish between firms that participate once in prepare2start, without repeated participation with consecutive export projects in the period of impact measurement following program participation and repeating firms. We do this in order to separate the impact from single program participation from possible non-linearities in the impact on export performance of accumulated participation. In addition, a firm is of course only allowed to revisit the program if the first participation did not push it beyond the limited export involvement requirement, which could put a downward bias on the results once including repeaters. Table 6.7 illustrates that the number of available program entries decreases rather quickly with an increase of the period of analysis. Considering a window of analysis of five consecutive years we have a total of 150 program-entries available, which decreases gradually to a mere 23 entries when considering a window of eight years (five years after program participation). If we also allow for

[16]Including a period of two years leading up to program participation is necessary in order to match program participants with non-participating exporters on similarity of growth rates for several performance dimensions.

repeated participation in the impact measurement period the numbers of observations increase to 184 resp. 34. Table 6.7 also shows that the number of non-participating firms serving as the pool from which the control group will be constructed is sufficiently large; the five year balanced panel consists of 238,000 non-exporters and 54,000 exporting firms.

balanced panel	5 yrs	6 yrs	7 yrs	8 yrs
period, prepare2start in t	t-2, t+2	t-2, t+3	t-2, t+4	t-2, t+5
program participants				
excl. repeaters, non-exporting in t	22	13	6	2
excl. repeaters, exporting in t	128	67	46	21
total	150	80	52	23
incl. repeaters, non-exporting in t	26	16	8	3
incl. repeaters, exporting in t	158	97	68	31
total	184	113	76	34
non-participants				
non-exporting in t, <= 100 FTE	237,687	77,502	51,614	30,130
exporting in t, <= 100 FTE	54,366	30,382	20,177	11,787
total	292,053	107,884	71,791	41,917

Note: *Excl. repeaters* indicates that firms with repeated program participation before the end of the cohort under investigation are excluded from the statistics. The subset denoted *incl. repeaters* includes this group of repeating participants. Non-participants larger than 100 FTE are excluded for comparability considerations, since program participation is limited to firms below this threshold.

Table 6.7: Prepare2start-participation and export status (balanced panel, 2002-2010)

Table 6.8 presents a few key parameters of interest for both prepare2start-participants and non-participating firms. We see the persistence of exporting growing considerably among participants, from 71 percent exporting already two years prior to participation to 87 percent two years after for the five year balanced panel. These figures are comparable if we allow for repeated program entries. Simultaneously, non-participants modestly increased their presence on foreign markets, with the persistence of exporting growing from 17 to 20 percent over the same period of time. Table 6.8 also presents the corresponding values for the last year of the six and seven year balanced panel. The persistence of exporting is considerably higher among both participants and non-participants, which is mainly due to mean firm size being higher for both subsets as the bottom part of Table 6.8 illustrates. This is tied to the underlying number of observations decreasing rapidly with an increasing panel length as Table 6.7 shows, and the probability of a firm surviving in a balanced panel of increasing length is higher for larger firms.

balanced panel				5 yrs			6 yrs	7 yrs
year, prepare2start in t		t-2	t-1	t	t+1	t+2	t+3	t+4
% of firms exporting								
participants (excl. repeaters)		71.3	74.0	85.3	84.0	87.3	92.5	90.4
participants (incl. repeaters)		71.2	73.9	85.9	85.3	88.0	92.9	93.4
non-participants (<= 100 FTE)		17.0	17.3	18.6	18.8	20.1	31.8	33.2
export share in sales								
participants (excl. repeaters)	mean	7.3	7.3	9.6	11.8	12.5	12.0	11.7
	median	2.6	2.7	5.4	5.0	5.9	7.4	8.8
participants (incl. repeaters)	mean	7.6	7.2	9.5	12.0	12.4	12.3	12.0
	median	2.7	2.7	4.9	6.1	5.9	7.9	8.6
non-participants (<= 100 FTE)	mean	3.0	3.0	3.1	3.2	3.3	5.2	5.2
	median	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total factor productivity								
participants (excl. repeaters)		16,958	18,314	19,220	18,785	20,191	19,957	19,317
participants (incl. repeaters)		17,329	18,599	18,909	18,624	19,688	20,563	19,181
non-participants (<= 100 FTE)		11,456	12,154	12,399	12,194	12,295	16,414	16,101
firm size (FTE)								
participants (excl. repeaters)		12.6	13	14.2	14.7	14.7	19.6	18
participants (incl. repeaters)		12.2	12.5	13.7	14.1	14.4	18.3	16.9
non-participants (<= 100 FTE)		6.3	6.3	6.3	6.3	6.2	9.7	9.6

Note: *Excl. repeaters* indicates that firms with repeated program participation before the end of the cohort under investigation are excluded from the statistics. The subset denoted *incl. repeaters* includes this group of repeating participants. Non-participants larger than 100 FTE are excluded for comparability considerations, since program participation is limited to firms below this threshold.

Table 6.8: Prepare2start-participation and firm characteristics (balanced panel, 2002-2010)

The second part of Table 6.8 shows that the export share of program participants also increases gradually over time, while that of non-participants remains largely constant at around 3 percent. For program entrants the export share in sales increases from 7 to over 12 percent in five years time. However, as we have seen in section 6.4.2 as well, the distribution is rather skewed, with the median export share in sales increasing from about 3 to 6 percent. Simultaneously, firm-level productivity measured as total factor productivity (TFP) is also higher among program participants and it seems to increase faster than among non-participants. Finally, the bottom part provides a (partial) explanation for higher persistence of exporting and higher TFP-levels among program participants compared to non-entrants; the average entrant is roughly twice as large as the average non-entrant.

6.5.2 Propensity Score Matching

The descriptive statistics presented in the previous subsection concerning prepare2start-participants and non-participants do not formally prove that

the export performance of participants is different from that of non-participating beginning exporters. Naturally, the subset of non-participants is likely to be more diverse, containing for example a considerable number of small firms which are not contemplating export activities in any way. This implies that the sheer observation that export shares and export persistence are higher and seem to grow faster among program participants relative to non-entrants is not sufficient to conclude that the export promotion program is successful in supporting beginning exporters in their endeavors on foreign markets, simply because it could be the case that firms entering the program self-select into participation because they are more motivated to succeed on foreign markets or are already better informed or prepared for an export start. However, it is impossible to check whether program entrants would have realized the same results on foreign markets if they entered export markets without the support of the export promotion agency, since this scenario is simply unobserved.

A common way to deal with this endogeneity issue is to employ propensity score matching (Greenaway and Kneller, 2007b). The objective of this procedure is to construct the non-observed counterfactual by matching each treated firm to a firm from the control group based on similarity of firm characteristics before the treatment. In this particular application the treatment is prepare2start-participation of the firm. The control group consists of firms that we observe consistently over exactly the same period of time as the treated unit for which it serves as the counterfactual and that never participated in the export promotion program altogether up to the end of the period under investigation. The aim is to analyze whether these matched pairs of firms show diverging performance growth paths in the years after program entry. We employ propensity score matching to investigate the impact of program participation on export performance. We take a closer look at two dimensions of export performance: the export value and the export share in sales. Firms participating in the program in year t are matched to a peer from the control group based on similarity of a set of firm characteristics at *t-1*. These characteristics are employed in a pooled probit model to estimate the probability of program participation at time t, the so-called propensity score.

