Determinants of Dutch Export Destinations: The Role of Experience and Spillover Effects

seo amsterdam economics

Amsterdam, December 2016

Determinants of Dutch Export Destinations: The Role of Experience and Spillover Effects

Discussion Paper

Ruben van den Hengel
Nienke Oomes
Tom Smits

seo amsterdam economics

SEO Economisch Onderzoek - Roetersstraat 29 - 1018 WB Amsterdam - T (+31) 20 525 1630 - www.seo.nl - secretariaat@seo.nl
ABN-AMRO IBAN: NL14ABNA0411744356 BIC: ABNANL2A - ING: IBAN: NL96INGB0004641100 BIC: INGBNL2A
KvK Amsterdam 41197444 - BTW NL 003023965 B01

Solid Research, Sound Advice

SEO Amsterdam Economics carries out independent applied economic research on behalf of national and international clients. Our research aims to make a major contribution to the decision-making processes of our clients. Originally founded by, and still affiliated with, the University of Amsterdam, SEO Amsterdam Economics is now an independent research group but retains a strong academic component. Operating on a nonprofit basis, SEO continually invests in the intellectual capital of its staff by granting them time to pursue continuing education, publish in academic journals, and participate in academic networks and conferences. As a result, our staff is fully up to date on the latest economic theories and econometric techniques.

Disclaimer: This is a discussion paper, not a finished report. The contents of this paper are not definite.

SEO Discussion Paper No. 86

Summary

This paper reports evidence of positive experience and spillover effects in the export destinations of Dutch firms over the period 2009-2014. We find strong evidence for positive experience effects, which increase with geographical proximity. This means that a Dutch firm is more likely to export to a particular destination when it has exported to that destination (or region) before. The evidence for positive spillover effects is weaker, but strongest at the sectoral level and sector-province level. This means that a Dutch firm is more likely to export to a particular destination when other firms in the same sector (and province) have experience with exporting to that destination. These results are generally robust to controlling for other determinants of export destinations that are used in standard 'gravity models', such as contiguous borders or a shared common language. The existence of experience and spillover effects among Dutch exporters implies that Dutch government policies, such as the provision of export credit insurance for exports to particular 'underserved' countries, can have a sustainable long-term impact on future Dutch exports to these countries.

Keywords: Exports, experience effects, spillover effects, extended gravity

JEL: D22, F10, F14

Table of contents

1 Introduction

The Netherlands is an export-oriented economy, with exports accounting for around 2/3 of GDP. These exports are highly concentrated in two important ways. First, Dutch exports are concentrated with regard to their *origin*: the top five percent of all Dutch exporting firms is responsible for approximately 85 percent of the total value of goods exports. Second, Dutch exports are concentrated with regard to their *destination*: the top 10 export destinations account for almost 70 percent of all Dutch exports.[1]

This paper assesses whether experience effects and spillover effects can help explain these two types of export concentration. Experience effects (sometimes called 'learning-by-doing' effects) occur when firm *i*'s export experience in period t−1 has an impact on firm *i*'s exports in period *t*. Spillover effects occur when the export experience of another firm, say, firm *j,* in period t−1 affects affects firm *i*'s exports in period *t*. Hence, experience effects operate at the *intra-firm* level (within one firm) whereas spillover effects exist on the *inter-firm* dimension (between different firms). They can in theory affect both the extensive margin of exporting (i.e., the choice whether to export or not) and the intensive margin of exporting (i.e. the value of exports).

To illustrate these definitions, consider the following example. Suppose that two firms *i* and *j* are identical in all respects, but firm *i* exports from the Netherlands to India in period t−1, whereas firm *j* concentrates only on the Dutch market. An 'experience effect' then occurs when firm *i*'s prior experience with exporting to India makes it more likely than firm *j* to export to India again in period t. However, due to 'spillover effects', the experience of firm *i* with exporting to India may make firm *j* more likely to export to India in period *t* as well (or induce firm *j* to export more to India than before). If they do, then this, in turn, will further increase firm *i*'s exports to India in period t+1.

In the example above, experience and spillover effects both strengthen and mitigate each other. They strengthen each other in that they together increase the persistence of export destinations, which could potentially explain the concentration of exports with regard to destinations. On the other hand, spillover effects can mitigate the impact of experience effects on the concentration of exports with regard to origin, since spillover effects can increase the likelihood that non-exporting firms will also start to export.

Experience effects should also be considered when the geographic clustering of export destinations is studied. If prior export experiences are country or region-specific, then exporting to the respective country and/or region enhances the relative likelihood of doing so again in the subsequent period compared to alternative export markets. For example, having exported to India in period t–1, firm *i* may now be more likely to export to Bangladesh in period *t*. Spillover effects may also be an important factor to consider when explaining the clustering of Dutch exports at the aggregate level. More specifically, if other firms' prior choice of export destination is important for a firm's

[1] Data for 2014 from Statistics Netherlands (2016). These numbers do not change significantly from year to year.

current export decision, then the distribution of export destinations may become more persistent over time, i.e., it will change only slowly from year to year.

Figure 1 shows that a Dutch firm's export entry decision to a specific country in period *t* is positively correlated with this firm's prior export experience in terms of the number of countries the firm exported to in period t−1. Figure 2 shows that there also exists a positive correlation, especially at the lower end, between the number of other firms *j* exporting in period t−1 to market *k* on the market entry of firm *i*. However, these correlations are not yet sufficient to empirically identify the two effects, as we need to control for all other factors that can affect the choice of export destination.

In our econometric estimates, we aim to identify the relative importance of experience and spillover effects by controlling for other factors that can affect the choice of export destination. We do so by distinguishing between six types of effects. First, we consider three type of experience effects, related to (1) country experience, (2) regional experience, and (3) extra-regional experience. We expect that (1) will empirically have a bigger impact than (2), which in turn would have a bigger impact than (3). In addition, we consider three type of spillover effects: (4) sector-specific spillovers; (5) province-specific spillovers; and (6) sector-province-specific spillovers. We estimate these based on firm-level export data for the Netherlands over the period 2009-2014.

We find strong evidence for positive experience effects at all geographical levels. As expected, experience effects are the strongest at the country level, and the least important at the extra-regional level. In other words, the probability (or value of) exporting to a particular country increases as a result of general prior export experience, increases further in case of prior export experience in the region, and increases the most in case of prior export experience to this particular country.

The evidence for positive spillover effects is weaker, but strongest at the sectoral level and sector-province level. In particular, the number of firms in the same sector (or in the same sector and province) that export to a specific destination generally has a positive impact on the value or probability of exporting to this destination. In contrast, province-specific spillovers are relatively small and can even be negative. Both sector-specific and sector-province-specific spillovers tend to be more positive at the country level, which suggests that at least some spillovers are country-specific. Although significant spillover effects are found at both the extensive and intensive margin of exporting, more significant spillover effects are recorded at the extensive margin.

Our results are generally robust to the inclusion of so-called extended gravity variables and to changes in the sample. However, when small firms are included in the sample, sector-specific spillovers turn negative at the intensive margin of exporting. We interpret this as evidence of competitive pressures at the sector-level, from which small firms in particular suffer when exporting.

Our findings have important policy implications, since they imply a potential role for government. The existence of experience effects implies that, by encouraging firms to export today, a government can have a sustainable long-term impact on the future level of exports by these firms. Similarly, the existence of spillover effects implies that, by stimulating firms to export to certain countries or regions, the government can induce other firms to also expand their exports to this respective country or region. This suggests again that policies such as the Export Credit Insurance funded

by the Ministry of Finance, or the export finance facility under the Dutch Good Growth Fund (both implemented by Atradius Dutch State Business) can gain a sustainable long-term impact.

This paper is not the first to study spillover effects among Dutch firms. In particular, Van Beers & Van Der Panne (2011) previously studied the effect of external economies of scale among small, innovating Dutch firms, both at the extensive and the intensive margin of exporting. They find that being located in a cluster with other innovating firms negatively impacts subsequent export entry, and that the decision to export is fostered particularly through non-technical knowledge spillovers, such as market-specific knowledge of consumer preferences or distribution channels. However, in clusters where many innovating firms are located, knowledge spillovers are predominantly technical. In contrast, the authors find a positive impact at the extensive margin of exporting in diversified clusters, in which non-technical knowledge is more prominent. In adddition, they suggest that information leakage is more costly for innovating firms because their commercial success is more closely linked to their innovative ability. Hence, export costs can only be overcome through outsmarting the competition.

Creusen & Lejour (2011) estimated both experience and spillover effects in the behaviour of Dutch exporting firms. First, they consider the effect of export experience in neighboring countries of a particular firm on subsequent foreign market entry (i.e., one form of experience effect). They also studied the relevance of export experience of other firms located in the same region or industry, and other firms that export to a similar destination. They find evidence that Dutch firms are more likely to enter those foreign markets that are geographically close to existing export destinations. In addition, they find evidence of spillover effects. More specifically, they show that the number of exporters within the same municipality and the number of exporters to the same country positively affect a firm's entry to that specific market.

This paper builds upon the Creusen & Lejour (2011) paper by considering not just the extensive margin of exporting, but also the intensive margin (the actual value of exports) through a Poisson pseudo-maximum likelihood estimation. Also, we expand the empirical model by incorporating a firm's experience effects more thoroughly. Where Creusen & Lejour (2011) include the distance to the nearest export market as a control variable, we consider different approaches to model proximity, and also incorporate the depth and diversity of export experience. Our main improvement upon the Creusen & Lejour (2011) paper, however, is that we control for shared similarities (i.e, contiguous borders, a common language, being located in the same region and belonging to the same income group) between a firm's export markets in period $t-1$ and the markets it serves in the subsequent period. This way we are able to separate true experience and spillover effects from these structural, underlying similarities between export markets that influence a firm's likelihood to enter these markets.

The contribution of this paper to the literature is therefore threefold. First, this paper employs a Poisson pseudo-maximum likelihood model to firm-level data, whereas this estimation technique was previously mostly applied to sector or country-level analysis. Second, this paper considers experience and spillover effects simultaneously, whereas these effects were typically studied separately before. Finally, as mentioned above, controlling for structural similarities between export markets in the model enables us to improve the estimation of the role of experience and spillover effects in

exports, because true experience and spillover effects are disentangled from underlying similarities across countries.

The remainder of this paper is structured as follows. Section 2 presents the literature review. Section 3 develops the underlying theoretical model. Section 4 presents the empirical approach. Section 5 describes the data and includes the descriptive statistics. Section 6 discusses the results and Section 7 concludes. Robustness checks are included in Appendix A.

