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Abstract

Do firms engaging in international trade have higher or lower profit margins? It is well-established that more productive firms engage in trading activities and as a result have higher profit levels. We use two theoretical models (the Melitz model and the Egger-Kreickemeier model) to clarify the relationship between productivity, trade activity, and profit margins and derive three hypotheses: (I) profit margins rise as productivity rises for domestic firms, (II) profit margins rise as productivity rises for trading firms, and (III) profit margins are not higher for trading firms than for domestic firms. We test these hypotheses using detailed micro-data for Finland (2005-2010) and the Netherlands (2002-2010). We find strong support for hypothesis I (in favour of the Melitz model), hypothesis II (in favour of both models), and hypothesis III (in favour of the Egger-Kreickemeier model). A propensity score matching analysis provides further support for hypothesis III.

Key words: profit margins, productivity, trade

JEL classes: F14, L25

1 Introduction

Are firms engaging in international trade more profitable than domestic firms? The assumption of profit maximization is at the heart of economic theory regarding firm behavior. Although recent surveys (Wagner, 2012b; Melitz and Redding, 2014) list many studies providing empirical evidence that internationally competing firm are on average more productive than domestically competing firm, the number of studies on the differences in profitability is much smaller and covers only a few European countries. As we discuss below, the fact that these few studies do not lead to clear conclusions regarding the relationship between internationalization and profitability, in contrast to the positive connection with productivity, seems puzzling to researchers in search for a positive link between these two forces. We argue that this confusion arises from not clearly distinguishing between profit levels and profit margins, as well as not clearly identifying the impact of productivity.

Naturally, one expects, other things equal, that more productive firms are also more profitable. The point is, of course, that other things are not equal. First, more productive firms tend to self-select into internationalization activities (exports, imports, and two-way trade). Associated with these activities are additional costs and investments related to selling and buying on international markets, such as market research, locating foreign trade partners, or modifying products to comply with local regulations and preferences. Second, more productive firms generally have a higher skilled and more productive workforce, which requires paying higher wages and thus leads to higher costs (Egger and Kreickemeier, 2012).

Theoretical models regarding the behavior of individual firms on international markets are based on the notion that a firm engages in internationalization if the expected profit level from doing so is positive, leading to self-selection of more productive firms (able to pay for the additional costs) into internationalization activities (Clerides, Lach, and Tybout, 1998; Melitz, 2003; Egger and Kreickemeier, 2012). The marginal trading firm and the firms with a productivity level slightly above it, thus engage in trade activities. This leads to a (slightly) higher profit level and increase in the scale of production, but also to a decline in profit margins as the margin on the trading activities is close to zero, in contrast to the profit margin on domestic sales.

The relatively small number of empirical studies on the link between profit margins and internationalization compared to the large number of studies on the link between productivity and internationalization is mainly caused by the additional informational requirements needed to adequately calculate profitability. The link between internationalization and profitability is, how-

ever, important from an empirical and practical point of view. Financial analysts generally evaluate firm performance based on information provided in financial statements in which profitability indicators play an important role (Robinson, van Greuning, Henry, and Broihahn, 2012). Profitability information is thus crucial in the decision making process of investors, thereby affecting the availability of funds for the firm. Consequently, various studies[1] have found that firms with low profitability levels, as measured by the return on assets (ROA) or net profit margins, are most likely to exit the market. Low profit margins can also lead to mass layoffs of employees and downsizing (Marques, Conzález, and Cruz, 2011; McKinley, Zhao, and Rust, 2000). An empirical study on the relations between internationalization and profitability is therefore welcome from a practical point of view. We contribute to the existing literature in two ways.

First, we use two theoretical models, namely the Melitz (2003) model and the Egger and Kreickemeier (2012) model, to clarify the relationship between productivity, trade activity, and profit margins and derive three hypotheses: (I) profit margins rise as productivity rises for domestic firms, (II) profit margins rise as productivity rises for trading firms, and (III) profit margins are not higher for trading firms than for domestic firms.

Second, we test these hypotheses empirically using two detailed, firm level data sets for two European countries: Finland and The Netherlands. As Hamermesh (2000, p. 376) puts it, we believe that *"the credibility of a new finding that is based on carefully analyzing two data sets is far more than twice that of a result based only on one".*

We analyse four different main sectors, namely manufacturing sectors in both countries, services sectors in Finland, and wholesale & retail trade in the Netherlands. We also identify three types of trading firms (exporting firms, importing firms, and two-way traders) for all main sectors, except for the services sector in Finland (where we identify only two types of trading firms, importers and services exporters). In total this gives us 11 different tests (3*3+2) of our three hypotheses. We find strong support for hypothesis I for all tests (in favour of the Melitz model), strong support for hypothesis II for all tests (in favour of both models), and relatively strong support for hypothesis III (namely 10 out of 11 tests; which is in favour of the Egger-Kreickemeier model). Our propensity score matching analysis provides further support for hypothesis III.

The paper is organized as follows. Section 2 briefly discusses the existing empirical literature on the relationship between internationalization and

[1]E.g. Bottazzi, Grazzi, Secchi, and Tamagni, 2011, Iwasaki, 2014, Tamminen, 2016, Bridges and Guariglia, 2008 and Ilmakunnas and Topi, 1999.

profitability. Section 3 reviews the theoretical framework for this relationship and derives simple testable hypotheses. Section 4 introduces the Finnish and Dutch data sets used in the analysis. Section 5 discusses the measurement of profitability and the methodology adopted in the empirical analysis. Section 6 presents our empirical findings and Section 7 concludes.

2 Firm heterogeneity and profitability

We briefly review the empirical studies on the link between internationalization and profitability, both from an international economics point of view (where there are relatively few studies in the firm heterogeneity literature) and an international business point of view (where there are many, mainly survey-based and small sample studies).

Various theoretical and empirical studies implicitly or explicitly expect that the productivity premium for exporters translates into a profitability premium as well, see (Wagner, 2012b) for a survey.[2] On the link between profitability and internationalization he notes, however, that: "As of today, a big picture has not emerged". Girma, Görg, and Strobl (2004), employing a series of Kolmogorov-Smirnov tests, find no significant difference between domestic non-exporters and domestic exporters for the profits per employee. Grazzi (2012) finds no significant relationship between exporting and profit margins in Italy, which is 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, but a small negative premium if the share of exports in total sales is small. Kox and Rojas-Romagosa (2010) present evidence for the Netherlands that profits per employee in exporting firms are higher and that more profitable firms seem to self-select into exporting.[3]

In the field of international business, the relationship between internationalization and firm performance has been heavily debated over the past decades. In their meta-analysis Bausch and Krist (2007, p 320) summarize the current state of affairs in a series of citations as: "inconsistent", "mixed",

[2]Our discussion in this section is based on this survey, see in particular Table 5 of Wagner (2012b, p. 257-258).

[3]Differences between our findings and those 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.

"decidedly mixed", "contradictory", "inconsistent and contradictory", "inconclusive and contradictory", and "conflicting".[4] Similarly, Sousa (2004) reviews 43 empirical papers published between 1998 and 2004 and argues that little consensus has been reached in the field, which has produced contradictory and fragmented findings thus far. An important drawback of this type of research in international business management is the fact that the performance of, for example, exporters is not related to that of importers, two-way traders, or domestic 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. Moreover, since many studies are survey-based, contain relatively small samples, use different methodologies, and rely on various measures of internationalization and profitability, generalization of the findings is a delicate endeavor.

The main conclusion we draw from the discussion above is that no consensus has been reached thus far regarding the link between internationalization and profitability, neither in the field of international economics nor in international business management.

3 Theoretical framework

To link the empirical findings to some basic theoretical frameworks, we briefly analyze profitability for domestic and exporting firms in the Melitz model and the Egger-Kreickemeier model. As noted above, the decision to produce at all and the decision to engage in export activity are based on the profit *level* associated with these activities.[5] Let φ denote the firm's productivity level, $r_d(\varphi)$ the domestic revenue generated by a firm with this productivity level, $\pi_d(\varphi)$ its domestic profit level, $r_x(\varphi)$ the export revenue, and $\pi_x(\varphi)$ its export profit level. Obviously, both domestic and foreign revenue and both domestic and foreign profits are rising functions of productivity. In both settings below, there are threshold productivity levels φ_d^* and φ_x^* for viability and exporting, respectively, such that firms engage in domestic production if $\varphi \geq \varphi_d^*$ and in export activity if $\varphi \geq \varphi_x^*$. In both settings, the exporting threshold is higher than the viability threshold: $\varphi_x^* \geq \varphi_d^*$. We therefore first have a range of productivity levels in which the firm is not viable, followed by a range of productivity levels in which the firm only produces for the

[4]Based on 36 studies from 25 years of research (41 samples, N=7,792) they nonetheless suggest that internationalization fosters firm performance, although the link is heavily affected by other characteristics, such as the size and age of the firm.

[5]To streamline the analysis we investigate only a 2-country model, but the symmetric multi-country analysis is straightforward.

domestic market, and concluded by a range of productivity levels in which the firm sells both domestically and on the export market. Since we are interested in the profitability of firms, that is the profit margin and not the profit level, we measure this by dividing the profit level by the firm's total revenue and label it $\tilde{\pi}$.

3.1 Profit margins in the Melitz model

In the Melitz model operating profits are a fraction $1/\sigma$ of the firm's revenue in the respective market, where $\sigma > 1$ is the price elasticity of demand. Before the firm can engage in production it has to overcome a fixed cost equal to f_d in the domestic market and equal to f_x in the foreign market. Firms engaged in exports incur higher marginal costs at the rate $\tau > 1$ (per unit iceberg costs). To ensure that the above discussed partitioning of firms by export status holds (which is widely observed empirically) Melitz assumes (as do we) that $f_x > \tau^{1-\sigma} f_d$. In the Geographical Economics literature the parameter combination $\tau^{1-\sigma}$ is generally referred to as the 'free-ness of trade', see Brakman, Garretsen, and van Marrewijk (2009).[6] We use $\alpha \equiv \tau^{1-\sigma}$ for this free-ness of trade, which will be useful also in this setting.[7] Note that the free-ness of trade ranges from zero (when τ is arbitrarily large for any given σ) to one (when $\tau = 1$). The partitioning condition above can then be written as $f_x > \alpha f_d$.

$$\tilde{\pi}_j(\varphi) \equiv \frac{\pi_j(\varphi)}{r_j(\varphi)} = \frac{\left[\frac{r_j(\varphi)}{\sigma}\right] - f_j}{r_j(\varphi)} = \frac{1}{\sigma} - \frac{f_j}{r_j(\varphi)};\ j = d, x;\ \varphi_j^* \leq \varphi \qquad (1)$$

The main characteristics for profitability in the domestic and foreign markets are simple to derive, see equation 1. Since the profit level is zero at the threshold productivity level, so is profitability at this point: $\tilde{\pi}_d(\varphi_d^*) = 0 = \tilde{\pi}_x(\varphi_x^*)$. Since revenue rises with productivity, so does profitability: $\tilde{\pi}_d{}'(\varphi) > 0$ and $\tilde{\pi}_x{}'(\varphi) > 0$, with an upper bound of $1/\sigma$ in both cases: $\lim_{\varphi\to\infty} \tilde{\pi}_d(\varphi) = \lim_{\varphi\to\infty} \tilde{\pi}_x(\varphi) = 1/\sigma$.