Firms from the subset of prepare2start-entrants are then matched to a peer from the non-participating control group by minimizing the difference in individual propensity scores; this procedure is referred to as nearest neighbor propensity score matching. We force matching to be allowed only within the same sector and year. In addition, it is desirable to match program entrants to peers who are roughly at the same stage in the internationalization

process, since the outcome variables of key interest are the export value and export share in sales after program entry. We operationalize this by dividing the distribution of export values of participants at *t-1* into brackets of 50,000 euro and force the matching of entrants to peers only to be allowed within these brackets when considering the export value as our performance variable of interest.[17] Following the same analogy, we only allow the matching of program participants to non-participating peers within export share brackets of 2.5 percent when the export share in sales is our outcome variable under investigation.[18]

The export performance dimension under investigation, on which the program participant is thus matched to a peer within narrowly defined brackets, is left out of the probit model in which the probability of program participation is estimated. The model is specified as follows for the analysis of the *export value* as the outcome variable of interest:

$$\begin{aligned} Pr(P2S_{it}=1) = \alpha + \beta_1 exporter_{it-1} + \beta_2 importer_{it-1} + \beta_3 twowaytrader_{it-1} \\ + \beta_4 foreigncontrolled_{it-1} + \beta_5 firmsize_{it-1} + \beta_6 ln(TFP_{it-1}) \\ + \beta_7 + TFPgrowth_{it-1,t-2} + \beta_8 exportshare_{it-1} + \beta_9 exportgrowth_{it-1,t-2} \\ + \beta_{10} year_t + \beta_{11} sector_{it-1} + e_{it} \end{aligned} \tag{6.1}$$

The analysis of the treatment effect expressed in terms of the *export share in sales* is derived from the following model:

$$\begin{aligned} Pr(P2S_{it}=1) = \alpha + \beta_1 exporter_{it-1} + \beta_2 importer_{it-1} + \beta_3 twowaytrader_{it-1} \\ + \beta_4 foreigncontrolled_{it-1} + \beta_5 firmsize_{it-1} + \beta_6 ln(TFP_{it-1}) \\ + \beta_7 + TFPgrowth_{it-1,t-2} + \beta_8 ln(exportvalue)_{it-1} + \beta_9 exportgrowth_{it-1,t-2} \\ + \beta_{10} year_t + \beta_{11} sector_{it-1} + e_{it} \end{aligned} \tag{6.2}$$

The propensity score of program participation is thus estimated from the trade status of the firm, both in terms of importing and exporting, whether the firm is foreign controlled, firm size in terms of employment in FTE, the level and growth rate of total factor productivity, the export growth rate and a full set of year and sector dummy variables. In addition, when the treatment effect is expressed in terms of export values we include the export

[17] The minimum export value of the treated firms at *t-1* is zero and the maximum is about 1.9 million euro, yielding about 40 brackets.

[18] In both cases a separate bracket is constructed for non-exporting firms with an export value and export share in sales of zero.

share as an explanatory variable in the probit model and vice versa. All explanatory variables are lagged one year, except for time-invariant variables and productivity growth and export growth, which are defined as the percentage change of productivity resp. export value between *t-2* and *t-1*.[19]

Propensity score matching is done using a caliper of 1/4 of the standard deviation of the estimated propensity score, as is common in the literature. Since we use a caliper, combined with the fact that we only allow matches within narrowly defined year-sector-export value bracket combinations, we decide not to additionally impose the common support condition on the matching procedure.[20] The only additional condition that needs to be satisfied is that both treated and matched untreated firms continuously stay in business during the period under investigation. In the final step the export performance of the matched pairs of program entrants and unsupported beginning exporters is compared.[21]

[19]The top and bottom 1% of the observations along the TFP and export growth distributions are excluded from the analysis in addition to the top and bottom 5% along the TFP growth distribution. This is done in order to eliminate implausible observations due to measurement error, which we are unable to further investigate due to confidentiality considerations. See section 3.4.4 for further details.

[20]The caliper ensures that treated firms with a propensity score that is at a distance of more than 1/4 standard deviation from the nearest untreated firm will be taken off support and will not be matched to a peer. The common support condition ensures that treated firms with a propensity score that is higher than the maximum or lower than the minimum of the control group are taken off support. However, due to technical reasons, forcing matches to be allowed only within narrowly defined year-sector-export value bracket combinations implies that the common support condition is only applied to the year-sector-export value bracket combinations with the highest and the lowest categorical value, which would be rather arbitrary. In addition, treated units with a propensity score that is too far from the nearest neighbor are not matched to a peer in any case because we work with a caliper. We thus conclude that dropping the common support condition altogether is the preferred strategy.

[21]To evaluate the average treatment effect on the treated (ATT) we construct bias-corrected 95% confidence intervals by bootstrapping the ATT with 1,000 replications. Abadie and Imbens (2008) show that bootstrapping nearest neighbor matching estimators yields invalid standard errors. However, Caliendo and Kopeinig (2008) argue that if propensity scores need to be estimated there is no feasible alternative available. To pursue caution we will however abstain from estimating and evaluating exact p-values and only construct bias-corrected 95% confidence intervals.

Cumulative export value

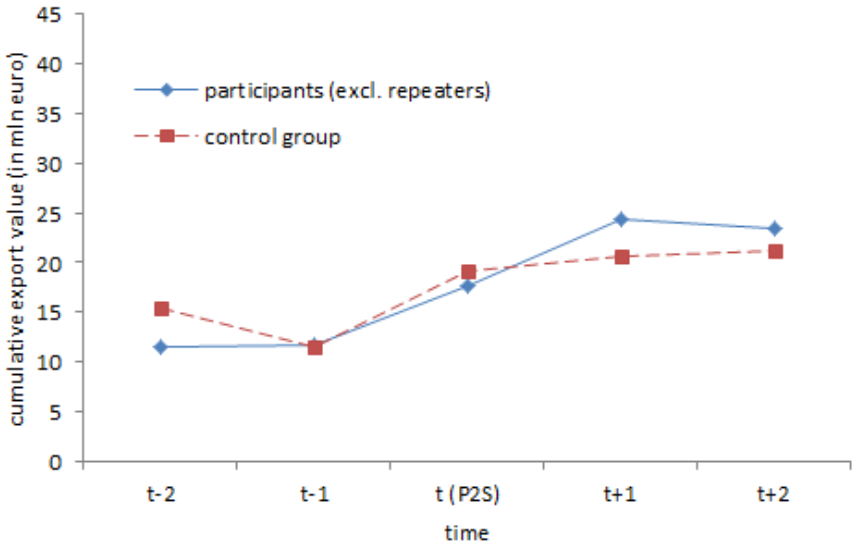

Figure 6.1: Cumulative export value of prepare2start-participants (P2S-entry in year *t*, excl. repeaters, n=87) and matched control group (n=87)

Figure 6.1 and Figure 6.2 depict the cumulative export values of prepare2start-participants and matched non-entrants over the observed period of five years surrounding program participation of the treated firm. We distinguish between the case where we do not allow for repeated program entries before the end of the period of analysis at *t+2* (Figure 6.1) and the case where repeated participation is allowed (Figure 6.2). The latter is considered both to maximize the number of treated firms available for analysis and to gain an understanding of possible nonlinearities in the impact of program participation on export performance. The fact that matching is forced within export value brackets is reflected by the cumulative export values of treated and control group being largely equal at *t-1*.