2 Literature review

2.1 Experience effects

A firm's export decision does not merely affect its export profits in the current period, but has an impact on its future export behaviour as well (Alvarez, 2007; Roberts & Tybout, 1997a). That is, export decisions are dynamic rather than static. Moreover, when a firm exports, it learns something about its market-specific export profitability, but also about its general export profitability. In addition, the firm gains experience on how to export its goods to foreign markets. For example, it learns how to find the right business partners, how to adapt its products to local preferences, or how to deal with foreign legislative requirements (Lawless, 2013). Experience effects cover these firm-specific prior experiences and specify through which channels current export behaviour is affected. But before discussing these mechanisms, we will first present the holistic frameworks in which experience effects can be considered.

First of all, experience effects can be placed within the field of contract theory. When, say, two firms engage in a buyer-supplier relationship there is a considerable need for formal contract enforcement to reduce the risks involved with the transaction. That is, transaction or relation-specific investments can expose a firm to the so-called hold-up problem. Consequently, the firm may suffer financially due to unfavorable re-negotiations (Hart & Moore, 1999). In extreme cases the buyer or supplier does not honor the delivery or payment commitment, respectively, typically leading to substantial financial losses. As the business relationship matures, informal contract enforcement based on trust or reputation tends to replace formal contractual elements (Klein-Woolthuis, Hillebrand & Nooteboom, 2005). Therefore, a firm's contract costs will decline given it does not have to consider all possible exposures related to the contract (Dyer & Chu, 2003). As a consequence, the profitability of exports can increase. Moreover, the increase in the relationship's value itself reduces uncertainty through the higher future rents linked to a long-term, sustainable relationship (Macchiavello & Morjaria, 2015).

Furthermore, there are two other primary fields of research that provide theoretical explanations for how experience effects can enhance exports. Firstly, a firm's export performance may benefit from previous exporting through the productivity channel. It has been argued that entering foreign markets allows a firm to exploit economies of scales through larger sale volumes and benefit from a more diverse exposure to different types of markets and consumers (Wagner, 2002). However, as documented by Clerides, Lach & Tybout (1998) and Wagner (2007), the causality mainly runs in the opposite direction. In other words, productive firms end up exporting through a self-selection mechanism, that is, only the most productive firms can bear the fixed costs of entering an export market (Melitz, 2003). In their meta-analysis Greenaway & Kneller (2008) conclude that indeed the relationship between productivity and export runs at best in both directions, where the self-selection hypothesis is superiorly supported by empirical research.

Finally, many scholars explain the value of experience effects through the reduction of expected fixed, including sunk, and variable trading costs or through the reduction in uncertainty associated with exporting. For example, Chaney (2013) outlines a model in which a firm can only export to a

particular export market through a contact. The probability of attaining this very contact is increasing in the firm's current exports irrespective of the export destination. In this light, prior export experience is valuable through the creation of an international network which enhances the probability of securing new export relations (Chaney, 2011).

Albornoz, Calvo-Pardo, Corcos & Ornelas (2012) and Nguyen (2012) reach a similar conclusion, but employ different models. Nguyen (2012) concentrates on ex ante demand uncertainty of a foreign market. A firm can discover what the local demand is by entering the respective market. And because consumer demand is imperfectly correlated across countries, a firm's entry to one export market reveals information about the demand for its goods in other foreign countries as well. As a result, firms choose to enter foreign markets sequentially which allows them to update their beliefs on consumer demand and thereby improve overall export profitability.

Albornoz et al. (2012) outline a slightly different model in which firms are uncertain about their export profitability at first, but through its export experience a firm will gain insights on its export profitability. The authors assume that the forces driving a firm's export profitability to be correlated over time and across export destinations. As a result, a firm's current export profits do not just reveal information on the firm's profitability in the current period for the respective export destination, but for upcoming periods and other potential export countries as well. Consequently, firms may exhibit 'sequential exporting' as they expand their exports to other countries once they determined exporting is profitable. That is, firms balance the risks associated with uncertainty regarding profitability on the one hand and potentially foregone profits if it decides not to enter on the other.

Eaton, Eslava, Tybout, Jinkins & Krizan (2014) develop a continuous-time model to explain export patterns observed among Colombian firms for the American market, that is, exporters that manage to keep exporting for one entire year tend to grow their exports quickly afterwards. Their model centers on search and learning processes by heterogeneous sellers who gather information about their product's profitability based on how successfully it sells and which segment of the market the firm should target. Consequently, the firm can optimize the intensity of its search efforts to maximize export profits and thereby enhance the firm's performance in future periods too.

The acquisition of information does not just reduce uncertainty of future profits, but can also impact profits directly. As substantiated by Bugamelli & Infante (2003), the costs costs associated with acquiring information are substantial. Schmeiser (2012) formalizes this argument in a dynamic general equilibrium model using Russian firm-level data. She models experience effects through a reduction in each firm's entry costs which implies firm-destination specific entry costs. As a result, this model incorporates sequential exporting since firms have an incentive to gradually enter export destinations to exploit reductions in fixed entry costs. In addition, the model can explain why firms may continue exporting when incurring small losses as pointed out by Cassey & Schmeiser (2013). Namely, firms expect that the experience effects will make exporting dynamically profitable as future export profits outweigh the short-term losses.

Also previous entry to other export markets may lower a firm's fixed costs of entering yet another export market given some of the acquired knowledge on the respective market or the firm's products provides insights which are also relevant for new export destinations (Sheard, 2014). These conclusions are especially relevant given research by Johanson & Vahlne (1977) who state that not

all knowledge about foreign markets can be retrieved through market research. This tacit or experiential knowledge is inherently difficult to obtain from third parties and hence can only be acquired through personal experience (Henisz & Macher, 2004). Empirical work indeed points out that prior export experience affects current export behaviour through the acquisition of export-specific knowledge (Artopoulos et al., 2010).

Lawless (2013) specifically looks into the role of export experience in neighboring markets on subsequent exports. The underlying motivation is that the more similar markets are, the larger the experience effects. She shows that experience of exporting to neighboring markets enhances the probability of entry into a market. Prior export experiences lowers the fixed export costs for a firm such as marketing expenses, setting up a distribution network or completing all local procedures needed to register and legally operate a business, which in turn lowers the firm's productivity threshold level that makes exporting profitable. Hence, in contrast to the positive effect on export entry does she find a negative impact of export experience at the intensive margin. She argues this is line with the heterogeneous firm model outlined by Melitz (2003). More specifically, she shows that the extensive margin of exporting is dependent on the fixed and variable costs of exporting whereas the intensive margin, or how much a firm exports to a foreign market, is dependent on just variable export costs. Firms which are less productive, but have substantial export experience face lower fixed costs meaning that, ceteris paribus, the average productivity of export firms drops. In this light it is no surprise that the average export sales are lower since less productive, marginal firms can survive in the marketplace.

Some of a firm's fixed export costs only apply to the first period of exporting. In other words, a portion of fixed costs are sunk which means that once a firm exports to a certain market it does not have to bear these costs as long as it continues exporting (to this export market) - depending on whether the respective sunk costs are country-specific. Meinen (2015) shows that market-specific sunk costs are an important factor to consider when studying export behaviour. That is, if a firm exported to a specific market last year it is twenty-three percent more likely to do so today compared to a firm who did not export to the respective market the previous period.

Besides the theoretical models discussed above, many scholars have put forward qualitative mechanisms through which experience effects influence export behaviour. First of all, a firm's prior exports to that specific country makes that firm more likely to export to this country in the subsequent period (Sinani & Hobdari, 2010). These so-called country-specific experience effects do not just apply to exports, but also other internationalization processes in which firms engage in such as acquiring a foreign market player, forming a joint venture or provide foreign direct investment (FDI) (Sinani & Hobdari, 1996; Davidson, 1980). Moreover, experience effects also exist on the regional level. Neighboring countries or countries that belong to the same region as one of a firm's current export destinations typically share cultural characteristics with these export destinations which reduce the uncertainty of sunk entry costs (Hofstede, 2001; Shenkar, 2001). Indeed, empirical research shows a firm is more likely to export to a country that is culturally and/or geographically proximate to its current export countries. More specifically, Defever et al. (2014) find evidence of geographic proximity for Chinese firms and report that the probability to export to an export destination rises by approximately two percentage points when this country shares a border with a currently served export market. Meinen (2015) considers Danish furniture manufacturing firms and his results suggest that exports are more likely to be extended to countries that speak the

same language, share a colonial history, share a common border or are located in the same region of the world with current export destinations served by the respective firm. Evenett & Venables (2002) concentrate their analysis on exporting to developing countries and also find that proximity to current export destinations significantly affects export entry, especially learning through the so-called 'proximity to the supply frontier', or the smallest distance between a candidate export destination and a firm's current export destinations is prevalent.

This concept has been formalized by Morales, Sheu & Zahler (2011) as 'extended gravity'. More specifically, the authors study the impact of similarities between potential export markets and the firm's current export markets aside looking into the impact of shared similarities of the firm's home country with potential export destinations. Based on the idea that firms have to incur startup and adaptation costs, including modifying products in accordance with legal procedures and requirements or local preferences, when entering a new export market a firm exporting to a similar country is expected to be better acquainted with market conditions which will likely reduce startup cost. Given the firm has already adapted to a similar market before, the costs of doing so again are expected to be lower(Morales et al., 2011). These experience effects are especially relevant in regions characterized by weak institutional environments provided the higher degree of uncertainty about expected profit possibilities in these settings (Defever, Heid & Larch, 2010).

Building on Helpman et al. (2008) who show that firms are especially likely to enter markets that are geographically and linguistically closer to the firm's home country, Morales et al. (2011) include similar variables in their model for current export destinations. More specifically, dummy variables indicating a common border, continent, official language or similar GDP per capita class are used as 'extended gravity' variables in their model. The authors find that these variables may reduce the fixed costs of export entry by up to forty percent. These variables are particularly relevant in the case of entry to distant markets given that startup and adaptation costs tend to be especially significant for those export destinations that are culturally different from the firm's home market (Dutt et al., 2014).

The magnitude of experience effects is dependent on several other factors. First of all, Albornoz et al. (2012) distinguish a firm's first entry to an export market from the entrance to subsequent export desti- nations. Based upon their premises that export profitability is correlated over time and across countries the first export experience naturally provides the most insights on a firm's dynamic profitability. This also applies, although potentially to a lesser extent, to the scenario in which the firm exported to a certain ex- port market before, stopped and then re-enters (Albornoz et al., 2012). Eaton, Kugler & Tybout (2007) empirically substantiate the idea that conditional on survival during the first year firms indeed expand their export sales substantially during the subsequent year.

Moreover, not just whether a firm exports to a certain export market, but also the so-called depth to which it trades with the respective market and the diversity of exports, or the number of export markets it currently serves are important for subsequent experience effects. In other words, the more a firm exports to a certain export country or the more countries it exports to, the higher the experience effects may be. The depth of a firm's export experience particularly enhances the probability the firm continues exporting to this particular market due to increased interdependence in the business relationships it maintains (Eriksson & Chetty, 2003). This particular knowledge can

make a firm more likely to intensify its operations in that particular market rather than broadening its export operations. Ultimately, the degree to which the gained experience can be transferred to other markets, or is country-specific, determines how this channel influences a firm's export behaviour. For example, Wang & Zhao (2013) substantiate the role of experience effects for export candidates geographically and culturally proximate to current export destinations, but only for the same product or same market based on product-level trade data of Chinese exports. Prior experience in exporting similar products to similar markets is insignificant which points towards geographical imitations of inter-product spillovers. In other words, a firm's prior (export) experience is co-determining the extent to which the firm can exploit the benefits of experience effects.