It is also straightforward to rank the profitability in the domestic market relative to the profitability in the foreign market. More precisely, using the fact that the revenue in the foreign market is a fraction α (indeed, the free-ness of trade) of the revenue in the domestic market ($r_x(\varphi) = \alpha r_d(\varphi)$), it

[6] Also referred to as the New Economic Geography literature.

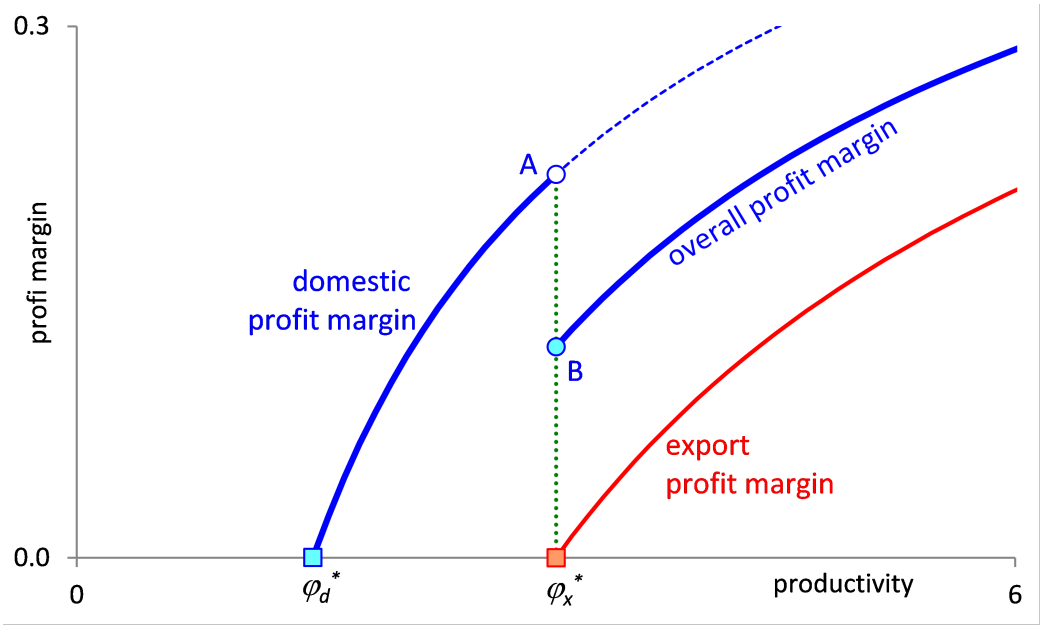
[7] The literature mostly uses ϕ for the free-ness of trade, but we want to avoid confusion between ϕ and φ.

follows that profitability in the foreign market is lower than in the domestic market if, and only if, $f_x > \alpha f_d$ since:

$$\tilde{\pi}_x(\varphi) = \frac{1}{\sigma} - \frac{f_x}{r_x(\varphi)} < \frac{1}{\sigma} - \frac{f_d}{r_d(\varphi)} = \tilde{\pi}_d(\varphi) \iff \frac{f_x}{r_x(\varphi)} > \frac{f_d}{r_d(\varphi)} \iff$$
$$\frac{f_x}{\alpha r_d(\varphi)} > \frac{f_d}{r_d(\varphi)} \iff f_x > \alpha f_d$$

This is the same condition as the condition for the partitioning of firms by export status already discussed above (and assumed to hold). Profitability in the export market is thus lower than profit margin in the domestic market for any arbitrary level of productivity.

Figure 1: Profitability in the Melitz model



Now that we have discussed profitability in the two separate markets, we are also able to determine the (overall) profitability that we should observe for firms producing only for the domestic market (with productivity between the domestic threshold and the exporting threshold) and for firms also engaged in exporting (with productivity above the exporting threshold). For firms producing only for the domestic market, this profitability is simply equal to domestic profitability. If we recall that $r_x(\varphi) = \alpha r_d(\varphi)$, it is clear that for

firms that also export, the overall profitability is equal to a weighted average of domestic profitability and export profitability.

$$\tilde{\pi}(\varphi) = \begin{cases} \frac{\pi_d(\varphi)}{r_d(\varphi)} = \tilde{\pi}_d(\varphi); & \text{for } \varphi_d^* < \varphi < \varphi_x^* \\ \frac{\pi_d(\varphi)+\pi_x(\varphi)}{r_d(\varphi)+r_x(\varphi)} = \frac{1}{1+\alpha}\tilde{\pi}_d(\varphi) + \frac{\alpha}{1+\alpha}\tilde{\pi}_x(\varphi); & \text{for } \varphi_x^* \leq \varphi \end{cases} \tag{2}$$

Figure 1 summarizes our findings. We do not observe any firms below the domestic threshold φ_d^*. Firms producing only for the domestic market start with a profitability of zero at the domestic threshold, which rises to a maximum denoted by point A in Figure 1 for firms approaching the export threshold φ_x^*. The marginal exporting firm at the export threshold is confronted with a fall in profit margin (but not in profit level) at point B in Figure 1 because its overall profit margin is a weighted average of profit margin in the two markets and profit margin in the domestic market is always higher than in the export market for any given profitability level. As productivity rises without bound, the overall profit margin of the firms engaged in exporting can be higher than that of even the most productive domestic firm as both domestic profit margin and export profit margin approach the same upper bound $1/\sigma$ (which must therefore also hold for its weighted average), which is higher than the productivity at point A. Whether such firms exist is an empirical matter also discussed below.

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

The Egger-Kreickemeier model incorporates similar firm heterogeneity features as the Melitz model. First, there is a viability threshold, such that the least productive firms do not produce. Second, there is a higher exporting threshold, such that only the most productive firms export and we have a partitioning of firms by export status. Third, there are higher marginal costs associated with exporting (iceberg costs τ) as well as fixed costs f_x. Fourth, there are (productivity) gains from trade.

There are, however, also several distinguishing features of the Egger-Kreickemeier model. Production in firms requires two types of labour: one manager and a range of workers. The ability of the manager determines productivity and the number of workers to hire. The labour market is based on a variant of the fair-wage effort mechanism developed by Akerlof and Yellen (1990). In bargaining with the firm, the workers take into consideration (i) a reference wage (which depends on unemployment and the average wage paid elsewhere) and (ii) the firm's performance (based on operating profits). As

a consequence, more productive firms pay higher wages, as is observed empirically. In addition, because of the discontinuity associated with operating profits once productivity reaches the export threshold, exporting firms pay an extra wage premium, as is also observed empirically.

For simplicity we use the same notation for profitability, the profit level, and revenue as in the Melitz model. Note, however, that the underlying functions are of course different. The discontinuity mentioned above results in a slight complication. Since exporting firms pay strictly higher wages than firms only producing for the domestic market for the same productivity level, the associated functions differ as well. We denote this by an extra sub-index x, that is $r_d(\varphi)$ denotes revenue in the domestic market for firms only producing in the domestic market and $r_{dx}(\varphi)$ denotes revenue in the domestic market for firms that also export, and so on.[8]

The Egger-Kreickemeier model is quite ingenious in the way it determines the viability and exporting thresholds. Economic agents can decide to become either a manager, a production worker, or a local expert for exporting firms. The agents can be ranked according to their management abilities (which determines firm productivity). An agent becomes a manager if the profit level she can reach is at least equal to the reference wage mentioned above. This determines the viability threshold φ_d^*, with only the most able managers becoming entrepreneurs. To engage in export activity, the firm needs to hire a local expert in the destination market. She will have to be paid the reference wage in order to get involved, which determines the fixed cost for exporting f_x and the export threshold φ_x^*. Note that the fact that the fixed costs for exporting are endogenously determined has no material consequences for the rest of our discussion.

As in the Melitz model, operating profits are a fraction $1/\sigma$ of the firm's revenue. Since an economic agent becomes a manager if the profit level exceeds the reference wage and does not incur any fixed costs, the profit margin is equal to $1/\sigma$ for these firms. For the firms engaging in export activity the export revenue is a fraction α of its domestic revenue (as in the Melitz model). Since the exporting activity does incur fixed costs to pay the local expert the profit level is thus: $\frac{(1+\alpha)r_{dx}(\varphi)}{\sigma} - f_x$. This implies that the profitability for exporting firms is lower than for domestic firms:

$$\tilde{\pi}(\varphi) = \begin{cases} \frac{\pi_d(\varphi)}{r_d(\varphi)} = \frac{1}{\sigma}; & \textit{for } \varphi_d^* < \varphi < \varphi_x^* \\ \frac{\frac{(1+\alpha)r_{dx}(\varphi)}{\sigma} - f_x}{(1+\alpha)r_{dx}(\varphi)} = \frac{1}{\sigma} - \frac{f_x}{(1+\alpha)r_{dx}(\varphi)}; & \textit{for } \varphi_x^* \leq \varphi \end{cases} \tag{3}$$

Figure 2: Profitability in the Egger-Kreickemeier model

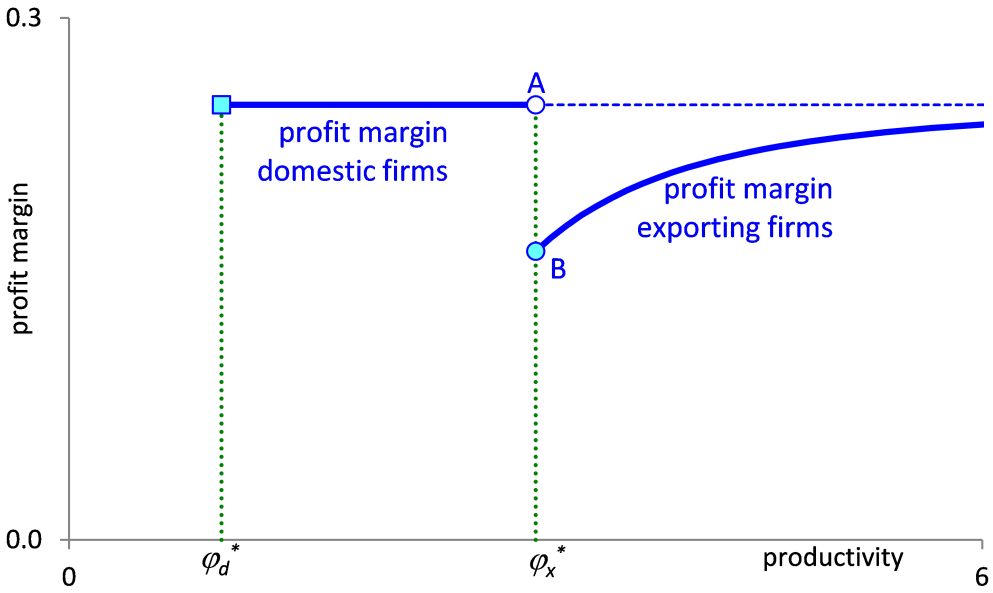


Figure 2 illustrates our findings for profit margins in the Egger-Kreickemeier model. The number of firms is determined by equality of the (endogenous) reference wage with the profit level of the marginal firm, which determines the viability threshold φ_d^*. Wages rise as the profit level rises, but the mark-up does not change. For domestic firms this implies that profitability is constant throughout its range. Firms start to export once the combined profit level from exporting and the domestic sales exceed that of supplying only the domestic market.[9] Since these firms incur a fixed cost to engage in exporting activity, profitability drops discontinuously from A to B at the export threshold φ_x^*. The profit margin returns back to $1/\sigma$ from below as productivity increases.