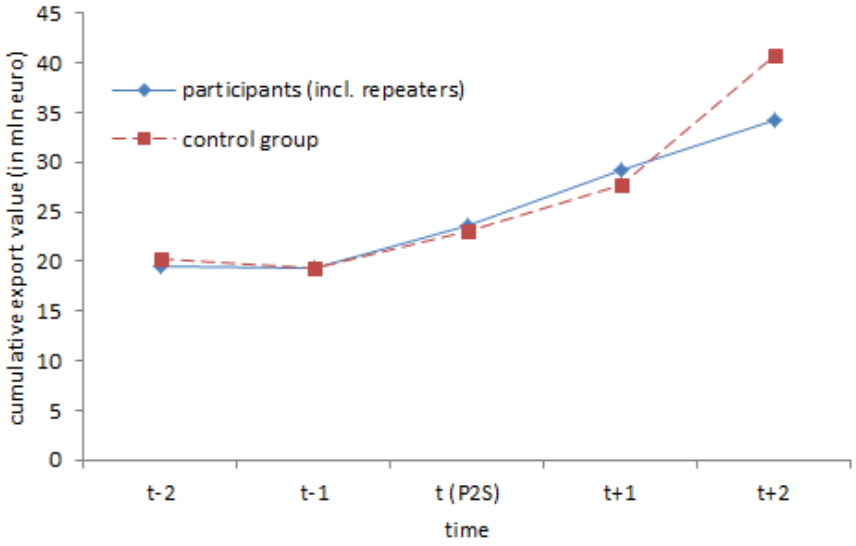

Figure 6.2: Cumulative export value of prepare2start-participants (P2S-entry in year *t*, incl. repeaters, n=111) and matched control group (n=111)

Figure 6.1 and Figure 6.2 show that the cumulative export value for treated and control group are apart no more than 8 percent in the year of program participation. In the year after program entry the generated export value is higher for both treated groups; the group excluding repeated entrants realizes a 19 percent higher export value than the control group and the treatment group including repeated entrants 6 percent. At *t+2* the export value growth of single participants vanishes, although the total export value is still 10 percent higher than that of the control group. Exports generated by the treatment group including repeated participants continues to grow at a constant growth rate. However, export growth among the control group spikes, rendering the total export value generated by the treatment group 16 percent smaller than the exports of the control group.

The picture emerging from Figure 6.1 and Figure 6.2 refutes the premise that entering the export promotion program prepare2start renders participating firms to materialize higher export value growth than their non-participating counterparts, although firms overall seem to be able to increase exports in the years after program participation. However, the figures do suggest that repeated participation in the program has a beneficial effect on export value growth, particularly in the second year after program entry.

Treatment effect I: higher export value

Looking at the average treatment effect on the treated (ATT) regarding export values, that is, the difference between the average export value generated by prepare2start-participants in the year of entry and the two years following program participation the picture emerging from Figure 6.1 and Figure 6.2 is confirmed. The mean program participant materializes exports of 200 to 300 thousand euro in the years after program entry, although we should add that a small number of participants is not able to successfully enter export markets altogether and remains serving solely domestic markets. We do not find any evidence for prepare2start participants generating higher export values than their non-participating counterfactuals (see Table 6.9). The treatment effect is generally small and not consistently positively signed. Every estimated average treatment effect on the treated lies well within the bootstrapped bias-corrected 95 percent confidence interval. Note that the relatively large and negative treatment effect of the treatment group including repeaters two years after program entry is not caused by a collapsing export performance of program entrants, but due to rapid export growth among control group members (see Figure 6.2).

	no. of matched treated	mean of matched treated (€)	mean of matched controls (€)	ATT (€)	bias-corrected 95% C.I. (€)	
excl. repeated participation						
export value in t	87	203,199	220,215	-17,016	-233,951	77,640
export value in t+1	87	280,178	236,264	43,914	-140,328	268,939
export value in t+2	87	268,889	243,980	24,909	-369,373	176,353
incl. repeated participation						
export value in t	111	212,495	207,139	5,357	-65,827	49,135
export value in t+1	111	263,177	249,029	14,148	-99,523	95,126
export value in t+2	111	308,155	366,757	-58,602	-733,817	119,615

Note: Nearest neighbor propensity score matching was done using Stata 12 and the psmatch2 package developed by Leuven and Sianesi (2003). Matching is done using a caliper of 1/4 of the standard deviation of the estimated propensity scores and by allowing matches only within narrowly defined year-sector-export value bracket combinations. Export values are expressed in constant euro's and are deflated using sector level price indices for gross output. The balancing property condition, requiring absence of statistically significant differences between mean values of the matching characteristics of the treatment and the control group is fully satisfied in all instances. The bias-corrected confidence intervals are constructed by bootstrapping the ATT with 1000 replications. * $p < 0.05$

Table 6.9: Effect of program participation on export value

Treatment effect II: higher export share

The picture looks somewhat different when considering the results of the propensity score matching procedure with the export share in sales as the outcome variable of interest (see Table 6.10). Participating firms return higher export shares in sales than their non-participating counterparts and continuously increase the share of exports in sales over the course of three years following program participation. The mean share of exports in sales is about 9 percent in the year of program participation, and increases to about 11 percent two years later. The average treatment effect is consistently positive, varying between 1.3 and 4 percent and is consistently higher for the treatment group including repeated entrants. However, only for the treatment group including repeated participants do we find a significantly positive effect of program participation on export shares in the two years following program participation. In these two years the mean program participant shows a 4 percentage point higher share of exports in sales than its non-participating counterpart.

	no. of matched treated	mean of matched treated (%)	mean of matched controls (%)	ATT (%)	bias-corrected 95% C.I.	
excl. repeated participation						
export share in t	92	9.3	7.5	1.8	-0.5	5.1
export share in t+1	92	10.9	9.0	1.9	-2.4	5.3
export share in t+2	92	11.2	8.3	2.9	-0.7	6.2
incl. repeated participation						
export share in t	121	9.1	7.8	1.3	-1.3	4.2
export share in t+1	121	11.5	7.5	4.0*	1.9	7.9
export share in t+2	121	11.5	7.6	3.9*	1.1	7.0

Note: Nearest neighbor propensity score matching was done using Stata 12 and the psmatch2 package developed by Leuven and Sianesi (2003). Matching is done using a caliper of 1/4 of the standard deviation of the estimated propensity scores and by allowing matches only within narrowly defined year-sector-export share bracket combinations. Export values are expressed in constant euro's and are deflated using sector level price indices for gross output. The balancing property condition, requiring absence of statistically significant differences between mean values of the matching characteristics of the treatment and the control group is fully satisfied in all instances. The bias-corrected confidence intervals are constructed by bootstrapping the ATT with 1000 replications. * $p < 0.05$