Finally, Eriksson & Chetty (2003) argue that this so-called firm's absorptive capacity may also be enhanced when a firm operates in multiple foreign markets because it exposes the firm to a wide range of relationships that can prosper learning and innovation. This feedback effect thus operates through the abovementioned learning by exporting channel which enhances the firm's productivity. Indeed (Meinen, 2015) shows that the number of export markets currently served by a firm positively affects the probability to enter yet another export destination.

A firm's absorptive capacity may not only determine the degree to which it can learn from its own export experience, but the firm's very absorptive capacity may also be depending on its personal prior export experience. Díez-Vial & Fernández-Olmoso (2014) show that firms can particularly improve their export performance based on observing the export behaviour of other local firms only when the firm has some export experience itself. These so-called spillover effects will be considered more rigorously in the next subsection.

2.2 Spillover effects

Even a firm's dynamic export decisions are not made in isolation. More specifically, the export behaviour of a firm is influenced by the export experience of other firms as well. These so-called spillover effects exist, again, on both the extensive and intensive margin of exporting and cover geographical and industrial dimensions (Koenig et al., 2010).

The value of spillover effects can be placed within a similar framework as modelled for experience effects by Albornoz et al. (2012). That is, the presence of other firms in foreign markets reduces the uncertainty in export profitability driven by improved availability of information on market characteristics and entry costs. Consequently, the more firms have already exported to an export destination, the more certain export profitability becomes and the more likely it is that additional firms will engage in exporting (Dutt et al., 2014; Muñoz-Sepúlveda & Rodríguez, 2015).

Rauch & Watson (2003) focus on a specific reduction in uncertainty through which spillover effects influence exporting behaviour. In their model uncertainty regarding the supplier's ability to fill a large order results into a buyer-supplier relationship that starts with small orders despite the fixed costs of finding a potential partner. The presence of previous exporters can increase the available information on potential suppliers and thereby reduces the uncertainty regarding their abilities. Consequently, buyers can be less reluctant to start with small orders and exports are expected to increase at the extensive margin (Koenig et al., 2010).

Besides reducing uncertainty, spillover effects can also reduce the actual exporting costs incurred by a firm (Castillo-Giménez, Serrano & Requena-Silvente, 2011; Roberts & Tybout, 1997b). For example, Krautheim (2007) introduces a general equilibrium model with heterogeneous firms and informational net- works on the country and regional level. The existence of networks among exporters can substantially lower the fixed costs of exporting and, therefore, not just variable trading costs increase with distance. That is, firms are less likely to export to distant export destinations due to the fact that variable trade costs do increase with distance to begin with. As a result, the inclusion of informational networks in the model intensifies the increase of exporting costs over distance which makes firms more likely to export to proximate countries. All abovementioned impacts of spillover effects reduce the firm's burden of obtaining information. Either the costs of acquiring information is reduced or information is simply revealed which implies the firm saves the costs of doing so itself.

Three channels can be distinguished through which the impacts described in the previous paragraph run (Choquette & Meinen, 2011). First of all, inter-firm labor mobility, that is, an employee who moves from an exporting to a non-exporting firm thereby spreads knowledge about exporting. This builds on the so-called notion of learning-by-hiring which has been empirically established by Parrotta & Pozzoli (2012). They show that the employment of highly educated workers resulted into knowledge diffusion among the hiring firms. Molina & Muendler (2013) show that firms can also successfully acquire knowledge specifically related to exports. By looking at Brazilian employer-employee data they show that firms which are about to export hire employees from firms that already export. As a result, the hiring firms reach more export markets and penetrate these markets deeper, whereas export performance drops for those firms that lose their workers. These results are confirmed by Choquette & Meinen (2011) who find that hiring people with exporting experience enhances the likelihood of exporting to that market irrespective of the industry this employee used to work in. Hiring an employee within geographic proximity appears the most robust. Although Masso, Rõigas & Vahter (2015) also find that export experience of high-skilled employees is important when it comes to a firm's export decisions, especially if the worker's export experience is recent and the firm has not entered any foreign markets, they also conclude that the relevance of an employee's export experience is in fact region specific and exports similar goods.

The second channel through which firms may be induced to start exporting is the signalling of market opportunities, that is, through the observation that other firms successfully managed to export to the respective market. Choquette & Meinen (2011) find that intra-industry spillovers, that is, the signaling of market opportunities, are most influential and greatest for proximate firms. Mittelstaedt, Ward & Nowlin (2006) also find that the more geographically concentrated a sector the more likely firms will export, particularly micro and small firms. Clerides & Kassinis (2009) call this concept 'informed imitation'. Rather than just copying another firm's behaviour, firms imitate the strategy of those competitors that show superior performance and particularly look at the strategy of similar, successfully operating firms. Firms' export behaviour is affected especially if its competitors are located nearby. Based on firm-specific export data from British firms Greenaway & Kneller (2008) provide additional evidence for industry-specific spillover effects. The authors match firms based on observable characteristics and employ a difference-in-difference approach to identify the determinants of export performance. Significant, positive spillover effects on export entry are only recorded within the same industry or region. The largest impact is found if both

industry and region characteristics match with current exporters. Finally, intra-industry spillovers can just like experience effects be funnelled through productivity enhancing processes, as outlined before. That is, firms learn from foreign buyers or competition on how innovate their products or processes (Wagner, 2002).

The third channel identified by Choquette & Meinen (2011) through which spillover effects affect export behaviour are inter-industry linkages. This claim is substantiated by Mittelstaedt et al. (2006) who report that inter-industry linkages tend to be more profound for concentrated industries and small firms as these firms benefit through the supply of specialized labor and linked services. Choquette & Meinen (2011) consider another form of inter-industry linkages. They argue that a firm's buyers or suppliers may support the initiation of exporting through informational exchange out of self-interest. In fact, Choquette & Meinen (2011) show that the positive effect of inter-industry linkages are completely driven by backward linkages and not restricted to geographic proximity. Eaton et al. (2014) also conclude that inter-industry ties positively affect a firm's future exports, because successful business relationships reduce the costs of attracting new buyers through the enhanced visibility of the exporting firm.

In addition to identifying the three main channels through which spillover effects operate, Choquette & Meinen (2011) acknowledge the importance of geographical proximity, or the relative importance of the other firms' location, on the magnitude of spillover effects. More specifically, a firm's export behaviour is influenced through geographical spillovers which constitute of firms which are located nearby in the home country and by firms that export to the same country or region, also known as destination-specific spillover effects.

The spillover effects of proximate firms may be especially relevant not just because a shared geographical location enhances the abovementioned signalling of opportunities, but also because of the fact that firms are located nearby brings in new information and cost economies. Greenaway & Kneller (2008) indicate that spillovers from the activities of other neighboring firms reduce the firm's cost of access to the export market. Such spillovers assist firms to overcome competitive disadvantages and expand into foreign markets. Therefore, the existence of spillovers will increase the firm's propensity to export even if exporting incurs high sunk costs. Finally, these so-called agglomeration economies imply thick markets for specialized skills that can reduce cost of exporting as well (Aitken, Hanson & Harrison, 1997).

Díez-Vial & Fernández-Olmoso (2014) argue that exporting firms can learn particularly from neighboring firms which also export within geographical clusters. These local clusters are characterized by shared goals, norms and beliefs that enhance the local learning process through the recognition of patterns (Antonietti & Cainelli, 2011). In addition, the coordination and communication costs for geographical clusters are rather limited given firms are proximate to one another. Also Díez-Vial & Fernández-Olmoso (2014) find that the benefits of local export spillovers are increasing in a firm's personal export experience. Hence, a firm's absorptive capacity influence the degree to which firms can benefit from local agglomeration effects.

Local networks may also enhance a firm's export performance through intensified competitive pressures. Belso-Martínez (2006) finds that the export performance of firms belonging to a strong network of small firms, or industrial district, is superior to those that do not by looking at Valencian

firm-specific data. The author claims that competition among firms spurs their export performance through the shortening of the internationalization process of SMEs.

Despite all the abovementioned enforcing factors, agglomeration effects may also negatively impact a firm's exports on the extensive and intensive margin which implies that existing export activity prevents other firms from entering foreign markets (Bernard & Jensen, 2004). Koenig (2009) argues this adverse effect may be caused by intensified competition, especially from multinationals, for the exported goods or limited capacities of the respective export infrastructure. Another explanation is provided by Díez-Vial & Fernández-Olmoso (2014) who argue that firms with substantial international experience are reluctant to share their export knowledge.

Studies show that not just proximity at the home country level can enhance spillover effects, but similarities in export destination may boost the value of these effects as well. That is, sharing information on the same or similar destination countries may be particularly valuable for firms. Indeed, empirical research shows that export spillovers tend to be destination specific (Castillo-Giménez et al., 2011). This finding is substantiated by Choquette & Meinen (2011) who also report that especially for medium and low income destination markets these export spillovers are relevant.

Cassey & Schmeiser (2013) develop a theoretical model based upon economies of scale in trading costs at the firm level that explains why spillover effects can be destination-specific. Given the fixed minimum size of each shipment, collaboration among firms is beneficial for all parties involved. Obviously, this option only apply if exporters serve the same export market.

Moreover, especially the combination of export destinations and a shared geographical location in the home country provides strong opportunities for firms to exploit spillovers from their peers. For example, Koenig et al. (2010) find a positive impact of geographical agglomeration effects, which include informational externalities and cost-reducing economies at the local level, on the extensive, but not intensive, margin in their study on product and destination-specific spillover effects for nearby exporters using French firm product-level data. Consequently, the authors argue that local export spillovers result into a reduction in fixed export costs. The decline in fixed export costs is most profound if both product and destination match across proximate exporters. On top, through the inclusion of different firm-level proximity variables the authors show that agglomeration effects exhibit a spatial decay.

In a similar fashion Koenig (2009) studies the role of agglomeration effects at the extensive margin of exports for French firms' exports using a different dataset. She concludes that agglomeration effects are destination-specific and especially large for firms that export to remote markets. A rationale for this finding may be provided by Ramos & Moral-Benito (2015) who find that exporters tend to be clustered more strongly in their home country when they export to countries that are culturally dissimilar to the home market. They argue that such countries are hard to enter for an individual firm which implies the reason for the formation of clusters particularly for distant countries is endogenously determined. Research by Choquette & Meinen (2011) focused on Danish manufacturing firms and Lovelya, Rosenthal & Sharma (2005) who study US manufacturing firms headquartered in the US reveal similar results and argue that more distant countries require a more elaborate acquisition of information because these are typically unfamiliar and generally unexploited markets to begin with.