3.3 Empirical implications

What are the testable empirical implications from the above discussion regarding the link between trade and profitability? We summarize these in the

[8]Because of the higher wage rate paid by exporters: $r_d(\varphi) > r_{dx}(\varphi)$, but remember that the firms are partitioned by productivity in equilibrium such that there is no overlap.

[9]Since exporting firms pay a strictly higher wage the marginal exporting firms has lower profits on the domestic market which must be compensated by positive profits on the export market.

following hypotheses.[10]

I Melitz Hypothesis: Profit margins rise as productivity rises for domestic firms.

II Trade-Productivity-Profitability Hypothesis: Profit margins rise as productivity rises for trading firms.

III Egger-Kreickemeier Hypothesis: Profit margins are at least as high for domestic firms as for trading firms.

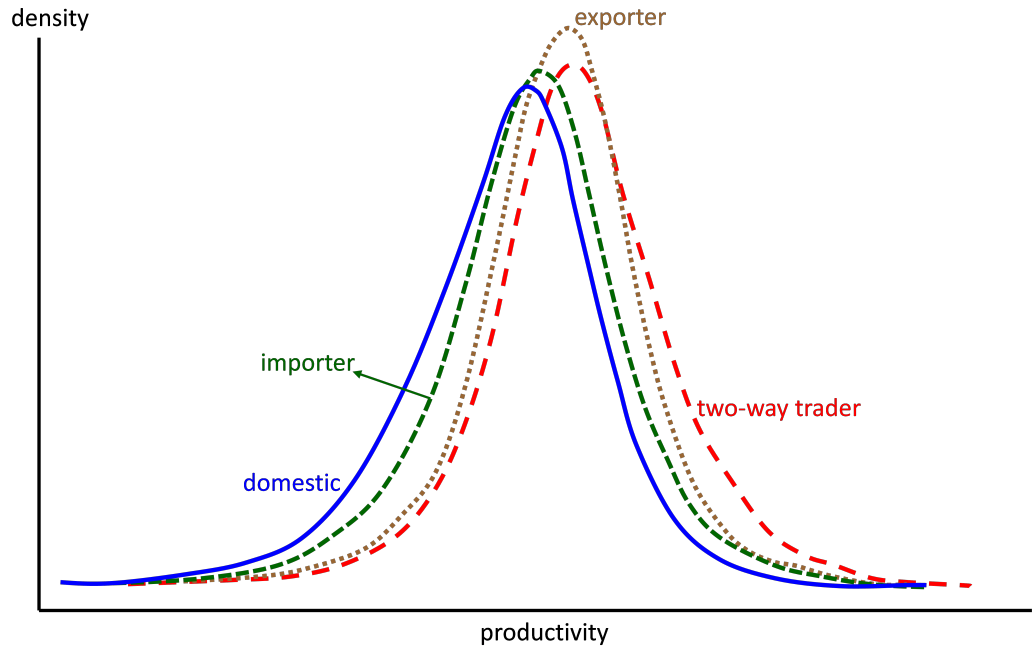
Hypothesis I on rising profit margins as productivity increases for domestic firms only holds for the Melitz model and not for the Egger-Kreickemeier model (where the profit margin is constant). This thus provides a clear distinction between the two models.

Hypothesis II holds for both models: profit margins rise as productivity increases for exporting firms, see Figures 1 and 2. Empirical support for this hypothesis is thus required for both models, but does not allow us to distinguish between the two models.

Hypothesis III only holds for the Egger-Kreickemeier model, where exporting firms have lower profit margins. We cannot draw the same conclusion for the Melitz model, where exporting firms can have both lower and higher profit margins than domestic firms.

[10]We phrase the hypotheses derived from an export perspective in a broader trade perspective (imports, exports, and two-way trade) since a similar analysis can be used to derive the same conclusions under those circumstances.

Figure 3: Productivity distributions for different types of Dutch manufacturing firms



Source: authors' calculations based on firm level data 2002-2010; horizontal axis represents firm level log labor productivity; vertical axis represents kernel density at that particular productivity level.

Although the Melitz model is thus not falsifiable regarding the profit margin ranking of domestic relative to exporting firms (hypothesis III), it does show that we should not be surprised if exporting firms have lower profit margins. We can go one step further if we look at the empirical distribution of productivity for domestic firms relative to different types of trading firms. This is shown for Dutch manufacturing firms in Figure 3 to illustrate two points. First, there is a certain ranking in trade type (as has been found many times before); in this case (from low to high): domestic firms - importers - exporters - two-way traders.[11] Second, there is considerable overlap in productivity for the different firm types, suggesting that most of the mass of

[11] A similar ranking holds for manufacturing firms in Finland and wholesale & retail trade firms in the Netherlands. For services firms in Finland the ranking is the same, but without the two-way trader group, which cannot be distinguished from the data.

trading firms is close to the threshold.[12] Combining this information with the theoretical implications of the Melitz model illustrated in Figure 1 suggests that empirically many trading firms will be in the range where profitability is lower than for many domestic firms. This strengthens the suggestion that we should not be surprised to find profitability to be higher for domestic firms, even in the Melitz model.

4 Data

For the empirical analysis we employ firm-level micro-data from Finland and the Netherlands. In order to gain an understanding of the consistency and robustness of our findings we run the analysis separately for both countries. The main aim of the data preparation process is to maximize the comparability of the Finnish and the Dutch data, particularly regarding the profitability measures employed.

4.1 Finland

For the Finnish analysis we use data from the Finnish tax authorities which includes information on corporate tax declarations and income tax declarations of entrepreneurs. The database covers essentially all Finnish firms operating in all sectors. This study analyzes Finnish data from 2005 until 2010. The tax database includes detailed financial accounts and balance sheet information for each firm and each year. The data is transformed to constant 2005 prices. Firms are classified into four size categories according to the official EU-classification.[13] Micro-sized firms are included in the analysis, except for firms with less than 4 employees.[14]

In addition to the main tax database, value added tax (VAT) records are used for the identification of goods and services exporters and firms importing

[12] See Chang and van Marrewijk (2013) for Latin America and Melitz and Redding (2014) for a review.

[13] Firms are classified into four groups: micro (less than 10 employees), small (10-49 employees), medium (50-249 employees), and large (at least 250 employees) firms according to the definitions of the European Union (see http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/).

[14] The analysis excludes self-employed and other firms with less than 4 employees. Finnish tax legislation provides an incentive for owners of small firms to pay themselves very low salaries and artificially increase the pre-tax profits of the firm. This way they can obtain lower taxation on their income, since profits have been 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.

goods from the EU. Exporters identification is only possible in selected service sectors due to data limitations.[15] Firms belonging to other service sectors are not included in the analysis. The database also allows the identification of multinational firms, which are identified from the legal form of the firm and from the information on foreign subsidiaries. The firms are grouped into 70 sectors, which correspond roughly to a combination of NACE 2 and 3-digit classifications. Since services and manufacturing exporters have typically different types of production processes, manufacturing sectors and service sectors are considered separately.[16] After merging of the two main databases, we obtain an unbalanced panel database of 122,621 observations (excluding outliers) from 34,941 firms for the period 2005-2010.

4.2 The Netherlands

For the empirical analysis for the Netherlands 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 2010.[17]

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.[18] Analogous to the Finnish data we eliminate firms with less than 4 employees from the analysis because comparable tax incentives apply to small firms in the Netherlands. We take from a related database information concerning the ultimate controlling institution of the firm being either Dutch or 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 transformed using separate sector level price indices. Because of

[15]The procedure for the identification of each firm's export status in each year is explained in detail in Tamminen and Chang (2012).

[16]Firms classified to NACE, rev.2 sectors from A to E are grouped to the manufacturing sectors class.

[17]We confine ourselves to discussing some key characteristics of each data source in this paper. For details regarding the merging procedure see Van den Berg (2014).

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

their fundamentally different nature, we separate the data into two main sectors, manufacturing, and wholesale & retail trading sectors.[19]

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.[20] 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).[21]

5 Empirical methodology

5.1 Measuring profitability

There are, of course, several ways to measure profitability empirically. Although some business people are interested in analysing profits per employee[22], most investors use indicators based on margins and returns from financial statements to assess the profitability, performance and attractiveness of a firm as an investment (Robinson, van Greuning, Henry, and Broihahn, 2012).[23] We concentrate our analyses on gross profit margins and net profit margins as these are the profitability indicators most related to the

[19]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. It is therefore more appropriate to separate these sections from typical (financial and public) service sectors.

[20]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.

[21]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.

[22]http://www.mckinsey.com/insights/strategy/the_new_metrics_of_corporate_performance_profit_per_employee

[23]They may also use indicators defined per dividend or per share, but most of the data we have available does not include that kind of information.

theoretical expectations derived in section 3.[24]

As we have information on the firm's revenue R and its variable costs VC, we can measure the gross profit level (π_G) as the difference between R and VC and gross profit margin GPM as the ratio of this relative to R, see equation 4.[25] Further, since we know the fixed cost of production FC and the fixed costs for exporting FC_X (which is zero for domestic firms) we can calculate net profit margin NPM, see equation 5.

$$GPM = \frac{\pi_G}{R} = \frac{R - VC}{R} \tag{4}$$

$$NPM = \frac{\pi_N}{R} = \frac{R - VC - FC - FC_X}{R} \tag{5}$$

5.2 Empirical methodology

We start the empirical analysis by investigating the correlation between export status, productivity and profit margins with pooled OLS 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 profit margins on export status, due to a sample selection bias. The purpose of the regressions in the first stage is thus to provide us an indication of the correlation between export status, productivity and the profit margins we employ and to test the hypotheses derived from the theoretical models.

The pooled ordinary least squares (OLS) regressions (see equation 6) provide a general correlation between profitability, trade status and productivity; the triangular relationship we are interested in. In addition, as a robustness test we estimate fixed effects panel regressions to control for unobserved firm-specific heterogeneity. However, in the fixed effects specifications the relationship between trade status and profitability only reflects the correlation between the two variables for the subset of firms that switch trade status in the observed time frame. Therefore, the pooled OLS model is our preferred specification bearing our hypotheses in mind. The panel regression model is

[24] We have done sensitivity analyses by analysing also returns on assets ROA, measured by net profit level divided by the value of assets, and gross profits per employee (GPE) in a similar way as gross profit margin GPM and net profit margin NPM. ROA and GPE analyses return relatively similar final conclusions on the relationship between internationalization status, profitability and productivity and therefore their results are not presented here. These results can be obtained from the authors upon request.