Table 6.10: Effect of program participation on export share

Treatment effect III: becoming a permanent exporter

The final performance dimension of exporting that we investigate is the probability of becoming a permanent exporter. A permanent exporter is defined as a firm that exports (export value larger than zero) in the year of program participation (denoted t) and the two years following program entry *t+1* and *t+2*. To gain an understanding of the impact of prepare2start-participation on the probability of becoming a permanent exporter we run a simple probit-model in which the dummy variable indicating whether a firm is a permanent exporter is regressed on a dummy variable indicating whether the firm participated in the program in year t and an additional set of control variables describing firm characteristics in year t.[22] The probit-model we estimate is thus defined as follows:

$$\begin{aligned} Pr(permanentexporter_{it,t+1,t+2} = 1) = \alpha + \beta_1 prepare2start + \beta_2 firmsize_{it} \\ + \beta_3 ln(TFP_{it}) + \beta_4 TFPgrowth_{it,t-1} + \beta_5 exportgrowth_{it,t-1} \\ + \beta_6 foreigncontrolled_{it} + \beta_7 importer_{it} + \beta_8 year_t + \beta_9 sector_{it} + e_{it} \end{aligned} \tag{6.3}$$

The probability of becoming a permanent exporter is thus estimated from a program participation dummy variable, firm size in terms of employment in FTE, the level and growth rate of total factor productivity, the export growth rate, whether the firm is foreign controlled, the import status of the firm and a full set of year and sector dummy variables. All explanatory variables are set in year t, except for time-invariant variables and productivity growth and export growth, which are defined as the percentage change of productivity resp. export value between *t-1* and *t*. To get an indication of the robustness of our findings we run this model separately on the four subsets of paired treated and control groups constructed by the propensity score matching procedure discussed above.[23]

Table 6.11 shows that there is evidence suggesting that prepare2start participation positively affects the probability of becoming a permanent exporter for the treatment groups including repeaters. The estimated coefficients for the participation dummy variable are consistently positive, although those concerning treatment groups including repeaters are significant

[22] As a robustness check we ran the same model in a logit framework, yielding comparable results.

[23] Recall that by means of propensity score matching we investigate the impact of prepare2start participation on export values and export shares both excluding and including repeating participants. This results in four separate matching procedures, with largely overlapping populations of matched treated subjects, but varying populations of matched control subjects, since matching is done using differing propensity score estimates.

at the 10 percent significance level only. This does not necessarily imply that there is a causal relationship between repeated program participation and export performance. It could be (partially) explained by the mere fact that the number of observations available for analysis is considerably larger when including repeating participants. In addition, the control variables included in the probit-model are generally intuitively straightforwardly signed. Export growth, productivity and import status are positively and generally significantly associated with becoming a permanent exporter. Productivity growth does not seem to be tied strongly to becoming a permanent exporter and the dummy variable indicating whether a firm is foreign controlled is the only variable yielding counterintuitive results.

	observation selection from PSM-procedure			
	export value excl. rep. part.	export value incl. rep. part.	export share excl. rep. part.	export share incl. rep. part.
prepare2start	0.366	0.661*	0.334	0.566†
	(1.05)	(2.27)	(1.03)	(1.85)
control variables				
export growth *(t-1,t)*	0.751*	0.584*	0.067	1.110**
	(2.53)	(2.32)	(0.28)	(3.16)
firm size (FTE, log)	0.497*	0.410*	0.910***	0.535*
	(2.18)	(2.27)	(4.29)	(2.40)
TFP (log)	0.638†	-0.061	0.721*	0.828**
	(1.85)	(-0.22)	(2.01)	(2.79)
TFP growth *(t-1,t)*	0.217	-0.382	-0.041	-1.170*
	(0.44)	(-1.05)	(-0.09)	(-2.33)
foreign controlled	-1.657*	0.510	-1.619**	1.543*
	(-2.34)	(0.52)	(-2.70)	(2.12)
importer	1.494***	1.842***	1.502**	3.015***
	(3.46)	(4.52)	(2.67)	(5.22)
No. of observations	111	142	128	172

Notes: All regressions include a full set of year and sector dummy variables.
z statistics in parentheses. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

Table 6.11: Effect of program participation on probability of becoming a permanent exporter (pooled probit-model)

The picture emerging from the empirical analysis in this section thus does not provide convincing evidence that entering the export promotion program prepare2start enables participating firms to perform better on export markets than their non-participating counterparts. Although program participants do show to increase their level of involvement in export mar-

kets in the years following program entry, both in terms of export value and export share in sales, propensity score matching does not convincingly show that this increase in export involvement is higher than that of beginning exporters that do not participate in the program. However, we do find some empirical evidence suggesting that program entrants are able to increase their export share in sales faster than non-participants in the years after program participation and that program participation has a positive effect on the probability of becoming a permanent exporter. These results seem to be notably tied to repeated program participation.

6.6 Conclusion and discussion

Until recently, most research concerning the effectiveness of export promotion is set at the macro level. The still small literature addressing this issue by means of firm-level data mainly concerns Latin American countries; firm-level research of export promotion in advanced countries is virtually non-existent thus far. This chapter aims to fill this gap by investigating the effectiveness of export promotion in the Netherlands, a small, open and advanced economy. The aim of the export promotion program prepare2start is to support small businesses in the internationalization of their activities. The support consists of two main elements: (i) supervision of and guidance in the development and deployment of an export plan and (ii) limited financial support for the execution of specific elements of that plan. The participating firm needs to put in a considerable effort as well. It is required to develop an export plan during program participation and it bears half the costs of executing subsidizable activities from the plan plus any additional non-subsidizable expenses. In addition, the instrument under investigation specifically targets small businesses, a group that is not frequently considered separately in this field.

Combining participation records from the Dutch export promotion program prepare2start with firm-level micro-data we investigate whether program entrants convert to a different export performance path than firms that are in the early stages of export market entry as well, but proceed without the support of such an export promotion program. Employing propensity score matching we investigate whether the export performance of participants significantly differs from that of comparable firms that are at the same stages of export market entry only without support from an export promotion program. We consider three dimensions of export performance; the export value and export share in sales generated by the beginning ex-

porter and the probability of becoming a permanent exporter.

Two separate propensity score matching procedures, either excluding or including repeated program participants, yield no convincing evidence that program participants are able to increase exports more rapidly than their counterparts that are at the same stage of export involvement, but that did not participate in the program. Mean and cumulative exports generated by participants do generally rise in the years after program entry, however, export growth does not show to be any higher than that of the control group. Nonetheless, export shares in sales show to be consistently higher among the treatment group, with the sample including repeaters returning a significantly positive average treatment effect on the treated of about 4 percent for the first and second year after participation in the export promotion program. Finally, the probability of becoming a permanent exporter is significantly higher for the group of program participants including repeaters relative to beginning exporters that did not receive support from the program.