3 Theoretical model

This paper is empirical in its nature, but builds upon the theory of heterogeneous firms. That is, a simplified version of the Melitz model as outlined by Lawless (2011) is employed to frame our empirical considerations. In accordance with Melitz (2003), each country produces a continuum of differentiated goods indexed by ω from set Ω which includes all available goods. Consumers in country j derive utility from the range ω of goods produced across all countries in accordance with the following utility function:

$$U_j = \left[\int_{\omega\in\Omega} q_j(\omega)^{\frac{\sigma-1}{\sigma}}\, d(\omega)\right]^{\frac{\sigma}{\sigma-1}} \quad . \tag{1}$$

The demand for good ω in country *j* is positively related to the aggregate Dixit-Stiglitz price level P_j and Y_j , the real income in country *j*. It is inversely related to its own price charged in country *j*: $p_j(\omega)$.

$$q_j(\omega) = \frac{p_j(\omega)^{-\sigma}}{{P_j}^{1-\sigma}} Y_j \qquad , \tag{2}$$

where Pj is defined as:

$$P_j = \left[\int_{\omega\in\Omega} p_j(\omega)^{1-\sigma}\, d(\omega)\right]^{\frac{1}{\sigma-1}} \tag{3}$$

Marginal production costs are constant and the cost-minimizing unit cost is equal to c , c being the country-level production costs and a representing the firm-specific productivity parameter. The higher a firm's productivity parameter the lower its effective production costs.

Trade costs associated with exporting to country *j* enter the firm's production function through a variable and a fixed component. Fixed costs are labelled by F_j and constitute of those costs that an exporter has to incur no matter how much goods it ends up exporting. A typical example of fixed trade costs are the bureaucratic paperwork a firm has to file in order to be eligible to export. Variable trade costs do vary with size and include transportation costs and tariffs (Lawless, 2013). Variable trade costs are represented by $\tau_j > 1$ and are modeled as an 'iceberg' trade cost which implies that only a fraction of the exported goods arrives at the destination. The remainder 'melts' during transportation (Bacchetta et al., 2012).

Inserting the marginal cost function into the profit equation gives:

$$\pi_j(a) = p_j q_j - \frac{\tau_j c}{a} q_j - F_j \tag{4}$$

When substituting equation 2 into equation 4 and taking the derivative with respect to pj gives the optimal price for a firm exporting its product to country j:

$$p_j(a) = \frac{\sigma}{\sigma-1}\frac{\tau_j c}{a} \tag{5}$$

As a result, the firm's profit for selling its product to country j are:

$$\pi_j(a) = \mu\left(\frac{P_j a}{\tau_j c}\right)^{\sigma-1} Y_j - F_j \quad , \tag{6}$$

where $\mu = (\sigma-1)^{\sigma-1}\sigma^{-\sigma}$. Profits from exporting to country j are positive for a sufficiently high productivity. More specifically:

$$a > \left(\frac{F_j}{\mu Y_j}\right)^{\frac{1}{\sigma-1}}\frac{\tau_j c}{P_j} \quad . \tag{7}$$

The cut-off productivity level required to enter country j equals:

$$\bar{a} = \left(\frac{F_j}{\mu Y_j}\right)^{\frac{1}{\sigma-1}}\frac{\tau_j c}{P_j} \tag{8}$$

As shown by equation (8), the cut-off productivity level increases in the fixed trade costs F_j and the variable trade costs τ_j and decreases in the aggregate price level P_j and real income Y_j in country j.

The intensive margin of exporting, or for how much value a firm exports to country *j*, follows from the multiplication of the price of the firm's good in market *j* with the quantity sold.

$$r_j = p_j q_j = p_j\left(\frac{{p_j}^{-\sigma}}{{P_j}^{1-\sigma}}Y_j\right) = \left(\frac{\sigma-1}{\sigma}\frac{P_j a}{\tau_j c}\right)^{\sigma-1} Y_j \tag{9}$$

In contrast, the value of exports, that is the intensive margin of exports, is just dependent on the variable trade costs and not affected by fixed trade costs. Thus, the more productive a firm is and the lower variable trade costs, the higher exports for the respective firm will be (Melitz, 2003).

Whereas in the above specification fixed and variable trade costs are assumed to be just depending on the export destination, that is, identical across firms, trade costs in fact are likely to depend on firm-specific characteristics as well. For example, a firm's prior export experience might affect its costs for subsequent exports. Also, export experience from other, related firms may impact the costs a particular firm faces. In other words, experience and spillover effects are likely to affect the extensive and intensive exports decisions of individual firms.

Castagnino (2011) introduces an extension to the model to capture experience effects. The author writes $F_{j,t} = f_{j,t}E_{k,t-1}$ where $f_{j,t}$ represent fixed trading costs specific to country *j* and $E_{k,t-1}$ define general fixed trading costs. Thus, the fixed trade costs for country *j* in period t are dependent on the other export markets *k* served in period *t−1*. The more similar a previously served export market is compared to a new export destination the lower $E_{k,t-1}$ and thereby the lower $F_{j,t}$ becomes. A similar analogy can be applied to variable trade costs or previously served foreign markets

by other exporting firms. That is, the more similar a firm's current export markets are to the new market it might enter the lower will its variable trade costs be. Also, the more other firms already exported to market *j* or similar markets *k* the lower a firm's trade costs will be. As discussed before, we expect the mitigating effect on exporting costs to be stronger for those other exporting firms that operate in the same industry and/or are located in the same province.

By equations 8 and 9 we can interpret the results of our empirical estimations. If experience and spillover effects only affect the fixed costs of exporting then just the extensive margin of exporting will change. However, if also variable trade costs are reduced by prior exporting experience then both the extensive and intensive margin of exporting will be affected. In addition, as discussed before, if the decline in fixed costs of exporting is relatively large compared to the drop in variable trade costs then the eventual effect at the intensive margin of exporting may be negative. That is, firms which are relatively unproductive may still be able to enter foreign markets when they acquired substantial export experience. As a result, the average exports of exporting firms will drop.

4 Empirical approach

4.1 Export entry and participation

By employing a logit model with destination country-year, sector-year and province-year we disentangle the impact of experience and spillover effects from country, sector and province-specific factors at the extensive margin of exporting. A logit model is employed because it is naturally constrained between zero and one. Also, in contrast to a probit specification, this model specification does not suffer from the incidental parameter problem (Shepherd, 2013). The abovementioned fixed effects have been employed often in the literature before, see for example Fernandes & Tang (2011), and are justified given the aim of this paper. That is, we are interested in firm-specific behaviour rather than the effect of any country, sector or province-specific variables. Not correcting for these effects would bias the regression outcomes because it would incorrectly ascribe structural differences between export destinations, sectors and/or provinces to specific firms.

We do expect country-specific variables such as distance to the Netherlands, GDP (per capita) and country risk to matter for trade. However, given that we only consider firms from one country, these effects are identical across firms for a given year. We can therefore control for these factors through a 'country fixed effect'. For similar reasons, we can control for sector and province-year fixed effects. That is, some sectors are generally more likely to export, for example, due to the nature of the goods they produce. Also, some provinces happen to have better (export) infrastructure which makes firms located in these provinces more likely to export, ceteris paribus.

The dependent variable considered at the extensive margin of exporting is the dummy variable 'export entry'. Where export entry of firm i to export market k in year t is defined as follows:

$$Entry_{i,k,t} = \begin{cases} 1 & \text{if } X_{i,k,t} > 0 \text{ and } X_{i,k,t-1} = 0 \\ 0 & \text{if } X_{i,k,t} = 0 \text{ and } X_{i,k,t-1} = 0 \\ . & \text{otherwise} \end{cases} \quad (10)$$

Export entry equals 1 in period t if firm i's exports, $X_{i,k,t}$, to export market k in period t are positive and the firm did not serve export to market k in period $t-1$. The export entry variable is undefined for the first year in which it enters the dataset, because $X_{i,k,t-1}$ is not observed for this time period.

To clarify the above specifications of the export entry variable, Table 1 provides an example of a firm's export behaviour, where the hypothetical firm exports goods valued at 100 in each period during which it exports (period 1, 4 and 5). This example can be applied at the country level to attain country–firm–specific exports.

Table 1 Definition of export variables

Time period t	1	2	3	4	5
Export value	100	0	0	100	100
Export entry	.	.	0	1	.

The exact specification of the logit model to study exporting at the extensive margin is as follows:

$$E_{i,k,t}^{s,p} = \beta_1 F_{i,k,t-1} + \beta_2 X_{i,k,t-1}^{s,p} + \beta_3 X_{j,k,t-1}^{s,p} + \beta_4 X_{i,k,t-1}^{p} + \beta_5 X_{j,k,t-1}^{s} + \alpha_{k,t} + \gamma_{s,t} + \delta_{p,t} + \varepsilon_{i,k,t} \quad (12)$$

where $E_{i,k,t}^{s,p}$ is an export entry dummy for firm i operating in sector s, located in province p to export market k in year t. Here market k is specified on three, mutually exclusive levels. The most strict criterion is the country-level which includes all exports to the respective country. The second level, hereafter specified as 'regional', includes all exports from the region excluding exports to the respective country. Hence, the regional and country-level exports together equal the aggregate exports to the respective region. The last level includes all exports not to the respective country or region and is hereafter called '-regional' exports.

This specification allows for direct comparison between these three classes of exports. Figure 3 visualizes the description outlined above. Based on the literature outlined in the previous section, different magnitudes of experience and spillover effects across the three specified geographical levels are expected where largest coefficients on these effects are expected to be reported at the country level due to the country-specific nature of some prior export experiences. Thus, separating prior export experience along these three dimensions therefore accommodates the corresponding analysis.

The included firm-level characteristics are the firm's size, in terms of the number of FTEs, and its labor productivity defined as annual firm sales divided by the number of FTEs. Both variables are included in logarithmic form.

As outlined before, we expect the more productive and larger firms to export more than their peers in accordance with Melitz (2003). Hence, the coefficients on the number of FTEs and labor productivity are expected to be positive.

The variables of interest are included through the remaining variables in the model. That is, experience $X_{i,k,t-1}^{s,p}$ which represent the firm's exports to the respective country, respective region k or exports to other regions in period $t-1$. For obvious reasons when considering export entry the export variables specific to market k are not included in the model as they would predict failure perfectly.

Experience effects are considered in three forms along the abovementioned geographical levels. First of all, experience is captured through binary variables. These three variables indicate whether a firm exported to the respective country, respective region and/or other regions. Secondly, two export experience variables are included in terms of the number of countries exported to within the region and outside the region. Finally, the value of exports in the previous period is considered.

Again, three variables are specified. Export value to the respective country, respective region and the total value of extra-regional exports.