[25] Only the cost of capital, depreciations and incidental expenses are considered a fixed cost in the short run, all other cost categories are considered variable.

of the form:

$$\frac{\pi_{Xijt}}{\pi_{Rijt}} = \alpha + Y'_{ijt}\beta_1 + \varphi_{ijt}\beta_2 + (Y_{ijt} * \varphi_{ijt})'\beta_3 + Z'_{ijt}\gamma + \epsilon_{ijt}, \tag{6}$$

where $\frac{\pi_{Xijt}}{R_{ijt}}$ refers to profit margin π_X of firm $i \in I$ from sector $j \in J$ in year $t \in T$ relative to the sector j's mean profit margin over sales; Y_{ijt} refers to a matrix of dummy variables for the trade status of the firm; φ_{ijt} to (the log of) labor productivity (defined as value added per employee)[26] and $Y_{ijt} * \varphi_{ijt}$ to a set of interaction terms between trade status and productivity. Non-trading firms mark the reference group, implying that α captures the correlation between being a non-trader and profitability. The correlation between trade status and profitability thus depends on β_1, β_3 and on labor productivity as equation 7 shows.

$$\frac{\partial \frac{\pi_{Xijt}}{\pi_{Rijt}}}{\partial Y} = \beta_1 + \varphi_{ijt} * \beta_3, \tag{7}$$

The matrix of control variables, Z_{ijt} includes the export share in total sales, a dummy for exporters during the years of the Great Recession from 2008 to 2009 (exports declined significantly during these years and this has been found to have affected also exporters' profit margins significantly), (the log of) firm size in terms of employment, and a dummy variable indicating whether the firm is under foreign control/multinational.[27] In addition, we control for the (log of) capital-labor ratio measured by the book value of total assets over employment. This variable is expected to be an important determinant of profit margins. However, due to suspected endogeneity with other explanatory variables (such as with the multinational dimension) we include this variable to the model in a stepwise fashion.

It should be noted that the firm size coefficient provides a mere correlation due to the endogeneity between profit margins and firm size.[28] Albuquerque (2009) argues that size and industry specific groups provide the best view on

[26]With Dutch data were run the regressions also with total factor productivity (TFP) instead of labor productivity to control for the sensitivity of the results with regards to the productivity measure included. The regression results were not significantly different between the two productivity measures.

[27]In the Dutch data, 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. For Finland we control for whether the firm is a multinational or not. A firm is classified as multinational if it has a subsidiary abroad or if it is classified as foreign firm or foreign subsidiary to the tax authorities.

[28]While larger firms can decrease the fixed costs per unit of production and increase profitability this way, profitability measures have been found to impact also the employment level of the firm as mentioned in section 1.

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 have been included in the control variables. In addition, since investors generally require a risk premium for financing start-ups, we would like to control for the age of the firm. Unfortunately this information is not available. However, the included control variable for firm size typically correlates with firm age. μ_i represents the firm fixed effect included in the fixed effects models, which capture unobserved firm specific factors, such as the quality of management, that affect both the decision to export and profitability of the firm. Finally, ϵ denotes the error term.

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, 2007), we employ propensity score matching (PSM) to investigate if export starters convert to a different profit margin's 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 8).[29]

$$Pr(exp_{ijt} = 1) = \alpha + Y'_{ijt-1}\beta + Z'_{ijt-1}\gamma + \epsilon_{ijt-1}, \tag{8}$$

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 / multinational, 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 used resemble the procedure pre-

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

sented by Ilmakunnas and Nurmi (2010)[30] and Arnold and Hussinger (2005) who find that in particular 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 in the appendix for the exact definition of the various cohorts that serve as input for the propensity score matching analysis). Firms that remain non-exporting represent the control group. The probit-regressions are run separately for each combined cohort of export starters and continuing non-exporters. We run in total 4 annual probit-regression for manufacturing and 4 probits for services sectors for Finland and 7 annual probit-regression for manufacturing and for wholesale & retail sectors separately for the Netherlands.

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.[31]

[30] The estimated propensities of becoming an exporter in Finland are remarkably similar to the findings of Ilmakunnas and Nurmi (2010) when we align our data set with theirs and limit the sample to firms with a minimum size of 20 employees.

[31] 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 abstain from estimating and evaluating exact p-values and only construct bias-corrected 95% confidence intervals.

6 Empirical findings

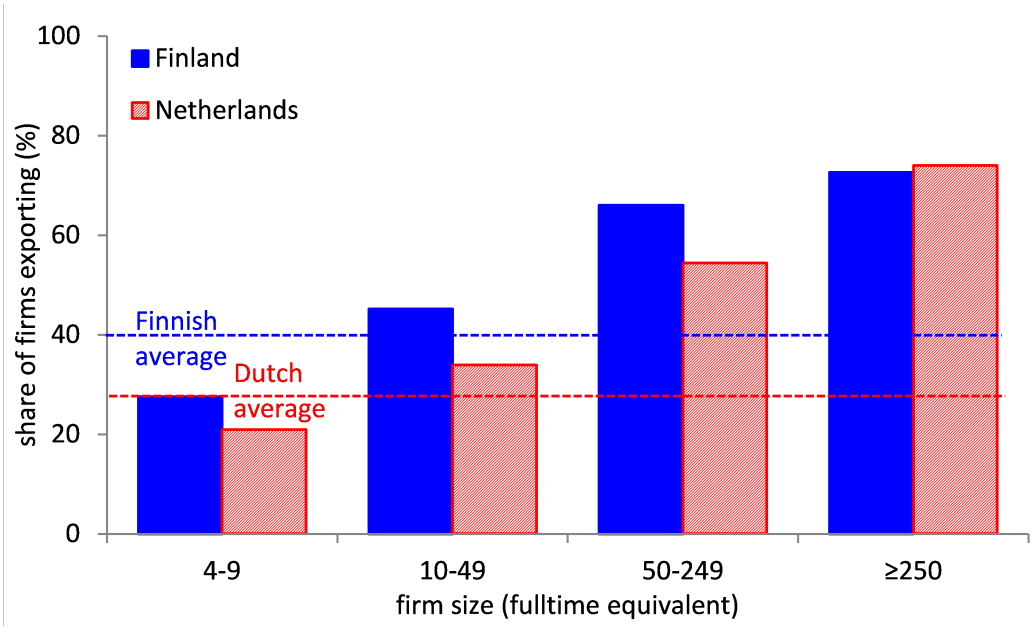
The results presented in this section are based on separate analyses of the data sets concerning Finland and the Netherlands. Table 1 provides information on the dimensions of the panel data for both countries and the propensity to export. Panel a of the table shows that the available number of observations is about four times larger for the Netherlands than for Finland, namely about 500,000 versus 120,000 observations. This can be explained by the relative size of both economies and the fact that the panel regarding the Netherlands includes three more years (2002-2010 compared to 2005-2010). For both countries the number of observations declines as firm size rises, such that the majority of observations is for micro firms (ranging from 42 to 65 percent) and for small firms (ranging from 32 to 44 percent). Taken together the micro firms and small firms account for at least 86 percent of the observations in Finland and 94 percent in the Netherlands. The lower number in Finland reflects the fact that the share of medium sized firms is about twice as high as in the Netherlands (10.0 versus 4.3 percent) and the share of large firms is about six times as high (2.6 versus 0.4 percent).

Table 1: Number of observations and share of firms exporting

Firm size class	micro		small	medium	large	all
Fulltime equivalent	0-3	4-9	10-49	50-249	≥ 250	firms
a. Number of observations						
Finland						
manufacturing	excluded	24,278	25,402	6,680	1,602	57,962
services	excluded	32,022	23,687	5,429	1,566	62,704
total		56,300	49,089	12,109	3,168	120,666
Netherlands						
manufacturing	excluded	149,983	111,976	14,276	1,384	277,619
wholesale & retail	excluded	143,968	70,759	7,405	728	222,860
total		293,951	182,735	21,681	2,112	500,479
b. Share of firms exporting (%)						
Finland						
manufacturing	excluded	31.4	52.5	84.1	93.5	48.4
services	excluded	24.6	37.4	43.8	51.2	31.7
total		27.5	45.2	66.0	72.6	39.7
Netherlands						
manufacturing	excluded	13.2	26.0	51.0	71.1	20.6
wholesale & retail	excluded	28.9	46.4	61.0	79.4	35.7
total		20.9	33.9	54.4	74.0	27.3

Panel b of Table 1 provides the share of firms that are exporting, both as a whole and in different size classes. Although at the macro-level the Dutch economy is more trade-oriented than the Finnish economy, it is well-known that at the micro-level the export involvement of Dutch firms is relatively low in an international perspective (Mayer and Ottaviano, 2008). In addition, the share of exporting firms rises monotonically in firm size for both countries. This is illustrated in Figure 4, which shows that in Finland the share of firms that exports rises from about 28 percent for micro firms to 73 percent for large firms, with an economy-wide average of about 40 percent of all firms exporting. For the Netherlands the share of firms exporting rises from about 21 percent for micro firms (somewhat lower than in Finland) to 74 percent for large firms (which is about the same as in Finland), with an economy-wide average of about 27 percent of all firms exporting.

Figure 4: Share of firms exporting (%)



Source: see Table 1b, total rows.

6.1 Trading and profit margins

This sub-section briefly discusses the relationship between trading firms and profit margins based on detailed micro-level panel regressions, first for Finland (Table 2) and then for the Netherlands (Table 3). As already indicated,

we extend the hypotheses I-III derived for exporting firms also to importing firms and two-way traders, for which a similar framework can be used. We also discuss the implications for these hypotheses.

Table 2 provides an overview of profit margins in Finland for different types of firms. Columns 1-4 analyse the manufacturing sectors and columns 5-8 analyse the services sectors. Columns 1, 2, 5, and 6 focus on net profit margins and the other columns focus on gross profit margins. All regressions control for sector-year fixed effects, export share, firm size (measured in log employment), foreign ownership (multinational dummy), and an exporter dummy variable in 2008-9. In addition, the even columns 2, 4, 6, and 8 control for capital intensity (measured in log of capital-labor ratio).

Non-trading firms are the reference group in all regressions. For the manufacturing sectors we identify three more types of firms: (i) only exports, (ii) only imports, and (iii) two-way traders. This gives us six estimated coefficients on the link between trade and either net profit margins or gross profit margins (three without and three with a control for capital intensity). For the services sectors we identify two firm types in addition to non-traders, namely (i) only imports and (ii) services exporters.[32] This gives us four estimated coefficients on the link between trade and either net profit margins or gross profit margins (two without and two with a control for capital intensity).[33] In addition to the direct correlation between a firm's trading type and the profit margins, Table 2 also reports the direct correlations between a firm's productivity level and profit margins as well as the interaction between trading type and productivity.