The fact that the empirical evidence suggests that the beneficial impact of program participation seems to be mainly tied to repeated program participation does not necessarily imply that there is a causal relationship between repeated program participation and export performance. It could be (partially) explained by the mere fact that the number of observations available for analysis is considerably larger when including repeating participants. An additional explanation could be that firms repeatedly participating in the program are more determined to succeed on export markets and fully explore the possibilities that foreign markets provide.

The welfare implications of our findings are difficult to assess, since we do not know to what extent participants would not have entered foreign market without support from the program. However, the fact that program participants do not appear to differ notably from their matched peers in terms of firm characteristics and export performance could imply that the additivity of the program is lower than the program evaluation surveys indicate. This would reduce the benefits and thus the net welfare gain from the program. However, if part of the participating firms would not have entered export markets altogether without support from the program, then program participation enabled them to match the export performance of unsupported beginning exporters, implying a net welfare gain. The question remains however to what extent that is the case.

Concerning the policy implications of this study we argue that a crucial step in an evaluation of the merits of any program is the assessment of the degree of additivity: to what extent would participants not have entered

foreign markets without support from the program? However, such an assessment mechanism is difficult to incorporate in the design of an export promotion program. Indeed, asking the prospective participant whether the decision to enter foreign markets hinges crucially upon program participation would not yield useful information because of the risk of strategic responding. Nonetheless, without at least an indication of the degree of additivity of program participation to the individual participant it is difficult to fully evaluate the merits of the program. In this respect, interesting design alternatives to explore are a reduction of the material subsidy for the execution of specific elements of the internationalization plan or a set-up where the participating firm would have to repay the material subsidy should it succeed in entering the anticipated export market. These alternative set-ups would decrease the financial support that the participant receives relative to the investment required from the participating firm. This provides an indication of the degree of additivity of program participation to the prospective participant, since at least some firms that would have entered export markets even without support from the program will decide not to enter the program because the financial support is perceived to be too little relative to the required investment from the participant. While this is theoretically sound, introducing the second option would in practice imply incurring another serious complexity, since a definition of export success would have to be developed, which is far from trivial either. Nonetheless, de Nooij, van den Berg, Garretsen, and de Groot (2010) show in their social cost-benefit analysis that these alternatives would most likely yield higher welfare gains than the current set-up of the program.

The empirical findings of this study are in line with earlier research on a number of dimensions. Our empirical evidence suggests that program participation positively affects the probability of becoming a permanent exporter, This aligns with the vast body of empirical evidence that the potential of export promotion is particularly promising along the extensive margin. In addition, we find little evidence suggesting that program participation positively affects exports along the intensive margin. This finding, paired with the observation that most firms participating in the program aim to enter nearby export markets, is in line with earlier empirical work showing that export promotion is particularly promising in boosting exports of low and middle income countries and less so in fostering exports of advanced economies such as the Netherlands.

A key challenge for further research would be to collect more extensive participation records of comparable export promotion programs. Not only to increase sheer numbers of observations in order to improve the robustness

of the analysis, but also to be able to investigate the export performance of participants over a longer period in time. In addition, more extensive participation records tracking individual firms could provide the possibility to add a geographical dimension to the analysis and investigate whether the relationship between program support and export performance in moderated by the destination of the beginning exporter, which would be a relevant extension with the findings of Van Bergeijk (2009); Van Veenstra, Yakop, and Van Bergeijk (2011) in mind. An interesting avenue for further research would also be to try to identify ways to objectively assess the degree of additivity of an export promotion instrument in an attempt to answer the question to what extent the exports generated by beneficiaries crucially hinge upon program participation. Research techniques such as propensity score matching enable us to investigate to what extent program beneficiaries outperform their unsupported counterparts, but they do not provide an answer to the question to what extent the exports generated by beneficiaries would not have been realized altogether without program support. This is however an important question to answer in order to gain a full understanding of the effectiveness of export promotion efforts.

Chapter 7

Conclusion

7.1 Summary of findings

The title of this thesis, *Does internationalization foster firm performance?*, could be considered a generalization of the research questions underlying each of chapters of this thesis. Each of the research chapters deals with the impact of a specific dimension of internationalization of business activities on a specific dimension of firm performance. More specifically, we consider the impact of importing and the composition of the goods import portfolio on firm-level productivity in chapters 3 and 4, the impact of exporting on profitability in chapter 5, and the impact of a publicly supervised and supported export start on export performance in chapter 6. The empirical analysis presented in the research chapters are in essence all based on the same unique firm-level micro-data set. We started by detailing the compilation procedure of this data set in chapter 2. The main findings of this dissertation can be summarized as follows.

In chapter 3 we start by investigating the relationship between trade status, firm size and firm-level productivity in the Netherlands, thereby focusing particularly on small- and medium-sized enterprizes (SMEs). The results can be summarized in four empirical regularities. (i) The productivity ranking by trade status of Dutch manufacturing firms in increasing order of productivity is: non-traders, importers, exporters and two-way traders (research question 1a). We find considerable heterogeneity in the productivity premia of trade along the firm size distribution (research question 1b). We find significant importer productivity premia for all firm size classes, but a clear pattern in the magnitude of the estimated premia by size group does not emerge. In addition, exporter premia tend to decrease in firm size. These

findings suggest that, relative to large firms, employing export activities is more complex for small firms than engaging in the international sourcing of inputs. (ii) Firm size and being controlled by a company located abroad are positively associated with firm-level productivity. (iii) The results point in the direction of self-selection of more productive manufacturing firms into importing, particularly for firms that did not trade altogether prior to the import start and for build-up periods of two and three years towards the import start (research question 1c). (iv) We do not find evidence that firms become more productive after an import start because of learning effects (research question 1d). The existence of a productivity premium of importing, the empirical evidence in favor of the self-selection hypothesis and the lack of evidence pointing to learning effects associated with importing are well in line with earlier research on the relationship between importing and firm-level productivity.

Building on the empirical results from chapter 3, we extend the analysis in chapter 4 by investigating whether importing different types of products from different source countries affects productivity premia of importing. We show that both the geographic component (what country is the import from) and the intensity component (what type of good is imported) are factors affecting the diffusion of efficiency gains embodied in imported goods. We show that increasing distance and decreasing levels of development of the origin economy negatively affect the diffusion of efficiency gains embodied in imported goods (research question 2a). Similarly, these gains are larger for technology intensive goods and smaller for unskilled-labor intensive goods (research question 2b). Illustrative for this finding is that technology intensive imports from nearby EU-15 countries are significantly more positively associated with firm-level productivity than are technology intensive imports from advanced countries outside Europe, like the U.S. or Japan. The observed premia patterns are comparable for manufacturing and wholesale & retail trading sectors, but are generally more pronounced in trading sectors. In addition, a diversified import portfolio (the extensive dimension) is always positively associated with firm-level productivity (research question 2c). These findings imply that the geographic-intensity markets are unique and cannot be lumped together and that the use of the country of origin of imports as a proxy for the factor intensity, as is frequently done in the literature, is too general (research question 2d). Nonetheless, our findings do corroborate the notion from earlier research that R&D-intensive imports or imports from advanced economies are associated with higher productivity premia.