The signs of these variables are all expected to be positive as a reduction in fixed and/or variable costs of exporting is expected if a firm exported during period $t-1$. In terms of magnitude, country-level experience effects are expected to be the largest and regional experience effects are projected to be larger than extra-regional experience effects. The degree to which experience is country or region-specific will determine the relative sizes of the respective coefficients.

Spillover effects are estimated by $X^{s,p}_{j,k,t-1}$, $X^{s,p}_{j,k,t-1}$ and $X^{s,p}_{j,k,t-1}$ which represent exports in the previous period by firms j which operate in the same sector and/or are proximate to, that is, are located in the same province p as firm i, and export to the same market k in period $t-1$. The sector and province classification can be retrieved in appendix A. All these variables are considered across the three, abovementioned geographical levels: country, regional and extra-regional.

Spillover effects are modelled in two forms. Three spillover experience variables are included in terms of the number of other firms that exported to the respective country, respective region, and other region in period $t-1$. Finally, the value of other firms' exports in the previous period is considered for the same, three geographical levels.

The expected sign on these spillover effects is ambiguous because a high number of exporting firms or a high export value in the previous period may indicate that this market appears to be attractive to many other firms or generally in high demand for Dutch goods thereby signaling possible sales opportunities to potential entrants, but may also be interpreted as a saturated or competitive market which would deter entry of potential entrants. Still, we argue that the number of firms exporting to the respective market in $t-1$ is a better proxy for the competitiveness of the market whereas export value is a better indicator for market potential. That is, market demand can still be low even though many firms are active in this market. For example, many firms may still be exploring opportunities in this market (without success). In neither case will this signal promising market prospects to other firms and hence the presence of many firms in this market will likely have no positive effect on subsequent entry by other firms to the respective market. Hence, we expect positive coefficients on those spillover effects modelled in value terms and a negative effect on export behaviour of those spillover effects considered in terms of the number of firms exporting to the respective market in period $t-1$.

The destination country-year, sector-year and province-year fixed effects are included as $\alpha_{k,t}$, $\gamma_{s,t}$ and $\delta_{p,t}$ respectively. The error term $\varepsilon_{i,k,t}$ completes the model. Standard errors are clustered by destination country.

4.2 Export value

The second main model considers the intensive margin of exporting, or export value, by the use of a Poisson pseudo-maximum likelihood (PPML) estimation with fixed effects at the country-year, sector-year and province-year level.

In contrast to other models, the PPML estimation naturally allows for the inclusion of zero trade flows (Silva & Tenreyro, 2006; Westerlund & Wilhelmsson, 2011). That is, gravity models are often estimated in a log-linear form which means that zero trade flows would have to be dropped from the sample given the logarithm of zero is undefined (Bacchetta et al., 2012). Hence, empirical models initially just included positive trade flows and disregarded those equal to zero, thereby throwing away potential information why some countries are not engaged in trade. However, since the occurrence of zero trade flows is usually not randomly distributed, but actually linked to the absence of trade, not including these observations will provide inconsistent results (Kristztin & Fischer, 2015). Adding an infinitesimal amount to each trade flow in order to include all observations typically results into biased outcomes as well (Silva & Tenreyro, 2006).

Also, the PPML specification has been proven to be consistent in the presence of heteroscedasticity contrary to those models that include exports in logarithmic form. Namely, log-linearization of the gravity equation can create a bias in the model whenever the error term is not independent of the explanatory variables. That is, when log-linearizing the gravity model the error term, ε, enters the equation in logarithmic form and is dependent on the moments of its distribution. Consequently, the logarithm of ε will be correlated with other dependent variables if the residuals of the multiplicative gravity model are heteroscedastic (Kristztin & Fischer, 2015).

The common specification for export flows in OLS specifies exports in logarithmic form:

$$\log X_{i,k,t}^{s,p} = \beta_1 F_{i,k,t-1} + \beta_2 X_{i,k,t-1}^{s,p} + \beta_3 X_{j,k,t-1}^{s,p} + \beta_4 X_{i,k,t-1}^{p} + \beta_5 X_{j,k,t-1}^{s} + \alpha_{k,t} + \gamma_{s,t} + \delta_{p,t} + \varepsilon_{i,k,t} \quad (13)$$

However, as outlined above, this implies that zero trade flows cannot be naturally included in the dataset. Taking the exponential form of equation 13 solves this problem since the dependent variable enters in numerical rather than logarithmic form:

$$X_{i,k,t}^{s,p} = e^{\beta_1 F_{i,k,t-1} + \beta_2 X_{i,k,t-1}^{s,p} + \beta_3 X_{j,k,t-1}^{s,p} + \beta_4 X_{i,k,t-1}^{p} + \beta_5 X_{j,k,t-1}^{s} + \alpha_{k,t} + \gamma_{s,t} + \delta_{p,t}} \eta_{i,k,t} \quad (14)$$

Where $X_{i,k,t}^{s,p}$ is the level of exports of firm *i* operating in sector *s*, with province *p* to country, region or extra-region *k* in year *t*, and where $\eta_{i,k,t} = e^{\varepsilon_{i,k,t}}$. The firm-level characteristics $F_{i,k,t-1}$ are similar as before. In accordance with the Melitz' model, these variables are expected to have a positive effect at the intensive margin of exporting as well.

The experience and spillover effects considered are included in the same manner as for the model considering the extensive margin. The impact of the considered experience and spillover effects on export value is ambiguous. On the one hand variable export costs may decline which translates into higher exports, see equation 9. However, on the other hand experience and spillover effects are also expected to lower the fixed costs of exporting which means that less productive firms can now compensate for their lower productivity through prior export experience and still enter the respective export country. This effect will dampen the positive impact on sales. Ultimately, the relative magnitude of these two effects will determine the sign of the respective coefficients.

This model also includes country-year, sector-year and province-year fixed effects denoted by $\alpha_{k,t}$, $\gamma_{s,t}$ and $\delta_{p,t}$ respectively. Again, standard errors are clustered by destination country.

5 Data and descriptive statistics

5.1 Data sources

Annualized firm-level data are provided by Statistics Netherlands and cover the period 2009-2014. Firm-level international trade data are retrieved from the 'International Trade in Goods' dataset. Hence, the analysis excludes exports of services. The firm-level export data used for this study exclude all re-exports and are quoted in 2009 export prices.

The dataset is based on customs data and extended with a survey among Dutch firms on their international trade in goods. More specifically, those firms for which annual imports and exports combined exceed € 900,000 are required to file their international trade on a monthly basis and report it to Statistics Netherlands. Consequently, no intra-EU country-level trade is recorded for the firms for which annual trade does not exceed this threshold. This implies that experience effects may be overstated. If, for example, a Dutch firm exports a value of € 500,000 to Germany, its extra-EU exports amount to € 10,000 in period $t-1$ and this firms decides to enter yet another extra-EU market in period t then all experience will be ascribed to the firm's € 10,000 extra-EU trade because the firm's German exports are not recorded. Given the typical cultural and geographical proximity of many countries in the European Union, the experience effects for a given value of exports are expected to be smaller than extra-EU trade. While we do acknowledge the potential bias of our results due to this data limitation, we therefore believe the effect is relatively small.

Namely, our sample only includes firms that employ fifty or more FTEs given computational constraints. Because these firms are relatively large in size their total trade is typically higher as well which implies that for many firms not just extra-EU but also intra-EU trade is recorded at the country-level. We wanted to include exporting and non-exporting firms in our sample in order to compare exporters to non-exporters and avoid creating another selection bias. Still, we do note that this sample selection implies that potential spillover effects from small and micro firms are not explicitly included in the model. However, we argue that the spillovers from small to large firms are relatively small. Also, we run a separate analysis on a sample which includes small firms as well and show the regression results are similar. More specifically, this sample includes all firms that employ ten or more FTEs.

Since experience and spillover effects essentially capture the effect of lagged exports we cannot apply the abovementioned size criterion for each year separately, because this may lead to gaps in our sample and preventing the correct modelling of experience and spillover effects. Therefore, we apply the firm size criterion in 2014 only. For the period 2009-2013 this implies that only firms that still existed in 2014 are included in the sample. Consequently, this may cause an upward bias in our estimation as firms that exported before 2014, but failed to stay in business are excluded from the sample.

The international trade data are merged with other firm-specific characteristics by the use of the 'General Firm Register' dataset. In addition, firms' province and sector data are retrieved from this dataset. The 'Non-Financial Firms' dataset is used to gather data on firms' total sales. The 'jobs

and wages for employees in the Netherlands' dataset provides the firms' size in terms of total number of FTEs employed. A firm's labor productivity is calculated by dividing total sales by the total number of FTEs and is deflated to 2009 prices. The extended gravity variables are retrieved from the CEPII database and the World Bank Development Indicators. Finally, the country-level FDI data are provided by the Dutch Central Bank (De Nederlandsche Bank, 2015).

5.2 Descriptive statistics

Table 2 shows that the number of firms per year increases over time. This is due to the employed sample selection method as described above. Moreover, we can see that the average number of countries exported to per exporter initially dropped, but increased again over the recent years. Note that this figure is based on our dataset and thererfore does not include the intra-EU destinations for the firms that trade less than € 900,000 in each respective year. Consequently, the actual average number of countries exported to per firm and per exporter are higher than reported. As expected on theoretical grounds, firm size (as measured by the number of FTEs) and labor productivity are higher for exporters than for their non-exporting peers in each given year.

Table 2 Descriptive statistics

Year	2009	2010	2011	2012	2013	2014
# of firms	8,467	8,832	10,182	10,553	10,931	11,333
# of exporters	2,412	2,354	2,605	2,762	2,914	3,198
Average # export countries served per firm	3.57	3.17	3.15	3.04	3.12	3.32
Average # export countries served per exporter	12.54	11.91	11.65	11.61	11.70	11.76
Average Log(Size) for exporters	4.99	4.97	4.95	4.97	4.99	5.02
Average Log(Size) for non-exporters	4.75	4.75	4.81	4.85	4.87	4.88
Average Log(Labor productivity) for exporters	12.79	12.56	12.71	12.79	12.80	12.77
Average Log(Labor productivity) for non-exporters	11.05	10.72	11.03	11.05	11.01	10.98

Source: SEO Amsterdam Economics, based on Statistics Netherlands

Table 3 (see 'Figures and Tables' at the end of this paper) gives other summary statistics.