[32]Only imports refers to firms that import from EU area, but do not export at all. Services exporters refer to service sector firms doing exports. Some of them are two-way traders, but valid identification of non-EU (service) imports is not available in the data. Therefore, two-way traders are not separated from pure exporters.

[33]We also ran the regressions for Finland on the subset of non-MNCs to exclude the possibility of artificially deflated profit margins tied to transfer pricing mechanisms. The results show that this does not affect the results to a noteworthy extent.

Table 2: Profit margins in Finland (OLS panel regressions, 2005-2010)

	manufacturing sectors				service sectors			
	net profit margin		gross profit margin		net profit margin		gross profit margin	
	1	2	3	4	5	6	7	8
non-trader	reference group							
only exports	-0.096	-0.036	-0.142*	-0.143*				
	(-1.74)	(-0.60)	(-2.41)	(-2.08)				
only imports	-0.107**	-0.086	-0.119**	-0.098*	-0.115*	-0.055	-0.035	-0.031
	(-2.63)	(-1.78)	(-3.09)	(-2.21)	(-2.01)	(-1.00)	(-0.81)	(-0.61)
2-way trader	-0.094**	-0.061	-0.119***	-0.106**				
	(-2.60)	(-1.43)	(-3.43)	(-2.67)				
service exp					-0.128***	-0.107*	-0.170***	-0.114*
					(-3.36)	(-2.34)	(-3.64)	(-2.23)
ln (*lab prod*)	0.056***	0.062***	0.051***	0.052***	0.068***	0.073***	0.065***	0.071***
	(26.76)	(22.48)	(25.37)	(20.36)	(32.72)	(23.54)	(26.34)	(18.82)
*Interaction terms with ln (*lab prod*)*								
only exports	0.009	0.003	0.012*	0.013				
	(1.62)	(0.58)	(2.15)	(1.90)				
only imports	0.009*	0.008	0.011**	0.009*	0.010	0.004	0.003	0.002
	(2.39)	(1.63)	(2.97)	(2.14)	(1.76)	(0.78)	(0.62)	(0.49)
2-way trading	0.007	0.004	0.009**	0.008*				
	(1.91)	(1.04)	(2.73)	(2.19)				
service exp					0.010**	0.009*	0.014**	0.009
					(2.80)	(2.02)	(3.05)	(1.81)
Wald test - H0: coefficients of labor productivity + labor productivity x trade status > 0								
only exports	1.000	1.000	1.000	1.000				
2-way trading	1.000	1.000	1.000	1.000				
service exp					1.000	1.000	1.000	1.000
# observations	51,249	39,284	51,073	39,091	58,360	45,288	57,943	44,911
R^2	0.292	0.312	0.224	0.232	0.307	0.315	0.207	0.206

All regressions include (not shown) as additional controls: sector-year fixed effects, exporter 2008-9 dummy, export share, firm size (ln), and multinational dummy; columns 2, 4, 6, and 8 in addition control for capital-labor ratio (ln); *, **, *** indicate statistically significant at 5, 1 and 0.1 percent level; t-statistics in (.)

We start with a discussion of hypotheses I and II on the relationship between productivity and profit margins for domestic and trading firms.

Regarding hypothesis I on domestic firms: for all eight regressions profit margins rise highly significantly as productivity rises for domestic firms. This strongly supports hypothesis I of the Melitz model and contradicts the Egger-Kreickemeier model.

Regarding hypothesis II on trading firms: based on the results from hypothesis I profit margins also rise with productivity for trading firms, unless the interaction between trading type and productivity would be sufficiently

strong and negative to overturn this outcome. This is not the case. Either the interaction term of trade type and productivity is not significant (in 11 cases, namely 6 for manufacturing and 5 for services) or it is significantly *positive* (in 9 cases, namely 6 for manufacturing and 3 for services), thus strengthening rather than weakening the link between profit margins and productivity for trading firms. This provides support for both the Melitz model and the Egger-Kreickemeier model.

We now turn to hypothesis III on the profit margins of trading relative to non-trading firms. This Egger-Kreickemeier hypothesis is supported if the estimated impact of trade type is either not significant or statistically significantly negative. *All* estimated coefficients meet this requirement and thus provide strong support for the Egger-Kreickemeier model. More specifically, for gross profit margins all 6 coefficients in manufacturing are significantly negative, compared with 2 in services (in addition to 2 coefficients that are not significant). Regarding net profit margins, 5 coefficients are significantly negative (2 for manufacturing and 3 for services) and 5 coefficients are not significant (4 for manufacturing and 1 for services).

Table 3 reports results for the Netherlands. The organization is similar, with non-trading firms as the reference group, columns 1, 2, 5, and 6 focusing on net profit margins and the other columns on gross profit margins, with the same control variables for each regression, controlling for capital intensity in the columns 2, 4, 6, and 8, and reporting manufacturing sectors in columns 1-4. The main differences are that we report results for wholesale & retail trade instead of services sectors in columns 5-8 and are able to identify the same type of trading firms in all columns, namely only exports, only imports, and two-way trader. There are thus six estimated coefficients on the link between trade and either net profit margins or gross profit margins (three firm types without and with controlling for capital intensity) for both manufacturing sectors and wholesale & retail trade.

Regarding hypothesis I on productivity and profit margins for domestic firms the results for the Netherlands are identical to those of Finland: for all eight regressions profit margins rise highly significantly as productivity rises for domestic firms. This thus supports hypothesis I of the Melitz model and contradicts the Egger-Kreickemeier model.

Regarding hypothesis II on productivity and profit margins for trading firms: the results for the Netherlands are the same as in Finland for manufacturing sectors and slightly different (but leading to the same conclusion) for wholesale & retail trade. More precisely, for the manufacturing sectors the interaction terms of productivity and trading type are either not significant (in one case) or statistically significantly *positive* (in 11 cases), thus

Table 3: Profit margins in the Netherlands (OLS panel regressions, 2002-2010)

	manufacturing sectors				wholesale & retail trade			
	net profit margin		gross profit margin		net profit margin		gross profit margin	
	1	2	3	4	5	6	7	8
non-trader	reference group							
only exports	-0.247***	-0.194***	-0.283***	-0.242***	0.165***	0.202***	0.074*	0.102**
	(-5.35)	(-4.27)	(-7.08)	(-6.00)	(4.48)	(4.36)	(2.33)	(2.69)
only imports	-0.055*	-0.061*	-0.085***	-0.064**	0.010	0.017	-0.034	-0.025
	(-2.21)	(-2.48)	(-3.69)	(-2.73)	(0.45)	(0.83)	(-1.86)	(-1.37)
2-way trader	-0.189***	-0.134***	-0.223***	-0.192***	-0.051**	-0.028	-0.108***	-0.091***
	(-8.31)	(-5.62)	(-10.85)	(-9.05)	(-2.85)	(-1.56)	(-6.79)	(-5.60)
ln(*lab prod*)	0.072***	0.109***	0.060***	0.077***	0.062***	0.089***	0.048***	0.067***
	(63.17)	(86.89)	(58.09)	(64.88)	(47.55)	(63.53)	(40.47)	(51.34)
*Interaction terms with ln (*lab prod*)*								
only exports	0.022***	0.018***	0.026***	0.022***	-0.016***	-0.019***	-0.008**	-0.011**
	(5.10)	(4.17)	(6.86)	(5.85)	(-4.76)	(-4.46)	(-2.75)	(-2.95)
only imports	0.004	0.005*	0.007**	0.005*	-0.002	-0.002	0.002	0.002
	(1.72)	(2.36)	(3.16)	(2.33)	(-1.11)	(-1.06)	(1.08)	(0.92)
2-way trader	0.016***	0.013***	0.019***	0.017***	0.003*	0.003	0.008***	0.008***
	(7.73)	(5.73)	(10.11)	(8.62)	(2.09)	(1.59)	(5.55)	(4.97)
Wald test - H0: coefficients of labor productivity + labor productivity x trade status > 0								
only exports	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2-way trader	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
# observations	269,362	265,514	269,122	265,287	214,796	212,010	214,651	211854
R^2	0.130	0.210	0.119	0.137	0.163	0.239	0.131	0.171

All regressions include (not shown) as additional controls: sector-year fixed effects, exporter 2008-9 dummy, export share, firm size (ln), and multinational dummy; columns 2, 4, 6, and 8 in addition control for capital-labor ratio (ln); *, **, *** indicate statistically significant at 5, 1 and 0.1 percent levels; t-statistics in (.)

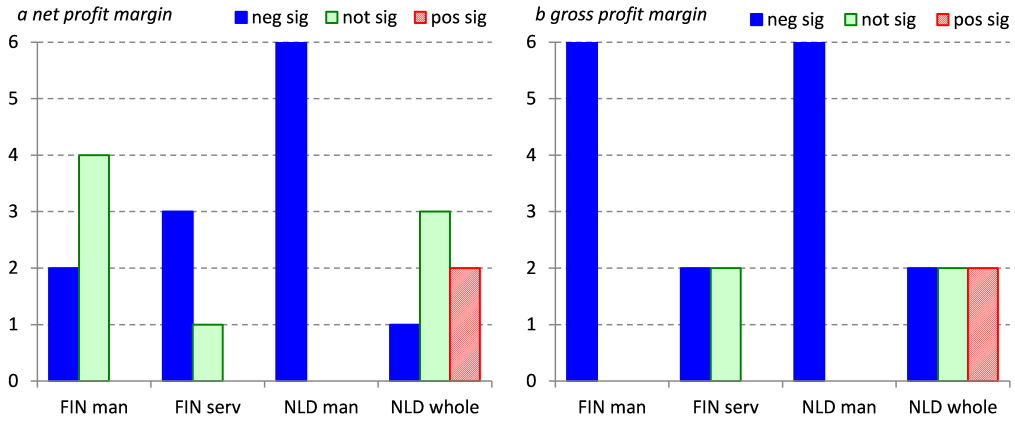
reinforcing the link of hypothesis I between productivity and trading type (as in Finland). For the wholesale & retail sector the interaction results are mixed: 5 coefficients are not significant (all 4 coefficients for only imports and 1 coefficient for two-way traders), 3 coefficients are significantly *positive* (and thus reinforce the direction of hypothesis II, all of these are for two-way traders), and 4 coefficients are significantly *negative* (all 4 coefficients for only exports). Since the significantly negative coefficients are not strong enough to overturn the general connection between productivity and proft margins, we still arrive at the same conclusion: for all trading firm types profit margins rise as productivity rises. This provides support for both the Melitz model and the Egger-Kreickemeier model.

Finally, we turn to hypothesis III on the profit margins of trading relative to non-trading firms for the Netherlands. Here the results are both stronger

and weaker than in Finland. The results are stronger in the Netherlands in the manufacturing sector where all 12 estimated coefficients are significantly negative for both gross profit margins and net profit margins: trading firms thus have a profit margin disadvantage relative to domestic firms, in accordance with hypothesis III and in support of the Egger-Kreickemeier model. The results are weaker in the Netherlands in the wholesale & retail trade sector. More specifically, they are in line with the findings in Finland for only importers and two-way traders, where the estimated coefficients are either not significant (in 5 cases) or significantly negative (in 3 cases). They are reversed, and thus in contradiction to hypothesis III, for only exporters, where all 4 estimated coefficients are significantly positive, indicating higher profit margins for only exporters than for domestic firms, in contrast to the Egger-Kreickemeier model.