In chapter 5 we turn to the export dimension of internationalization and

investigate the relationship between exporting and firm-level profit margins. We start by deriving empirically testable hypothesis regarding the relationship between exporting and profit margins from two existing theoretical models regarding firm heterogeneity and trade, Melitz (2003) and Egger and Kreickemeier (2012). Profit margins are not an explicit parameter in these theoretical models, but they can be derived from the available information regarding firm-level profits and sales. The hypothesis we take from the theoretical analysis to the data suggests that profit rates of exporters are lower than or equal to those of non-exporters (research question 3a). The empirical results show that internationalization of firm activities is not heavily correlated with profit rates. We find largely insignificant or significantly negative trade premia of small magnitude, which thus aligns with theoretical expectations (research question 3b). The negative trade premia seem to be related mainly to exporting rather than to importing and particularly to micro- and small firms (research question 3c). Our findings also consistently show that productivity is an important indicator for firm-level profitability (research question 3d). Results from propensity score matching analysis also support the hypothesis that exporting firms face profit rates lower than or equal to domestic firms. However, we do find some evidence suggesting that export starters in manufacturing sectors materialize higher profit margins in the longer run. These results could indicate that especially new exporters seem to be willing to fully explore the possibilities that foreign markets provide even at the cost of (temporarily) materializing lower profit rates.

In chapter 6 we dig into the effectiveness of public export promotion efforts. We combine participation records from a Dutch export promotion program specifically designed to support small businesses in the early stages of their export involvement with firm-level micro-data and investigate the effect of program participation on export performance. Utilizing propensity score matching techniques, we show that exports generated by participants do generally rise in the years after program entry, however, export growth does not outpace that of comparable, but unsupported firms (research question 4a). However, there is some evidence suggesting that export shares in sales rise faster among program entrants, particularly in the first and second year after participation (research question 4b). Furthermore, we present evidence suggesting that the probability of becoming a permanent exporter is higher for participants relative to beginning exporters that did not receive support from the program (research question 4c). The empirical findings of this study confirm the findings of earlier research on a number of dimensions. Our empirical evidence showing that program participation

positively affects the probability of becoming a permanent exporter aligns with compelling empirical evidence that the potential of export promotion is particularly promising along the extensive margin. We find little evidence suggesting that program participation positively affects exports along the intensive margin. Paired with the observation that most firms participating in the program aim to enter nearby export markets, this finding is in line with earlier empirical work showing that export promotion is particularly promising in boosting exports of low and middle income countries and less so in fostering exports of advanced economies such as the Netherlands.

7.2 Discussion, limitations and avenues for further research

The empirical research presented in this thesis is subject to a number of limitations. It is important to address these limitations in order to fully appreciate the findings and to put them in perspective. In addition, some interesting avenues for further research follow naturally from a discussion of the limitations of our studies.

The first limitation that needs to be addressed is the use of propensity score matching as a research technique employed for two related reasons: (i) to solve endogeneity issues which cannot be solved by instrumenting since a suitable instrument is not available and (ii) to get a grasp of the 'what if' scenario; the non-observed scenario of what would have happened with a treated firm would it not have received treatment. In this dissertation we employ this technique in three chapters: chapters 3, 5 and 6. For the research questions at hand in these chapters, propensity score matching is the most suitable research method to deploy. Nonetheless, propensity score matching suffers from a few drawbacks. Due to the considerable data requirements in terms of panel length and detail the ultimately available numbers of observations for the propensity score matching procedure are frequently rather small. In addition, utilizing propensity score matching inevitably implies working with growth rates of both explanatory and outcome variables. However, growth rates in micro-data sets are frequently much more volatile than levels, not necessarily because they intrinsically are, but also because between-year consistency checks are generally less comprehensive than within-year checks, resulting in high standard errors (see section 3.4.4 for a discussion). These two factors combined (a relatively small number of observations available for analysis paired with high standard errors of both explanatory and outcome variables) sometimes leads to considerable volatil-

ity in estimated treatment effects and wide confidence intervals. Developing alternative methods, which are preferably less dependent on the combination of the number of observations available and the underlying distribution of variables, to investigate this type of research question, not necessarily as a replacement, but more so as a robustness check, would pose a valuable addition to this field of empirical research.

Another interesting direction for further research follows from the empirical analysis presented in chapter 4. The evidence in this study suggests that the fixed and variable costs of importing are not higher for imports from regions far away from the Netherlands or from 'difficult' regions. A possible explanation for this finding might be found in the nature of the products being imported from these regions, namely that imports from developing countries tend to contain a larger fraction of final goods, frequently predestined for re-exporting, compared to imports from advanced countries which contain a larger fraction of intermediate inputs. The potential for incurring productivity and efficiency gains is thought to be larger for intermediate goods imports than for imports of final goods or goods predestined for re-exporting, dimensions which are unfortunately lacking in our data set. This suggests that unskilled labor intensive imports contain a relatively large fraction of final goods. Adding a third and fourth dimension of imported goods to the analysis, next to geographic origin and factor intensity, would be a potentially interesting extension of this research in order to further gain an understanding of the productivity premia patterns of importing. The third dimension could be defined along the lines of capital goods, intermediate goods and final goods, for which the product classification in terms of broad economic categories (BEC) developed by the United Nations could provide a useful starting point. In addition, the fourth dimension to consider in the relationship between imports and productivity would be the role of goods imports destined for re-exporting. Admittedly, this dimension is still difficult to distill from firm-level trade data.

From the analysis presented in chapter 4 it follows that further deepening of our understanding of the direction of causality between productivity and importing is also needed, particularly along the different dimensions of imports (geography, intensity, and dispersion) that show to moderate this relationship. Our findings in chapter 3 show that firms self-select into importing and do not support the learning-by-importing hypothesis. However, these results are not at odds with the findings in 4 showing that the relationship between importing and productivity is moderated by what goods are imported from which country. That is, self-selection into importing and potential productivity gains emanating from learning-by-importing could

hinge on the underlying characteristics of the imported goods. This form of heterogeneity in the causality between importing and productivity is an issue that needs further research.

Concerning the relationship between exporting and profitability discussed in chapter 5 it would be interesting to further explore the profitability path of export starters in the longer run. The results of this study show that new exporters seem to be willing to accept lower profit margins in the short run, in order to fully explore the possibilities that export markets provide. The empirical analysis also shows that the export share in sales correlates positively with profitability. This could imply that in the longer run, say, three to five years, when export skills are fully internalized by the export starter, the export share in total sales starts increasing over time relative to the first years of foreign market entry. This could drive up profit margins in the longer run, albeit through a different mechanism. The higher probability of survival of exporters relative to non-exporters is also a relevant factor to consider in this respect. This would be an interesting line of reasoning to further explore empirically, although it should be noted that the data requirements tied to investigating this hypothesis are considerable, since a sufficiently sizeable balanced panel of export starters and continuing non-exporters over a period of at least five to seven years would be needed.