6 Results

6.1 Export entry

To determine which factors determine whether a firm starts to export to a particular market we first run a logit model which just contains the firm-specific variables: the number of FTEs and labor productivity, both included in logarithmic form. In accordance with Melitz (2003), a firm's size and its productivity are both highly significant and thus co-determining the likelihood of exporting, as presented in column 1 in Table 4. Since both variables are specified in logarithmic form the interpretation of their coefficients is identical and based upon the interpretation of odds and the odds ratio. For all variables *i* in logarithmic form the odds ratio is affected as follows:

$$Odds\ ratio = \frac{Odds_B}{Odds_A} = \frac{P_B(Entry=1)/P_B(Entry=0)}{P_A(Entry=1)/P_A(Entry=0)} = \left(\frac{X_i^B}{X_i^A}\right)^{\beta_i} \quad (15)$$

Where β_i is the relevant coefficient and X_i^A and X_i^B are potential values of the relevant variable, respectively. For example, the coefficient of labor productivity equals 0.349 which implies that a doubling in labor productivity would result into an odds ratio of $2^{0.349} \approx 1.27$. This means that the odds of export entry increase by approximately 27 percent. In a similar fashion it can be concluded that doubling the number of FTEs enhances the odds of export entry by almost 20 percent since $2^{0.259} \approx 1.20$.

The explanatory power of the model is enhanced through the inclusion of experience effects. Column 2 specifies a model which includes two dummy variables to indicate whether a firm exported to the region in period *t−1* and whether it exported, but to another region. In addition, variables indicating the number of countries a firm exported to within and outside the region during the previous period are included. As mentioned before, all models with export entry as the dependent variable exclude the country-specific exporting dummy variable because it would predict failure perfectly.

All experience variables are highly significant and have the expected sign, while the economic significance of the firm-specific variables drops with the inclusion of experience effects. A possible explanation for this could be that the fixed and variable costs of exporting are effectively lowered through previous exporting experience, meaning that the explanatory power of labor productivity and firm size on export entry declines. That is, the odds of export entry can be raised through two main channels. The first channel is that high productivity or a large firm size can boost the chance of entry to an export market. The second channel is that prior export experience can enhance the likelihood of entering yet another country. Consequently, the relation between export entry and firm productivity or size becomes less clear-cut.

The lower statistical significance of the firm-specific characteristics when experience effects are captured through the number of countries exported to in period t−1 may suggest that the so-called diversity of exports in the previous period has a larger effect on the reduction of the fixed costs of exporting than the depth of exporting, represented by the export value. This may be due to the

country-specific nature of a firm's export experience which means the firm may not be able to fully exploit its prior export experience when entering another export market. Thus, exporting a certain value of goods to one particular country may not benefit a firm as much in terms of subsequent market entries as a scenario in which a firm exported the same aggregate value of goods, but exported to multiple foreign markets.

All experience and spillover effects are included in the models in numerical form. The corresponding odds ratio is specified as follows:

$$Odds\ ratio = e^{\beta_i(X_i^B - X_i^A)} \tag{16}$$

This implies that if a firm exports to one more country within a region in period t − 1, that is $X_i^B = X_i^A + 1$ (i.e. $X_i^B - X_i^A = 1$), the odds of export entry to yet another increases by approximately 11 percent since the relevant coefficient equals 0.108 and $e^{0.108} \approx 1.11$. Through a similar approach the odds of export entry increases by 1134 percent, since the odds ratio is $e^{2.513} \approx 12.34$, if a firm already exported to the respective region in period *t−1*. For example, if a firm did not export to the respective country in period *t−1* and its odds ratio equals 1 the chance of entering this particular country the next period equals 11 percent. However, if the same firm did export to this particular region its odds of export entry would equal 1 multiplied by 12.34, or approximately 3 , and the firm's probability of exporting to this particular country next period increases to just above 60 percent. If the firm merely exported to another region the previous period then the odds ratio would equal $e^{1.718} \approx 5.57$ or the odds of export entry increase by 457 percent. Exporting to another region in period *t−1* raise the odds of export entry by 5 percent since $e^{0.0510} \approx 1.0501$.

The models specified in Table 5 build upon the abovementioned models, but also include several forms of spillover effects. The model presented in column 1 considers the effect of the export behaviour in the previous period of the other firms which operate in the same sector. More specifically, the model includes the number of other firms exporting to other regions, the number of other firms exporting to the respective region and the number of other firms exporting to the respective country. Again, only firms operating in the same sector are included in these variables. The regression results show that the probability of exporting to a particular country decreases in the number of other firms already exporting.

The coefficients indicate that the country-specific spillover is the least negative which may suggest that at the country-level some positive spillover effects exist that benefit potential entrants. In other words, some spillover effects seem to be country-specific and may include familiarity with local customs, local partners or the local distribution networks. Still, however, the negative spillover effects prevail as all coefficients show a negative sign. More specifically, the effect of one additional firm exporting to the respective country in period *t−1* on the odds ratio equals $e^{-0.00579} \approx 0.994$ which means the odds of export entry decrease by 0.6 percent. The equivalent effects on the odds of export entry at the regional level and for exports to other regions are both close to -0.7 percent.

The model outlined in column 2 also includes sector-specific spillover effects, however, this specification includes the value of other firms' exports rather than the number of other firms operating in the same sector and exporting to the respective country, region or elsewhere in period *t−1*. As

the value of exports is reported in million euros, one million euros additional exports to the respective country decreases the odds of export entry by $e^{0.00054} - 1 \approx 0.0005$, or 0.05 percent, while the incremental effect of regional exports or exports to other regions is very similar and equals -0.045 percent.

The contradiction between the sign of the spillover effects across the two specification can be explained when potential entrants regard a high export value in period $t-1$ as an indicator for great market potential, whereas the number of firms exporting to the respective market last period is interpreted as an indication of a competitive or saturated market. Moreover, potential entrants may deter entry to a foreign market if they believe the number of firms currently exporting to this market equals the maximum capacity the respective export infrastructure can accommodate. Finally, a high number of firms entering a market may suggest that many are still exploring the potential of this market and only once some of these firms have successfully entered the market others will follow. Thus, a high number of firms exporting to a specific market does not necessarily imply that this market is attractive for non-exporters to enter.

Similar models considering spillover effects at the province level are presented in columns 3 and 4. While the learning and firm-specific effects of models specified in columns 3 and 4 show similar signs in comparison to the models in columns 1 and 2, respectively, the reported spillovers are different in magnitude. The negative effect of the number of firms exporting to a similar destination is larger, see column 3. This may be caused by the absence of positive spillover effects that only exist on the sector dimension. For example, foreign customer preferences are likely to be similar for firms operating in the same sector. But being located in the same province does not mean that a potential entrant can benefit from these sector-specific informational spillovers when considering the export behaviour of proximate firms irrespective of the industry these operate in. The effective impact on the odds of export entry is similar across geographical categories and approximately comes down to a decrease of 0.1 percent.

Column 4 presents the results when looking at the role of the lagged value of other firms' exports which are located in the same province. In this case both the statistical as well as economic significance reported for the spillover effects are similar as the equivalent sector-specific model. The reported spillovers are only not as economically significant at the country-level compared to sector-specific spillover effects. The effect on the odds of export entry is roughly equal across the different geographical specification and is approximately 0.04 percent. Overall, the models in Table 4 generally indicate that spillover effects are more positive the stricter the geographical criterion applied which suggests some positive spillovers are country-specific.

Finally, we run models in which not just both sector and province-specific spillovers are included but also spillovers specific to an overlap in both dimensions, see Table 6. That is, sector-province-specific spillovers, again, at the country, regional and extra-regional level are added to the regression model. The cumulative effect of spillovers at a certain geographical level can be calculated through the addition of its components for this particular geographical criterion. For example, to determine the incremental effect of one additional firm which operates in the same sector and is located in the same province exporting to the respective country in period $t-1$ on export entry of a potential entrant would be attained by adding the sector-specific, province-specific and sector-province-specific spillover effects at the country level.

The model specified in column 1 includes spillover effects in the form of numbers of other firms exporting to the respective zone in period *t−1*. Most reported coefficients are statistically insignificant. Hence, the cumulative effect cannot be retrieved. More specifically, we only find evidence of a positive effect of sector-province-specific spillover at the country level, while a negative effect is reported for exports to other regions. These results suggests that some positive spillover effects are country-specific. The experience effects remain statistically significant.

Again, when export values rather than the numbers of firms exporting the spillover effects are statis- tically significant, see column 2. Both along the sector and sector-province dimension are mainly positive coefficients reported. However, only at the extra-regional level can we compute the cumulative effect of one million additional export value at the sector-province-specific level as all relevant variables are statistically significant. The effect equals $e^{(0.000451+0.0000175-0.0000153)} = e^{0.0004522} \approx 1.00045$ which means the odds of export entry increase by 0.045 percent.

In a similar fashion as Table 4 are also two models considered in which experience effects are captured through binary and value variables rather than in the form of binary and 'number of firms' variables. The effects of prior export experiences are similar to those presented in column 3 of Table 4. Column 3 captures spillover effects in terms of the 'number of firms' exporting in period *t−1* just like column 2, whereas the model specified in column 3 includes spillover effects through export value variables. The regression results presented in column 3 provide some evidence for negative spillover effects when the number of firms exporting in the previous period are considered. More specifically, we find these effects on the province and sector-province dimension. Column 4 provides additional evidence for the presence of positive spillover effects along the sector and sector-province dimension. The high z-statistics recorded for the sector-specific spillovers in column 4 are likely caused by multicollinearity issues among the sector and sector-province-specific variables. That is, the correlation is just below 80 percent at the country and regional level. Hence, these coefficients should be interpreted with caution.

The cumulative effect of the sector-province-specific spillovers at the regional level can be computed since all relevant variables are statistically significant. The addition of all three coefficients yields an increase in the odds of $e^{(0.000236-0.0000146+0.00000986)} \approx e^{0.00024} - 1 \approx 0.024$ percent. But, again these results should be interpreted with caution given potential multicollinearity issues.

Altogether, the results show that learning effects have a significant positive effect on the odds of export entry. Also, the firm-specific variables are no longer statistically significant once learning effects are included in the model. Finally, evidence of positive spillover effects is found when these are included in numerical form whereas some significant, but negative effects are reported when spillovers are considered in terms of the number of firms exporting to the respective country in period *t−1*.

6.2 Export value

The impact of experience and spillover effects has also been studied at the intensive margin, or export value, through a Poisson pseudo-maximum likelihood (PPML) estimation. As before, the

dependent variable is measured at the firm-country-specific level. The interpretation of the coefficients is now different than for the logit model, given that the PPML model is specified as:

$$X_{i,k,t}^{s,p} = e^{\beta_1 F_{i,k,t-1} + \beta_2 X_{i,k,t-1}^{s,p} + \beta_3 X_{j,k,t-1}^{s,p} + \beta_4 X_{i,k,t-1}^{p} + \beta_5 X_{j,k,t-1}^{s} + \alpha_{k,t} + \gamma_{s,t} + \delta_{p,t}} \eta_{i,k,t} \quad (17)$$

As a consequence, the effect of the firm-specific variables, which are expressed in logarithmic form, equals e^{β_i} . For example, the effect of a change in labor productivity from some level A to B can be defined as the ratio between the two values of exports:

$$\frac{Export\ value_B}{Export\ value_A} = \left(\frac{Labor\ productivity_B}{Labor\ productivity_A}\right)^{\beta_i} \quad (18)$$

Since the coefficient on labor productivity equals 1.01, see column 1 in Table 7, a doubling in labor productivity leads to a ratio of $2^{1.01} \approx 2.01$. This translates to an increase in country exports of approximately one hundred percent for the respective firm. Employing the same approach reveals that a doubling in firm size increases a firm's exports by $2^{0.923} - 1 \approx 0.89$, or 89 percent for this particular country.