Figure 5 summarizes the findings on hypothesis III for both Finland and the Netherlands. The strongest support is for manufacturing sectors in the Netherlands, where all estimated coefficients are significantly negative for all profit margins. The same holds for the gross profit margin for manufacturing sectors in Finland. Somewhat weaker support, but all results still in line with hypothesis III is provided by the net profit margin for manufactures in Finland, by the services sector in Finland, and by only importers and two-way traders for wholesale & retail trade in the Netherlands. The only exception to hypothesis III is thus provided by only exporters in wholesale & retail trade in the Netherlands.

Figure 5: Overview of profit margins and trading firms



Source: Tables 2, 3; overview of coefficients for all types of trading firms; neg sig = negative significant; not sig = not significant; pos sig = positive significant; significance at 5% or better; man = manufacturing; serv = services exporter; whole = wholesale & retail trade; FIN = Finland; NLD = Netherlands; all positively significant coefficients are related to only exporters in wholesale & retail trade.

Summary of empirical findings 1

We analyse hypotheses I-III for domestic firms and three different types of trading firms for manufacturing sectors in Finland and the Netherlands, services sectors in Finland, and wholesale & retail trade in the Netherlands, together representing 11 different cases. We find (strong) support for all hypotheses:

- Hypothesis I is supported in *all cases*: profit margins rise as productivity rises for domestic firms; this is in line with the Melitz model and contradicts the Egger-Kreickemeier model.
- Hypothesis II is supported in *all cases*: profit margins rise as productivity rises for trading firms; this is in line with both the Melitz model and the Egger-Kreickemeier model.
- Hypothesis III is supported in *almost all cases* (10 out of 11): profit margins for trading firms are lower than for domestic firms or not significantly different. The only exception is for exporting firms in the Dutch wholesale & retail sector. This is in line with the Egger-Kreickemeier model.

6.2 Propensity score matching 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 profit margins in the years following foreign market entry. Table 4 summarizes the results for Finland (panel a) and the Netherlands (panel b). See Tables 9 through 12 in the Appendix for details.[34]

Table 4 is sub-divided into manufacturing sectors and services sectors in Finland and into manufacturing sectors and wholesale & retail trade for the Netherlands. The top part of each panel focuses on the profit margin level and the bottom part of each panel on profit margin growth. Both gross profit margins and net profit margins are analysed. The last column summarizes the results for all cases taken together.

Each entry in Table 4 (each 'case') summarizes the comparison of a number of firms entering the export market in a given year for a particular type of sector compared to the performance of a group of matched firms in that sector. In 2007, for example, 263 manufacturing firms in Finland started exporting. These 263 firms are then matched with 263 other manufacturing firms in Finland that continued to be non-exporters (the control group). The performance of both groups is then compared regarding gross profit margin, net profit margin, and their growth rates in the year of entry up to three years afterward. In this sense one 'case' thus represents the comparison of performance of a large number of firms. On average, about 242 manufacturing firms started to export in Finland every year between 2007 and 2010 and about 413 firms in the services sector. Similarly, in the Netherland on average about 489 firms annually started exporting in manufacturing and about 391 in wholesale & retail trade. Each case in Table 4 (which thus represents the comparison of a large number of firms) is classified into one of three categories:

- No difference between the treated firms and continuing non-exporters
- Higher profit margins for exporters
- Lower profit margins for exporters

For Finland we find virtually no empirical evidence suggesting that Finnish export starters convert to a different profitability growth path relative to continuing non-exporters. Out of 64 cases in Table 4 we find just one significant treatment effect in Finland (manufacturing firms that entered foreign markets

[34]The results of the Probit-regressions underlying the matching procedure can be obtained from the authors upon request.

in 2007 show lower profit margins after three years). We conclude, therefore, that firms that enter an export market do not convert to a different path for their profit margins (do not 'learn by exporting').

Table 4: Propensity Score Matching results on profit margins

a Finland									
	manufacturing sectors				services sectors				total
Main finding (# of cases)	static effect	t+1	t+2	t+3	static effect	t+1	t+2	t+3	# of cases
a1 Profit margin level									
No difference	8	6	4	1	8	6	4	2	39
Higher profit margin exporters	0	0	0	0	0	0	0	0	0
Lower profit margin exporters	0	0	0	1	0	0	0	0	1
a2 Profit margin growth									
No difference	-	6	4	2	-	6	4	2	24
Higher profit margin exporters	-	0	0	0	-	0	0	0	0
Lower profit margin exporters	-	0	0	0	-	0	0	0	0
b Netherlands									
	manufacturing sectors				wholesale & retail trade				total
Main finding (# of cases)	static effect	t+1	t+2	t+3	static effect	t+1	t+2	t+3	# of cases
b1 Profit margin level									
No difference	14	11	8	8	14	12	10	5	82
Higher profitability for exporters	0	1	2	0	0	0	0	2	5
Lower profitability for exporters	0	0	0	0	0	0	0	1	1
b2 Profit margin growth									
No difference	-	11	8	6	-	12	8	8	53
Higher profitability for exporters	-	0	2	2	-	0	2	0	6
Lower profitability for exporters	-	1	0	0	-	0	0	0	1

Source: based on Tables 9 through 12 in the Appendix; each 'case' in the table represents a comparison of the number of firms that started exporting in a given year compared to a similar group of matched firms.

For the Netherlands we have a higher number of cases to compare because of the longer time period involved, namely 148 cases (compared to 64 cases in Finland). Most of the comparisons in the Netherlands show no difference between treatment group and control group (namely 135 cases, or 91 percent of all cases). Of the 13 cases that are different, 11 cases (7 percent) show a higher profit margin for exporters and 2 cases (1 percent) show a lower profit margin for exporters. All in all these few cases fall into the margin of error (in total, export starters in Finland or in the Netherlands have a higher profit margin in only about 5 percent of all cases studied, namely 11 out of 212 cases), which leads us to conclude again that there is no difference

between treated firms and the control group.

Summary of empirical findings 2

Export starters do not have higher profit margins than continuing non-exporters, providing further support for hypothesis III.

7 Conclusion

Compiling two parallel firm level data sets covering Dutch firms over the years 2002-2010 and Finnish firms over the years 2005-2010, we investigate the relationship between trade status, productivity, and profitability. We proceed in three steps. First, we analyse the predictions of two theoretical models (the Melitz model and the Egger-Kreickemeier model) regarding the relationship between profit margins and trade. This allows us to derive three testable hypotheses. Second, we empirically evaluate the three hypotheses for three types of trading firms and four types of sectors, for both gross profit margins and net profit margins. Third, we analyse if there is a change in profit margins observable when firms start to export using propensity score matching.

Hypothesis I states that profit margins rise as productivity rises for domestic firms. The Melitz model supports this hypothesis, while the Egger-Kreickemeier model does not. Hypothesis II states that profit margins rise as productivity rises for trading firms. Both models support this hypothesis. Finally, hypothesis III states that profit margins are at least as high for domestic firms as for trading firms. The Egger-Kreickemeier model supports this hypothesis, while the Melitz model does not allow for any falsification in this respect.

We analyse hypotheses I-III for domestic firms and three different types of trading firms for manufacturing sectors in Finland and the Netherlands, services sectors in Finland, and wholesale & retail trade in the Netherlands, together representing 11 different cases. We find (strong) support for all hypotheses. Hypothesis I is supported in all cases; profit margins rise as productivity rises for domestic firms. This is in line with the Melitz model and contradicts the Egger-Kreickemeier model. Hypothesis II is also supported in all cases; profit margins rise as productivity rises for trading firms. This is in line with both the Melitz model and the Egger-Kreickemeier model. Hypothesis III, finally, is supported in almost all cases (namely 10 out of 11); the profit margin for domestic firms is at least as high as for trading firms. This supports the Egger-Kreickemeier model. Regarding the two theoretical

models, we thus find (i) support for the Melitz model in hypotheses I and II and (ii) support for the Egger-Kreickemeier model in hypotheses II and III, but in contrast to hypothesis I.

We also provide a separate analysis of hypothesis III using propensity score matching methods for export starters in any given year in all four different types of sectors, including an analysis of net profit margins, gross profit margins, and the growth in profit margins in the year of becoming an exporter and three subsequent years. Only in a small fraction of all cases (5 percent of the total) do we find a higher profit margin for exporters than for matched domestic firms. This analysis therefore also provides support for hypothesis III.

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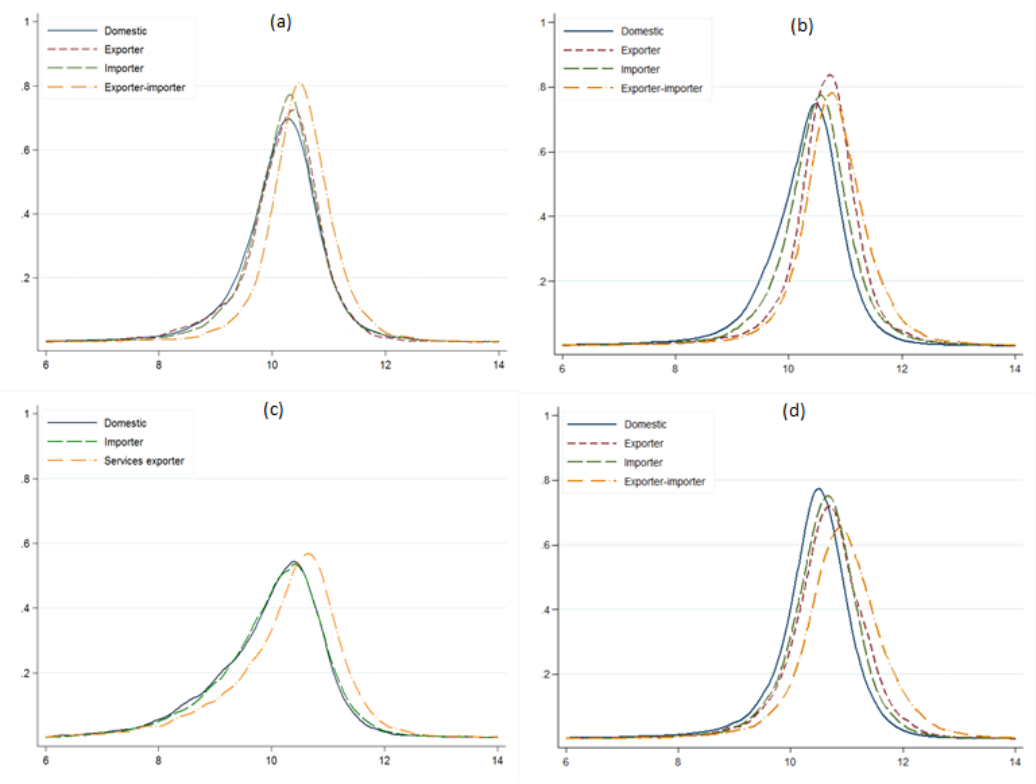
Appendix

Figure 6: Productivity distributions by trade status



Notes: Panel *a* and *b* contain information on manufacturing sectors in Finland resp. the Netherlands. Panel *c* concerns service sectors in Finland and panel *d* wholesale and retail trading in the Netherlands. The horizontal axis represents the firm-level log of labor productivity. The vertical axis represents the kernel density of firms at that particular productivity level.