Extending the analysis of the relationship between internationalization and profitability to factor in firm survival would be a challenging but potentially rewarding line of research. It is well established that internationalization positively affects the probability of firm survival. This implies that the discounted value of future profits is likely to be higher for trading firms compared to non-traders, irrespective of the insignificant premia we find in our analysis regarding annual profit rates. Unfortunately we are unable to factor in the impact of trading on firm survival in the relationship between exporting and profitability at this point. Although this might tip the balance in favor of the internationalizing firm, further research would be needed to deepen our understanding of the relationship between internationalization, profitability and firm survival.

Up till now, empirical research at the micro-level concerning export promotion, particularly in advanced countries, has been very limited. Further firm-level research of export promotion programs in other (advanced) economies would thus enable us to benchmark our findings for the Netherlands and deepen our understanding of the merits of export promotion in general. Another key challenge for further research would be to collect more extensive participation records of comparable export promotion programs. Not only to increase sheer numbers of observations in order to improve the

robustness of the analysis, but also to be able to investigate the export performance of participants over a longer period in time. In addition, more extensive participation records tracking individual firms could provide the possibility to add a geographical dimension to the analysis and investigate whether the relationship between program support and export performance is moderated by the destination of the beginning exporter. The analysis in chapters 3 and 4 indicate that importing is an important channel for productivity enhancement. However, the impact of import promotion efforts on importing and productivity has thus far been ignored in the firm heterogeneity literature. This would also be an interesting issue to further explore.

A final limitation of the research concerning chapter 6 regards the additivity of export promotion. The analysis does not convincingly show that program beneficiaries perform better than non-participants. However, this does not render the export promotion program a useless instrument, since it could be that participating firms would not have entered export markets without support from the program. This would imply that program participation enabled them to match the export performance of unsupported beginning exporters. This line of reasoning can be readily extended to an interesting direction for further research. An important challenge of future research concerning the effectiveness of export promotion would thus be to try to identify ways to objectively assess the degree of additivity of an export promotion instrument in an attempt to answer the question to what extent the exports generated by beneficiaries hinge upon program participation. Research techniques such as propensity score matching enable us to investigate to what extent program beneficiaries outperform their unsupported counterparts, but they do not provide an answer to the question to what extent the exports generated by beneficiaries would not have been realized altogether without program support. This is however an important question to answer in order to gain a full understanding of the effectiveness of export promotion efforts.

The aim of the studies in this dissertation is to address a selection of identified gaps in the existing body of knowledge and issues on which no consensus has been reached thus far concerning the relationship between internationalization of business activities and various dimensions of firm performance. Extending the empirical research in this field along the lines identified in this section would further deepen our understanding of the mechanisms underlying firm heterogeneity in internationalization.

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Nederlandse samenvatting

De titel van dit proefschrift *Bevordert internationalisering bedrijfsprestaties?*, kan worden beschouwd als een veralgemenisering van de onderzoeksvragen die als als uitgangspunt dienen voor de verschillende hoofdstukken. Ieder hoofdstuk behandelt de invloed van een specifieke dimensie van internationalisering van bedrijfsactiviteiten op een specifieke dimensie van het presteren van bedrijven. Om precies te zijn, we onderzoeken de invloed van importeren en de samenstelling en herkomst van de bundel ingevoerde goederen op de productiviteit van het individuele bedrijf in hoofdstukken 3 en 4, de invloed van exporteren op winstgevendheid in hoofdstuk 5 en de invloed van het verstrekken van begeleiding en ondersteuning door de overheid aan individuele bedrijven bij het zetten van de eerste stappen op exportmarkten op de exportprestaties van de beginnende exporteur in hoofdstuk 6. De onderzoeken in deze hoofdstukken zijn feitelijk alle gebaseerd op varianten van hetzelfde unieke microdatabestand waarin het waarnemingsniveau het individuele bedrijf is. Het koppel- en bewerkingsproces dat is doorlopen om tot dit onderzoeksbestand te komen is in detail beschreven in hoofdstuk 2. De belangrijkste bevindingen van deze dissertatie kunnen als volgt worden samengevat.

In hoofdstuk 3 beginnen we met een empirische analyse van de relatie tussen handelsstatus (exporteert een bedrijf, importeert het, doet het beide parallel of geen van beide?), bedrijfsomvang en productiviteit op het niveau van individuele bedrijven in Nederland. Hierbij ligt de focus van de analyse op het midden- en kleinbedrijf (MKB). De bevindingen kunnen worden samengevat in vier empirische wetmatigheden. (i) De sortering op productiviteit van bedrijven in de Nederlandse industrie naar handelsstatus is, in oplopende volgorde: niet internationaal actieve bedrijven, importeurs, exporteurs en bedrijven die beide parallel doen. We zien aanzienlijke heterogeniteit in de productiviteitspremie van internationale handel (het productiviteitsverschil tussen internationaal actieve bedrijven en bedrijven die zich op de binnenlandse markt richten wanneer gecontroleerd wordt voor

andere bedrijfskenmerken) naar bedrijfsomvangklasse. De productiviteitspremie van importeren is significant en positief voor alle bedrijfsomvangklassen, maar een duidelijk patroon in de omvang van de geschatte premies naar bedrijfsomvangklassen ontbreekt. Wel zien we de omvang van de productiviteitspremie van exporteren afnemen in bedrijfsomvang. Deze bevindingen suggereren dat, ten opzichte van grote bedrijven, het ontwikkelen van exportactiviteiten is complexer voor kleine bedrijven dan het buitenlands betrekken van goederen als input voor het productieproces. (ii) Bedrijfsomvang en onder buitenlandse controle staan hangen beide positief samen met productiviteit. (iii) De resultaten suggereren dat hoger productieve bedrijven in de maakindustrie zichzelf voorselecteren voor een entree op internationale inputmarkten. Oftewel, beginnende importeurs zijn al voordat zij beginnen met importeren gemiddeld hoger productief dan bedrijven die niet gaan importeren. In het bijzonder geldt dit voor voor bedrijven die ook niet actief waren als exporteur voordat zij gaan importeren en voor aanloopperiodes tot een importstart van twee tot drie jaar. (iv) We vinden geen empirisch bewijs voor het bestaan van leereffecten van importeren; bedrijven worden niet aantoonbaar productiever doordat zij zijn gaan importeren. Het bestaan van een productiviteitspremie van importeren, het empirische bewijs dat wijst in de richting van zelfselectie voor een importstart en het ontbreken van bewijs voor leereffecten van importeren sluiten aan bij de bevindingen uit eerder onderzoek in andere landen naar de relatie tussen importeren en productiviteit.