Adding experience effects in terms of dummy variables and the number of countries exported to in the previous period enhances the explanatory power of the model significantly, as presented in column 2 of Table 7. While the magnitude of the firm-specific variables remains similar, most experience effects are statistically significant. The reported coefficients on the experience effects show positive signs and should be interpreted as follows:

$$\frac{Export\ value_B}{Export\ value_A} = e^{\beta_i (X_i^B - X_i^A)} \quad (19)$$

Thus, if a firm exported to one additional country within the region in period *t−1* this increases the value of country exports with factor $e^{0.0471} \approx 1.05$, ceteris paribus (see column 2 of Table 7).

These results suggest that the reduction in a firm's variable trade costs due to its own export experience in the last period outweigh the negative effect at the extensive margin of exporting, caused by the entry of the marginally productive firms which could not enter the respective country in isolation, but now are able to enter this market due to experience effects. More specifically, if prior export experience lowers the fixed costs of entry, then firms that are relatively unproductive but do have extensive export experience can still enter the respective export market. Simultaneously, the reduction in fixed costs of exporting does not affect the intensive margin of exporting (see equation 9). As a result, the average value exported to the respective country could drop through this channel. Altogether, it means that the abovementioned positive experience effects are relatively large in size. In contrast, exporting to one additional country outside the respective region decreases the value of country exports. This may suggest that firms tend to concentrate their efforts on exporting to certain countries or regions. As firms have finite resources, some might not be able to profitably greatly diversify their export destinations.

The economic significance of firm-specific variables remains high when experience effects are captured in binary and value terms, see column 3. Similar as before, the experience effects enter the

model with a positive sign and therefore enhance country exports in period t. Similar to the results presented for export entry, see Table 4, under this model specification extra-regional exports have no effect on export value, while country and regional exports have a positive effect. This suggests that some experience effects are region and/or country-specific.

The models presented in Table 8 build upon on the model outlined in column 2 of Table 7 by the inclusion of sector or province-specific spillover effects in various forms. Whereas the statistical and economic significance of the firm-specific and experience variables are very similar as before, none of the spillover effects appear to be significant at the employed confidence levels.

Including sector-province-specific spillover effects does not alter the economic and statistical significance of the firm-specific and experience effects either (columns 1 and 2 of Table 9). The sector-specific spillover effects remain statistically insignificant, while the province-specific spillovers are significant at the country and extra-regional level. As before, the value of other firms' export can be interpreted as an indicator of market potential which means that more firms may enter this very market. Information spillovers effectively lower the fixed costs of exporting which means that less productive firms can profitably enter the respective markets as well. Because the intensive margin of exporting is not affected by the fixed costs of exporting combined with the fact that less productive firms typically export less means that the export value is negatively affected.

Altogether, the regression outcomes seem to suggest that the magnitude of the effect of reduction in the costs of exporting through experience effects is larger than the negative effect of marginally productive firms entering the respective export markets. In contrast, this latter effect seems to dominate the first when spillover effects are considered in value terms.

7 Conclusion

This paper provides evidence for the existence of positive experience and spillover effects in the export destinations of Dutch firms, based on firm-level data for the Netherlands on the exports of goods during 2009-2014.

We find evidence of positive experience effects at all geographical levels. As expected, experience effects are the strongest at the country level, and the least important at the extra-regional level. In other words, the probability (or value of) exporting to a particular country increases as a result of general prior export experience, increases further in case of prior export experience in the region, and increases the most in case of prior export experience to this particular country.

We also find evidence for positive spillover effects, but the evidence is mixed, and strongest at the sectoral and sector-province level. At the sectoral level, there is clear evidence of positive spillovers in terms of export value, but no significant effect when spillovers are captured in terms of the number of firms exporting in the previous period. At the sector-province level, there is evidence for positive spillovers when export experience to the same country or region is considered, but these spillovers sometimes turn negative at the extra-regional level. Finally, at the province level, **s**pillover effects are negative in some model specifications, whereas in other cases no significant effect is reported. The negative effects primarily exist at the regional and extra-regional level, which suggests that some province-specific spillover effects are country-specific and can offset the negative province-specific spillovers.

Although significant spillover effects are found at both the extensive and intensive margin of exporting, more significant spillover effects are recorded at the extensive margin. This suggests that the prior export experience of other firms particularly reduces the fixed costs of exporting, because the extensive margin of exporting depends not just on variable costs but also on fixed costs. Evidence for a positive spillover effect at the intensive margin is only found at the sector-province-specific level, and confined to the country level. This implies that reductions in variable trade costs are realised only when exploiting the experience of firms that are located in the same province, operate in the same sector and export to the same foreign market.

The abovementioned findings generally hold up to several robustness checks, including extending the sample with small firms, controlling for FDI choice, as well as controlling for shared similarities that could independently affect the choice of export destination (e.g, having contiguous borders, sharing a common language, being located in the same region, or belonging to the same income group). When small firms are included in the sample, sector-specific spillovers do turn negative at the intensive margin of exporting. We interpret this as evidence of competitive pressures at the sector-level, from which small firms in particular suffer when exporting. When excluding the top 10 destinations of Dutch FDI, the economic significance of experience and spillover effects increases. When controlling for shared similarities, we still find evidence for experience and spillover effects.

The conclusions drawn from this analysis may not be restricted to the Dutch setting, but could apply to the export behaviour of firms in other countries as well, to the extent that the described mechanisms through which experience and spillover effects influence export behaviour apply to all firms. Indeed, as described in the literature review, multiple countries are considered in which similar experience and spillover effects are found. Firms from countries that are comparable to the Netherlands, in terms of culture and/or structure of the economy, may be expected to behave similarly. For example, the export behaviour of Belgian firms is likely to resemble the behaviour of their Dutch peers, given that (a) both the Netherlands and Belgium are small open economies, (b) the culture of the two countries is similar; and (c) the physical distances to other export markets are alike. However, it should be noted that the specific sample selection used for this study is dissimilar from those used in other studies, both in terms of the firm size criterion as well as the represented sectors in which firms operate. Consequently, care should be taken when making comparisons between results across countries.

Future research could consider the effect of different types of firms on the existence and magnitude of spillover effects. On the one hand, a high number of similar firms could create many opportunities for learning from other firms. On the other hand, however, firms may suffer from higher competitive pressures at the marketplace. How these two factors interact across different dimensions is an area of research that we did not consider, but which could have important policy implications.

Another extension to our work might be the consideration of non-linear specifications of spillover and network effects beyond squared effects. In this paper, we showed that that firms are positively affected by their own export experience and by the experiences of other firms when considered in export value terms, but we modelled these effects only in linear terms and hence did not allow for different marginal effects. Additional research on the existence of non-linear effects could also be important for policy considerations.

Literature

Aitken, B., Hanson, G. H., & Harrison, A. E. (1997). Spillovers, foreign investment, and export behaviour. Journal of International Economics, 43 (1-2), 103–132.

Albornoz, F., Calvo-Pardo, H. F., Corcos, G., & Ornelas, E. (2012). Sequential Exporting. Journal of International Economics, 88 (1), 17-31.

Alvarez, R. (2007). Explaining Export Success: Firm Characteristics and Spillover Effects. World Development, 35 (3), 377-393.

Antonietti, R. & Cainelli, G. (2011). The role of spatial agglomeration in a structural model of innovation, productivity and export: a firm-level analysis. Annals of Regional Science, 46 (3), 577-600.

Artopoulos, A., Friel, D., & Hallak, J. C. (2010). Challenges of Exporting Differentiated Products to Developed Countries: The Case of SME-Dominated Sectors in a Semi-Industrialized Country. Inter-American Development Bank Working Paper, 166. Retrieved from http://www.iadb.org/res/publications/pubfiles/pubIDB-WP–166.pdf.

Bacchetta, M., Beverelli, C., Cadot, O., Fugazza, M., Grether, J., Helble, M., Nicita, A., & Piermartini, R. (2012). A Practical Guide to Trade Policy Analysis. New York, NY: WTO and the United Nations Conference on Trade and Development.

Belso-Martínez, J. (2006). Do industrial districts influence export performance and export intensity? Evi- dence for Spanish SMEs' internationalization process. European Planning Studies, 14 (6), 791-810.

Bernard, A. & Jensen, J. (2004). Why some firms export. Review of Economics and Statistics, 86 (2), 561-569.

Bugamelli, M. & Infante, L. (2003). Sunk Costs of Exports: A Role for Industrial Districts? Temi di discus- sione (Economic working papers), 469. Retrieved from https://www.bancaditalia.it/ pubblicazioni/altri-atti-convegni/2003-econom-locali/bugamelli-infante.pdf.

Cassey, A. J. & Schmeiser, K. N. (2013). The agglomeration of exporters by destination. Annals of Regional Science, 51 (2), 495-513.

Castagnino, T. (2011). Export Costs and Geographic Diversification: Does Experience Matter? Central Bank of Argentina Working Paper, 52. Retrieved from https://www.econstor.eu/bitstream/10419/86116/ 1/667701176.pdf.

Castillo-Giménez, J., Serrano, G., & Requena-Silvente, F. (2011). Exports dynamics and information spillovers: evidence from Spanish firms. Working Papers in Applied Economics, 1103. Retrieved from ftp://147.156.210.157/RePEc/pdf/eec_1103.pdf.

Chaney, T. (2013). The Gravity Equation in International Trade: An Explanation. National Bureau of Economic Research Working Paper, 19285. Retrieved from http://www.nber.org/ papers/w19285.pdf.

Choquette, E. & Meinen, P. (2011). The Channels of Export Spillovers. Paper presented at EARIE 2011 Conference, Stockholm, Sweden. Retrieved from http://www.webmeets.com/files/papers/earie/2011/343/Export_Spillovers_v11.pdf.

Clerides, S. & Kassinis, G. (2009). Modeling the diffusion of strategies: an application to exporting. Industrial and Corporate Change, 18 (3), 415-434.

Clerides, S. K., Lach, S., & Tybout, J. R. (1998). Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco. Quarterly Journal of Economics, 113 (3), 903-947.

Creusen, H. & Lejour, A. (2011). Uncertainty and the export decisions of Dutch firms. CPB Discussion Paper, 183. Retrieved from http://www.cpb.nl/sites/default/files/publicaties/ download/dp183uncertainty-and- export-decisions-dutch-firms.pdf.