Table 5: Definition of cohorts for PSM-analysis of export starters

2002	2003	2004	2005	2006	2007	2008	2009	2010
continuing non-trader								
NT	NT	$NT*$	NT	NT	NT			
		$prof_t$	$prof_{t+1}$	$prof_{t+2}$	$prof_{t+3}$			
			$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$	$prof.gr_{t+2,t+3}$			
	NT	NT	$NT*$	NT	NT	NT		
			$prof_t$	$prof_{t+1}$	$prof_{t+2}$	$prof_{t+3}$		
				$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$	$prof.gr_{t+2,t+3}$		
		NT	NT	$NT*$	NT	NT	NT	
				$prof_t$	$prof_{t+1}$	$prof_{t+2}$	$prof_{t+3}$	
					$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$	$prof.gr_{t+2,t+3}$	
			NT	NT	$NT*$	NT	NT	NT
					$prof_t$	$prof_{t+1}$	$prof_{t+2}$	$prof_{t+3}$
						$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$	$prof.gr_{t+2,t+3}$
				NT	NT	$NT*$	NT	NT
						$prof_t$	$prof_{t+1}$	$prof_{t+2}$
							$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$
					NT	NT	$NT*$	NT
							$prof_t$	$prof_{t+1}$
								$prof.gr_{t,t+1}$
						NT	NT	$NT*$
								$prof_t$
export starter								
NT	NT	$EXP*$	EXP	EXP	EXP			
		$prof_t$	$prof_{t+1}$	$prof_{t+2}$	$prof_{t+3}$			
			$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$	$prof.gr_{t+2,t+3}$			
	NT	NT	$EXP*$	EXP	EXP	EXP		
			$prof_t$	$prof_{t+1}$	$prof_{t+2}$	$prof_{t+3}$		
				$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$	$prof.gr_{t+2,t+3}$		
		NT	NT	$EXP*$	EXP	EXP	EXP	
				$prof_t$	$prof_{t+1}$	$prof_{t+2}$	$prof_{t+3}$	
					$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$	$prof.gr_{t+2,t+3}$	
			NT	NT	$EXP*$	EXP	EXP	EXP
					$prof_t$	$prof_{t+1}$	$prof_{t+2}$	$prof_{t+3}$
						$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$	$prof.gr_{t+2,t+3}$
				NT	NT	$EXP*$	EXP	EXP
						$prof_t$	$prof_{t+1}$	$prof_{t+2}$
							$prof.gr_{t,t+1}$	$prof.gr_{t+1,t+2}$
					NT	NT	$EXP*$	EXP
							$prof_t$	$prof_{t+1}$
								$prof.gr_{t,t+1}$
						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*. The sections above the dashed lines only apply to the Netherlands, the sections below the dashed lines apply to both Finland and the Netherlands.

Table 6: Profit rate premia in Finland (fixed effects panel regressions, 2005-2010)

	manufacturing sectors				service sectors			
	net profit margin		gross profit margin		net profit margin		gross profit margin	
	1	2	3	4	5	6	7	8
non-trader	reference group							
only exports	0.025	0.086	-0.003	-0.035				
	(0.36)	(1.25)	(-0.04)	(-0.47)				
only imports	-0.041	0.004	-0.090	-0.052	-0.024	-0.024	-0.064	-0.116
	(-0.68)	(0.07)	(-1.80)	(-0.97)	(-0.34)	(-0.31)	(-1.06)	(-1.56)
2-way trader	0.113*	0.106	0.050	0.030				
	(2.13)	(1.77)	(1.01)	(0.54)				
service exp					0.000	-0.014	-0.049	-0.038
					(0.00)	(-0.26)	(-0.83)	(-0.60)
ln(*lab prod*)	0.067***	0.066***	0.056***	0.053***	0.080***	0.077***	0.071***	0.065***
	(15.56)	(13.62)	(15.75)	(13.60)	(23.95)	(18.33)	(17.75)	(13.19)
*Interaction terms with ln (*lab prod*)*								
only exports	-0.003	-0.008	0.000	0.003				
	(-0.38)	(-1.24)	(0.00)	(0.46)				
only imports	0.004	-0.001	0.009	0.005	0.002	0.002	0.006	0.011
	(0.62)	(-0.12)	(1.75)	(0.90)	(0.32)	(0.30)	(1.03)	(1.53)
2-way trading	-0.012*	-0.011	-0.005	-0.003				
	(-2.26)	(-1.87)	(-1.13)	(-0.64)				
service exp					-0.000	0.001	0.004	0.003
					(-0.10)	(0.25)	(0.69)	(0.48)
Wald test - H0: coefficients of labor productivity + labor productivity x trade status > 0								
only exports	1.000	1.000	1.000	1.000				
2-way trading	1.000	1.000	1.000	1.000				
service exp					1.000	1.000	1.000	1.000
# observations	51,249	39,284	51,073	39,091	58,360	45,288	57,943	44,911
R^2 - *within*	0.267	0.273	0.226	0.235	0.292	0.286	0.200	0.184
R^2 - *between*	0.149	0.100	0.079	0.042	0.255	0.236	0.107	0.101
R^2 - *overall*	0.131	0.085	0.073	0.038	0.229	0.210	0.101	0.095

All regressions include (not shown) as additional controls: a full set of year-sector dummies. exporter 2008-9 dummy, export share, firm size (ln), and multinational dummy; columns 2, 4, 6, and 8 in addition control for capital-labor ratio (ln); *, **, *** indicate statistically significant at 5, 1 and 0.1 percent level; t-statistics in (.)

Table 7: Profit rate premia in the Netherlands (fixed effects panel regressions, 2002-2010)

	manufacturing sectors				wholesale & retail trade			
	net profit margin		gross profit margin		net profit margin		gross profit margin	
	1	2	3	4	5	6	7	8
non-trader	reference group							
only exports	-0.049	-0.030	-0.122**	-0.098*	0.132***	0.149***	0.039	0.048
	(-1.19)	(-0.69)	(-3.20)	(-2.47)	(3.47)	(3.71)	(1.21)	(1.44)
only imports	-0.006	0.006	-0.043	-0.028	0.000	0.003	-0.044*	-0.044*
	(-0.21)	(0.23)	(-1.73)	(-1.11)	(0.01)	(0.14)	(-2.31)	(-2.28)
2-way trading	0.030	0.053	-0.060*	-0.045	0.082***	0.089***	-0.024	-0.020
	(1.04)	(1.86)	(-2.47)	(-1.80)	(3.68)	(3.92)	(-1.20)	(-1.01)
ln(*lab prod*)	0.111***	0.124***	0.087***	0.094***	0.087***	0.095***	0.067***	0.072***
	(62.52)	(68.21)	(54.36)	(54.82)	(46.46)	(49.20)	(41.00)	(42.08)
*Interaction terms with ln (*lab prod*)*								
only exports	0.004	0.003	0.011**	0.009*	-0.013***	-0.014***	-0.004	-0.005
	(1.12)	(0.63)	(3.15)	(2.43)	(-3.56)	(-3.79)	(-1.34)	(-1.56)
only imports	0.000	-0.001	0.004	0.002	-0.000	-0.000	0.004*	0.004*
	(0.13)	(-0.31)	(1.64)	(1.02)	(-0.09)	(-0.21)	(2.21)	(2.19)
2-way trading	-0.003	-0.005	0.005*	0.004	-0.008***	-0.009***	0.002	0.001
	(-1.18)	(-1.94)	(2.38)	(1.74)	(-3.89)	(-4.09)	(0.91)	(0.75)
Wald test - H0: coefficients of labor productivity + labor productivity x trade status > 0								
only exports	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2-way trading	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
# observations	269,362	265,514	269,122	265,287	214,796	212,010	214,651	211,854
R^2 - *within*	0.285	0.309	0.253	0.263	0.265	0.284	0.232	0.243
R^2 - *between*	0.011	0.043	0.003	0.005	0.051	0.103	0.026	0.042
R^2 - *overall*	0.030	0.070	0.015	0.020	0.075	0.126	0.044	0.062

All regressions include (not shown) as additional controls: a full set of year-sector dummies. exporter 2008-9 dummy, export share, firm size (ln), and multinational dummy; columns 2, 4, 6, and 8 in addition control for capital-labor ratio (ln); *, **, *** indicate statistically significant at 5, 1 and 0.1 percent level; t-statistics in (.)

Table 8: Relative net profit rate premia by firm size (OLS panel regressions)

	Finland (2005-2010)					the Netherlands (2002-2010)				
	manufacturing sectors					manufacturing sectors				
	all	micro	small	medium	large	all	micro	small	medium	large
	1	2	3	4	5	6	7	8	9	10
non-trader	reference group									
only exports	-0.036	-0.075	0.03	-0.411*	0.137	-0.194***	-0.156**	-0.294***	0.203	0.017
only imports	-0.086	-0.082	-0.098	-0.135	-0.435	-0.061*	-0.03	-0.147***	-0.197*	0.025
2-way trading	-0.061	0.01	-0.176**	-0.213*	-0.155	-0.134***	-0.091**	-0.243***	-0.196*	-0.262*
ln(*lab prod*)	0.062***	0.065***	0.058***	0.040***	0.038**	0.109***	0.118***	0.099***	0.064***	0.021*
*Interaction terms with ln (*lab prod*)*										
only exports	0.003	0.007	-0.003	0.039*	-0.013	0.018***	0.014**	0.027***	-0.019	-0.004
only imports	0.008	0.008	0.009	0.011	0.039	0.005*	0.002	0.014***	0.018*	0
2-way trading	0.004	-0.003	0.016*	0.019*	0.014	0.013***	0.008**	0.023***	0.018*	0.026*
Wald test - H0: coefficients of labor productivity + labor productivity x trade status > 0										
only exports	1.000	1.000	1.000	0.999	0.721	1.000	1.000	1.000	0.999	0.755
2-way trading	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.999
# observations .	39,284	14,685	17,866	5,348	1,385	265,514	141,926	108,787	13,627	1,174
	service sectors					wholesale & retail trading sectors				
	11	12	13	14	15	16	17	18	19	20
non-trader	reference group									
only exports						0.202***	0.168***	0.187***	0.794***	0.461
only imports	-0.055	0.029	-0.235*	0.073	0.027	0.017	0.037	-0.034	0.151	0.660
2-way trading						-0.028	0.019	-0.061	0.035	0.224
service exp	-0.107*	-0.051	-0.201***	-0.164	-0.307***					
ln(*lab prod*)	0.073***	0.078***	0.068***	0.054***	0.017*	0.089***	0.092***	0.087***	0.088***	0.053***
*Interaction terms with ln (*lab prod*)*										
only exports						-0.019***	-0.016***	-0.018***	-0.076***	-0.045
only imports	0.004	-0.004	0.022*	-0.008	-0.004	-0.002	-0.004	0.003	-0.015	-0.062
2-way trading						0.003	-0.002	0.006	-0.005	-0.023
service exp	0.009*	0.004	0.018**	0.016	0.029***					
Wald test - H0: coefficients of labor productivity + labor productivity x trade status > 0										
only exports						1.000	1.000	1.000	0.986	0.619
2-way trading/service exp	1.000	1.000	1.000	0.999	1.000	1.000	1.000	1.000	1.000	0.995
# observations	45,288	22,603	17,466	4,058	1,161	212,010	136,651	67,836	6,868	655