Voortbordurend op de empirische bevindingen van hoofdstuk 3 verdiepen we de analyse in hoofdstuk 4 door te onderzoeken of het importeren van verschillende typen producten vanuit verschillende landen de productiviteitspremie van importeren verschillend beïnvloedt. We tonen aan dat zowel de geografische component (waar komt het geïmporteerde product vandaan) als de factorintensiteit (welke type product wordt geïmporteerd) elementen zijn die van invloed zijn op de mate waarin potentiële efficiëntiewinsten die besloten liggen in ingevoerde goederen worden gematerialiseerd. We tonen aan dat een grotere afstand tot en een afnemend ontwikkelingsniveau van het herkomstland van invoer negatief samenhangen met de materialisatie van productiviteitspremies van importeren. Deze premies zijn bovendien groter bij de import van hoogtechnologische producten en lager voor arbeidsintensieve producten vervaardigd door ongeschoolde arbeidskrachten. Illustratief voor deze bevinding is dat hoogtechnologische importen uit de nabijgelegen EU-15 gepaard gaan met significant hogere productiviteitspremies dan hoogtechnologische importen uit eveneens ontwikkelde economieën buiten Europa, zoals de Verenigde Staten en Japan.

De geobserveerde patronen in productiviteitspremies zijn vergelijkbaar voor de maakindustrie en de groot- en detailhandel, maar zijn over het algemeen meer geprononceerd in de handelssectoren. Daarnaast zien we dat meer diversiteit in de samenstelling van de importen (het aantal producten dat wordt ingevoerd of het aantal landen van waaruit wordt geïmporteerd, de extensieve dimensie) altijd positief samenhangt met productiviteit. Deze bevindingen impliceren dat importmarkten in termen van combinaties van de herkomst en factorintensiteit van geïmporteerde producten uniek zijn en niet kunnen worden samengevoegd. Dit betekent tevens dat het gebruik van de herkomst van invoer als benadering voor de factorintensiteit (bijvoorbeeld: alle invoer vanuit de Verenigde Staten hoogtechnologisch veronderstellen), zoals regelmatig gebeurt in de literatuur, te grofmazig is. Onze bevindingen bevestigen resultaten uit eerder onderzoek dat innovatieve importen en importen vanuit hoogontwikkelde economieën samenhangen met hogere productiviteitspremies.

In hoofdstuk 5 richten we ons op de exportkant van internationalisering en onderzoeken de relatie tussen export status en winstmarges. We beginnen met het afleiden van een aantal empirisch toetsbare hypotheses met betrekking tot de relatie tussen exporteren en winstmarges. We leiden deze hypothese af uit twee bestaande theoretische modellen op het gebied van handel en heterogeniteit van bedrijven; Melitz (2003) en Egger and Kreickemeier (2012). Winstmarges zijn geen expliciete parameter in deze theoretische modellen, maar deze kunnen wel worden afgeleid uit de beschikbare informatie met betrekking tot bedrijfswinsten en omzet. De hypothese resulterend uit deze theoretische exercitie die we in de volgende stap empirisch toetsen aan de data stelt dat winstmarges van exporteurs lager of ten hoogste gelijk zijn aan die van bedrijven die niet exporteren.

De empirische resultaten laten zien dat internationalisering van bedrijfsactiviteiten niet sterk is gecorreleerd met winstmarges. We vinden overwegend insignificante of significant negatieve winstpremies van beperkte omvang. Dit sluit derhalve aan bij de verwachtingen ontleend aan de theoretische analyse. De negatieve winstpremie lijkt met name samen te hangen met exporteren en minder met importeren en vooral met kleine bedrijven. Onze bevindingen laten ook consequent zien dat productiviteit een belangrijke indicator is voor winstgevendheid. De resultaten van de *propensity score matching* analyse ondersteunen de hypothese dat exporterende bedrijven te maken hebben met lagere of ten hoogste gelijke winstmarges vergeleken met bedrijven die zich uitsluitend op de binnenlandse markt richten. Niettemin zijn er aanwijzingen dat startende exporteurs in maakindustrieën hogere winstmarges weten te behalen op de langere termijn. Deze resultaten zouden

er op kunnen duiden dat in het bijzonder nieuwe exporteurs bereid zijn om de mogelijkheden die buitenlandse markten hen bieden ten volle te verkennen zelfs als dat betekent dat er (tijdelijk) lagere winstmarges gerealiseerd worden als gevolg van deze strategische beslissing.

In hoofdstuk 6 gaan we in op de effectiviteit van publieke exportpromotieactiviteiten. We combineren deelnamebestanden van een Nederlands exportpromotieprogramma dat specifiek gericht is op het ondersteunen van kleine ondernemingen bij het zetten van de eerste stappen op buitenlandse markten met microdata op bedrijfsniveau en onderzoeken het effect van deelname aan het programma op de exportprestaties. Door toepassing van *propensity score matching* technieken tonen we aan dat de export bij programmadeelnemers in de jaren na deelname over het algemeen stijgt, maar dat de exportgroei niet sneller gaat dan die bij vergelijkbare exportstarters die geen publieke begeleiding hebben ontvangen. Niettemin zijn er wel aanwijzingen dat het exportaandeel in de omzet sneller oploopt bij programmadeelnemers, in het bijzonder in het eerste en tweede jaar na deelname. Voorts laten we zien dat de kans dat een programmadeelnemer een permanente exporteur wordt hoger is dan de kans dat een beginnende exporteur die niet wordt bijgestaan met publieke begeleiding structureel actief wordt op buitenlandse markten. De empirische bevindingen in dit hoofdstuk bevestigen de resultaten uit eerder onderzoek op verschillende punten. Het empirische resultaat dat programmadeelname positief van invloed is op de kans dat een bedrijf permanent exporteur wordt sluit aan bij overtuigend empirische bewijs dat de potentie van exportpromotie met name hoog is wanneer programma's gericht worden op de extensieve marge. Daarentegen vinden we weinig bewijs dat programmadeelname effect heeft op de intensieve marge. Gecombineerd met de observatie dat de meeste programmadeelnemers van zins zijn om nabije exportmarkten te betreden is dit resultaat in overeenstemming met eerder empirisch onderzoek dat aantoont dat exportpromotie met name een zinvol instrument is bij het stimuleren van exporteren door bedrijven in landen met lage of middelhoge inkomensniveaus en minder in het bevorderen van de export in ontwikkelde economieën zoals Nederland.

Het doel van de verschillende onderzoeken in deze dissertatie is om met betrekking tot de relatie tussen internationalisering van bedrijfsactiviteiten en verschillende dimensies van bedrijfsprestaties een aantal lacunes in de bestaande kennisbasis en kwesties waar nog geen consensus is bereikt te adresseren. Dientengevolge dragen de empirische onderzoeken in deze dissertatie bij aan een dieper begrip van de mechanismen onderliggend aan de geobserveerde heterogeniteit in de relatie tussen internationalisering en bedrijfsprestaties.

Curriculum Vitae

Marcel van den Berg (1980) was born in Amersfoort, the Netherlands, and completed his education at the Revius Lyceum in Doorn in 1999. He studied Economics at the Erasmus University in Rotterdam and received his degree in 2005. From 2005 to 2010 he worked at SEO Economic Research in Amsterdam as a researcher in applied economics, mainly working on sector studies and social cost-benefit analysis. In September 2010, he started working on his dissertation as a PhD candidate at the Utrecht University School of Economics at the chair of international macro-economics. To this end, he also worked as a guest researcher at Statistics Netherlands in Heerlen starting in September 2011. As of April 2014, he will take up a position as researcher at Statistics Netherlands.

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