In addition to the variables presented in the table, all regressions include firm size, the export share in sales, a dummy variable indicating if a firm exports in 2008 or 2009, a dummy variable indicating if a firm is under foreign control, the capital-labor ratio, and a full set of year-sector dummies as explanatory variables in addition to fixed effects at firm level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: The effect of exporting on profitability in manufacturing sectors in Finland

		relative gross profit margin		relative net profit margin	
export start in year t	outcome variable	no. of matched treated firms	ATT (%)	no. of matched treated firms	ATT (%)
2007	$profitlevel$ at time t	263	-1.96	262	0.43
	$profitgrowth_{t,t+1}$ (percentage point change)	141	-0.09	140	0.21
	$profitlevel$ at time $t+1$	139	-10.71	140	0.02
	$profitgrowth_{t+1,t+2}$ (percentage point change)	99	-4.34	101	-0.23
	$profitlevel$ at time $t+2$	100	-4.62	100	-1.57
	$profitgrowth_{t+2,t+3}$ (percentage point change)	66	-3.56	66	-5.46
	profit level at time $t+3$	67	-11.72*	66	-4.59
2008	$profitlevel$ at time t	214	-2.02	224	-2.95
	$profitgrowth_{t,t+1}$ (percentage point change)	87	0.65	89	-0.19
	$profitlevel$ at time $t+1$	88	-1.78	88	-1.29
	$profitgrowth_{t+1,t+2}$ (percentage point change)	62	-1.87	65	-0.77
	$profitlevel$ at time $t+2$	71	-4.06	72	-2.29
2009	$profitlevel$ at time t	231	-1.32	244	-0.78
	$profitgrowth_{t,t+1}$ (percentage point change)	105	-2.08	106	-0.65
	$profitlevel$ at time $t+1$	105	-0.20	108	-0.72
2010	$profitlevel$ at time t	258	-1.12	264	0.14

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 10: The effect of exporting on profitability in service sectors in Finland

		relative gross profit margin		relative net profit margin	
export start in year t	outcome variable	no. of matched treated firms	ATT (%)	no. of matched treated firms	ATT (%)
2007	$profitlevel$ at time t	353	-2.04	358	0.78
	$profitgrowth_{t,t+1}$ (percentage point change)	185	-8.22	187	-0.03
	$profitlevel$ at time $t+1$	185	-14.92	187	-3.19
	$profitgrowth_{t+1,t+2}$ (percentage point change)	130	-15.18	129	-0.40
	$profitlevel$ at time $t+2$	141	-16.68	142	-2.79
	$profitgrowth_{t+2,t+3}$ (percentage point change)	93	0.18	93	-1.30
	$profitlevel$ at time $t+3$	93	4.51	92	-1.01
2008	$profitlevel$ at time t	331	-1.73	343	-1.16
	$profitgrowth_{t,t+1}$ (percentage point change)	166	1.21	168	1.13
	$profitlevel$ at time $t+1$	166	0.64	168	0.77
	$profitgrowth_{t+1,t+2}$ (percentage point change)	108	2.48	109	1.36
	$profitlevel$ at time $t+2$	111	-1.76	115	-6.10
2009	$profitlevel$ at time t	350	-1.33	358	-3.65
	$profitgrowth_{t,t+1}$ (percentage point change)	190	2.30	191	-0.21
	$profitlevel$ at time $t+1$	195	0.52	193	-5.12
2010	$profitlevel$ at time t	616	-3.61	625	0.49

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

		relative gross profit margin		relative net profit margin	
export start in year t	outcome variable	no. of matched treated firms	ATT (%)	no. of matched treated firms	ATT (%)
2004	$profitlevel$ at time t	280	0.7	282	-0.18
	$profitgrowth_{t,t+1}$ (percentage point change)	94	-0.88	96	-0.41
	$profitlevel$ at time $t+1$	103	0.49	104	0.29
	$profitgrowth_{t+1,t+2}$ (percentage point change)	47	-1.61	47	-0.89
	$profitlevel$ at time $t+2$	49	-1.87	49	-2.2
	$profitgrowth_{t+2,t+3}$ (percentage point change)	34	0.32	35	-0.82
	$profitlevel$ at time $t+3$	36	0.58	36	-0.12
2005	$profitlevel$ at time t	280	-0.24	280	1.65
	$profitgrowth_{t,t+1}$ (percentage point change)	84	0.68	86	0.5
	$profitlevel$ at time $t+1$	94	0.61	95	1.81
	$profitgrowth_{t+1,t+2}$ (percentage point change)	51	0.16	50	0.38
	$profitlevel$ at time $t+2$	55	3.4	55	3.56
	$profitgrowth_{t+2,t+3}$ (percentage point change)	42	-0.63	42	-1.12
	$profitlevel$ at time $t+3$	43	2.57	43	1.42
2006	$profitlevel$ at time t	233	-0.93	232	-0.78
	$profitgrowth_{t,t+1}$ (percentage point change)	87	-0.51	87	-0.62
	$profitlevel$ at time $t+1$	94	-1.79	94	-1.04
	$profitgrowth_{t+1,t+2}$ (percentage point change)	47	0.34	45	0.11
	$profitlevel$ at time $t+2$	51	1.56	51	0.3
	$profitgrowth_{t+2,t+3}$ (percentage point change)	24	4.85*	26	2.76
	$profitlevel$ at time $t+3$	31	3.49	31	3.34
2007	$profitlevel$ at time t	244	-0.33	244	0.69
	$profitgrowth_{t,t+1}$ (percentage point change)	117	-0.55	117	-0.91
	$profitlevel$ at time $t+1$	128	-2.19	128	-1.65
	$profitgrowth_{t+1,t+2}$ (percentage point change)	52	-0.47	55	-0.46
	$profitlevel$ at time $t+2$	66	-1.83	66	-2.16
	$profitgrowth_{t+2,t+3}$ (percentage point change)	40	2.97*	41	1.44
	$profitlevel$ at time $t+3$	48	2.01	48	0.48
2008	$profitlevel$ at time t	983	0.42	983	-0.22
	$profitgrowth_{t,t+1}$ (percentage point change)	442	-0.51	437	-1.11*
	$profitlevel$ at time $t+1$	503	0.39	502	0.53
	$profitgrowth_{t+1,t+2}$ (percentage point change)	332	1.28*	320	1.44*
	$profitlevel$ at time $t+2$	366	2.46*	367	2.25*
2009	$profitlevel$ at time t	405	0.54	405	0.12
	$profitgrowth_{t,t+1}$ (percentage point change)	146	0.29	144	0.58
	$profitlevel$ at time $t+1$	169	3.43	169	3.22*
2010	$profitlevel$ at time t	995	-0.51	995	-0.24

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

		relative gross profit margin		relative net profit margin	
export start in year t	outcome variable	no. of matched treated firms	ATT (%)	no. of matched treated firms	ATT (%)
2004	$profitlevel$ at time t	236	-0.79	237	-0.5
	$profitgrowth_{t,t+1}$ (percentage point change)	93	-0.68	95	-1.02
	$profitlevel$ at time $t+1$	99	0.45	99	0.18
	$profitgrowth_{t+1,t+2}$ (percentage point change)	44	0.08	44	-0.46
	$profitlevel$ at time $t+2$	45	1.9	45	2.67
	$profitgrowth_{t+2,t+3}$ (percentage point change)	31	1.74	31	1.77
	$profitlevel$ at time $t+3$	32	-1.05	32	-0.45
2005	$profitlevel$ at time t	294	-0.14	294	0.43
	$profitgrowth_{t,t+1}$ (percentage point change)	92	-0.84	92	-0.63
	$profitlevel$ at time $t+1$	98	-0.99	98	-1.15
	$profitgrowth_{t+1,t+2}$ (percentage point change)	50	-0.25	50	-0.36
	$profitlevel$ at time $t+2$	52	0.6	52	1.02
	$profitgrowth_{t+2,t+3}$ (percentage point change)	38	-0.42	37	-0.45
	$profitlevel$ at time $t+3$	41	-3.12*	41	-2.18
2006	$profitlevel$ at time t	217	-1.17	217	-0.6
	$profitgrowth_{t,t+1}$ (percentage point change)	93	0.12	91	0.27
	$profitlevel$ at time $t+1$	93	-0.42	93	0.22
	$profitgrowth_{t+1,t+2}$ (percentage point change)	62	1.76*	62	1.31*
	$profitlevel$ at time $t+2$	68	0.7	68	1.05
	$profitgrowth_{t+2,t+3}$ (percentage point change)	44	0.8	44	0.8
	$profitlevel$ at time $t+3$	45	5.68*	45	6.48*
2007	$profitlevel$ at time t	243	0.41	242	0.76
	$profitgrowth_{t,t+1}$ (percentage point change)	126	0.42	128	0.03
	$profitlevel$ at time $t+1$	130	-0.24	130	-0.09
	$profitgrowth_{t+1,t+2}$ (percentage point change)	80	-0.34	80	-0.44
	$profitlevel$ at time $t+2$	85	0.1	85	1.08
	$profitgrowth_{t+2,t+3}$ (percentage point change)	64	1.37	64	1.08
	$profitlevel$ at time $t+3$	67	2.79	67	3.82
2008	$profitlevel$ at time t	822	-0.83	822	-0.17
	$profitgrowth_{t,t+1}$ (percentage point change)	401	0.01	402	-0.16
	$profitlevel$ at time $t+1$	418	0.38	418	0.97
	$profitgrowth_{t+1,t+2}$ (percentage point change)	312	-0.06	316	0.11
	$profitlevel$ at time $t+2$	321	-0.54	321	0.34
2009	$profitlevel$ at time t	357	-0.28	357	0.16
	$profitgrowth_{t,t+1}$ (percentage point change)	149	-0.27	150	-0.2
	$profitlevel$ at time $t+1$	161	1.78	161	1.72
2010	$profitlevel$ at time t	569	0.44	569	0.01

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 8 does not converge for this cohort. The bias-corrected 95% confidence intervals are generated by bootstrapping the ATT with 200 replications. * $p < 0.05$