Davidson, W. (1980). The location of foreign direct investment activity: Country characteristics and expe- rience effects. Journal of International Business Studies, 11 (2), 9-22.

De Nederlandsche Bank (2015). Nederlandse directe investeringen in het buitenland (standen). Retrieved from http://www.dnb.nl/binaries/t12.17ny_tcm46-332282.xls.

Defever, F., Heid, B., & Larch, M. (2010). Spatial exporter dynamics. Retrieved from http://www.webmeets.com/files/papers/ESWC/2010/2062/Heid%20RMET2010.pdf.

Dutt, P., Santacreu, A. M., & Daniel, T. (2014). The Gravity of Experience. Federal Reserve Bank of St. Louis Working Paper, 41. Retrieved from https://research.stlouisfed.org/wp/2014/2014-041.pdf.

Dyer, J. H. & Chu, W. (2003). The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea. Organization Science, 14 (1), 57-68.

Díez-Vial, I. & Fernández-Olmoso, M. (2014). Does Experience Facilitate Entry into New Export Destina- tions? European Planning Studies, 22 (1), 143–163.

Eaton, J., Eslava, M., Tybout, J. R., Jinkins, D., & Krizan, C. (2014). A Search and Learning Model of Export Dynamics. Presented at Society for Economic Dynamics Annual Meeting 2015, Warsaw, Poland. Retrieved from http://www.davidjinkins.com/docs/EE-JKT_02_26_2014.pdf.

Eaton, J., Kugler, M. E. M., & Tybout, J. R. (2007). Export Dynamics in Colombia: Firm-level Evidence. National Bureau of Economic Research Working Paper, 13531. Retrieved from http://www.nber.org/papers/w13531.pdf.

Eriksson, K. & Chetty, S. (2003). The effect of experience and absorptive capacity on foreign market knowledge. International Business Review, 12 (6), 673-695.

Evenett, S. & Venables, A. (2002). Export growth by developing economies: Market entry and bilateral trade. Retrieved from https://www.alexandria.unisg.ch/22177/1/setvend.pdf.

Fernandes, A. & Tang, H. (2011). Learning to Export and Export Processing Spillovers. Presented at European Trade Study Group conference Copenhagen, Denmark. Retrieved from http://www.etsg.org/ETSG2011/Papers/Fernandes_Tang.pdf.

Greenaway, D. & Kneller, R. (2008). Exporting, productivity and agglomeration. European Economic Review, 52 (5), 919-939.

Hart, O. & Moore, J. (1999). Foundations of Incomplete Contracts. Review of Economic Studies, 66 (1), 115–138.

Helpman, E., Melitz, M. J., & Rubinstein, Y. (2008). Estimating Trade Flows: Trading Partners and Trading Volumes. Quarterly Journal of Economics, 123 (2), 441-487.

Henisz, W. J. & Macher, J. T. (2004). Firm- and Country-Level Trade-Offs and Contingencies in the Evaluation of Foreign Investment: The Semiconductor Industry, 1994-2002. Organization Science, 15 (5), 537-554.

Hofstede, G. (2001). Culture's consequences: Comparing values, behaviours, institutions and organizations across nations (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Johanson, J. & Vahlne, J.-E. (1977). Internationalization process of firm - model of knowledge development and increasing foreign market commitments. Journal of International Business Studies, 8 (1), 23-32.

Klein-Woolthuis, R., Hillebrand, B., & Nooteboom, B. (2005). Trust, contract and relationship development. Organization Studies, 26 (6), 813-840.

Koenig, P. (2009). Agglomeration and the export decisions of French firms. Journal of Urban Economics, 66 (3), 186–195.

Koenig, P., Mayneris, F., & Poncet, S. (2010). Local export spillovers in France. European Economic Review, 54 (4), 622-641.

Krautheim, S. (2007). Gravity and Information: Heterogeneous Firms, Exporter Networks and the 'Distance Puzzle'. European University Institute Working Paper, 51. Retrieved from http://cadmus.eui.eu/bitstream/handle/1814/7602/ECO-2007-51.pdf.

Kristztin, T. & Fischer, M. M. (2015). The Gravity Model for International Trade: Specification and Estimation Issues. Spatial Economic Analysis, 10 (4), 451-470.

Lawless, M. (2013). Marginal Distance: Does Export Experience Reduce Firm Trade Costs? Open Economies Review, 24 (5), 819-841.

Lovelya, M. E., Rosenthal, S. S., & Sharma, S. (2005). Information, agglomeration, and the headquarters of U.S. exporters. Regional Science and Urban Economics, 35 (2), 167–191.

Macchiavello, R. & Morjaria, A. (2015). The value of relationships: evidence from a supply shock to Kenyan rose exports. American Economic Review, 105 (9), 2911-2945.

Masso, J., Rõigas, K., & Vahter, P. (2015). Foreign market experience, learning by hiring and firm export performance. Review of World Economics, 51 (4), 659-686.

Meinen, P. (2015). Sunk costs of exporting and the role of experience in international trade. Canadian Journal of Economics, 48 (1), 335-367.

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

Mittelstaedt, J. D., Ward, W. A., & Nowlin, E. (2006). Location, industrial concentration and the propensity of small US firms to export. International Marketing Review, 23 (5), 486-503.

Molina, D. & Muendler, M. (2013). Preparing to Export. National Bureau of Economic Research Working Paper, 18962. Retrieved from http://www.nber.org/papers/w18962.pdf.

Morales, E., Sheu, G., & Zahler, A. (2011). Gravity and Extended Gravity: Estimating a Structural Model of Export Entry. Retrieved from http://www.parisschoolofeconomics.eu/docs/ydepot/ semin/texte1112/ MOR2012GRA.pdf.

Muñoz-Sepúlveda, J. A. & Rodríguez, D. (2015). Geographical and industrial spillovers in entry decisions across export markets. Applied Economics, 47 (39), 4168-4183.

Nguyen, D. X. (2012). Demand uncertainty: Exporting delays and exporting failures. Journal of International Economics, 86 (2), 336-344.

Parrotta, P. & Pozzoli, D. (2012). The effect of learning by hiring on productivity. RAND Journal of Economics, 43 (1), 167–185.

Ramos, R. & Moral-Benito, E. (2015). Agglomeration Matters for Trade. 85. Presented at Society for Economic Dynamics Annual Meeting 2013, Seoul, South Korea. Retrieved from https://www.economicdynamics.org/meetpapers/2013/paper_85.pdf.

Rauch, J. E. & Watson, J. (2003). Starting small in an unfamiliar environment. International Journal of Industrial Organization, 21 (7), 1021–1042.

Roberts, M. J. & Tybout, J. R. (1997a). The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs. American Economic Review, 87 (4), 545-564.

Roberts, M. J. & Tybout, J. R. (1997b). What Makes Exports Boom? Washington, DC: World Bank.

Schmeiser, K. N. (2012). Learning to export: Export growth and the destination decision of firms. Journal of International Economics, 87 (1), 89-97.

Sheard, N. (2014). Learning to Export and the Timing of Entry to Export Markets. Review of International Economics, 22 (3), 536-560.

Shenkar, O. (2001). Cultural Distance Revisited: Towards a More Rigorous Conceptualization and Measure- ment of Cultural Differences. Journal of International Business Studies, 32 (3), 519-535.

Shepherd, B. (2013). The Gravity Model of International Trade: A User Guide (2nd ed.). Bangkok, Thailand: United Nations.

Silva, J. S. & Tenreyro, S. (2006). The Log of Gravity. Review of Economics and Statistics, 88 (4), 641-658.

Sinani, E. & Hobdari, B. (1996). Foreign Entry, Cultural Barriers, and Learning. Strategic Management Journal, 17 (2), 151–166.

Sinani, E. & Hobdari, B. (2010). Export market participation with sunk costs and firm heterogeneity. Applied Economics, 42 (25), 3195-3207.

Statistics Netherlands (2016). Internationale handel; in- en uitvoer kerncijfers. Retrieved from http://statline.cbs.nl/StatWeb/publication/?VW=TDM=SLNLPA=70017LA=NL.

Van Beers, C. & Van Der Panne, G. (2011). Geography, knowledge spillovers and small firms' exports: an empirical examination for The Netherlands. Small Business Economics, 37 (3), 325-339.

Wagner, J. (2002). The causal effects of exports on firm size and labor productivity: first evidence from a matching approach. Economics Letters, 77 (2), 287-292.

Wagner, J. (2007). Exports and Productivity: A Survey of the Evidence from Firm-level Data. World Economy, 30 (1), 60-82.

Wang, L. & Zhao, Y. (2013). Does Experience Facilitate Entry into New Export Destinations? China World Economy, 21 (5), 36-59.

Westerlund, J. & Wilhelmsson, F. (2011). Estimating the gravity model without gravity using panel data. Applied Economics, 43 (6), 641-649.

Figures and tables

Figure 1: The role of experience effects on export entry of firm *i* to country *k*

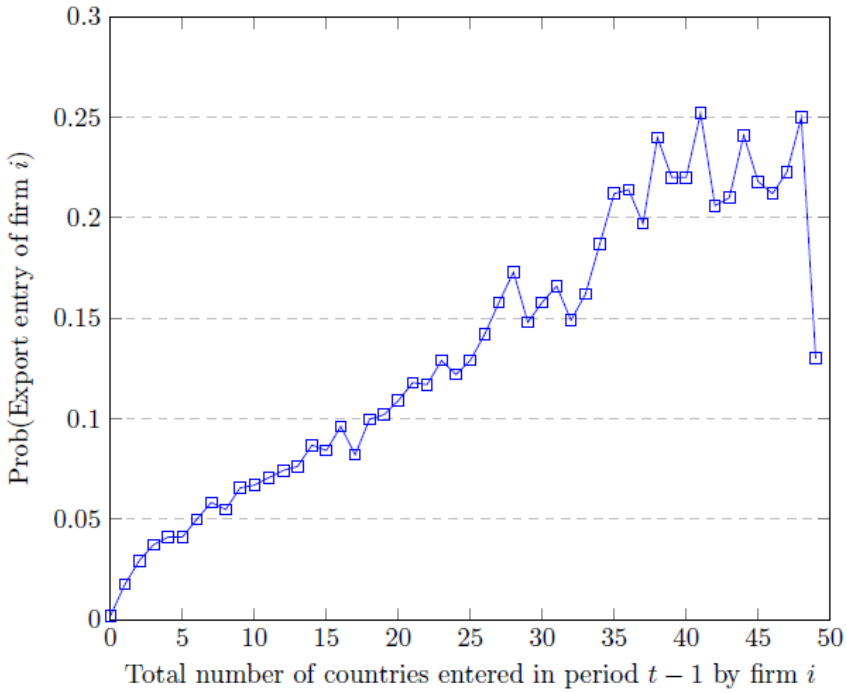

Figure 2: The role of spillover effects on export entry of firm i to country k

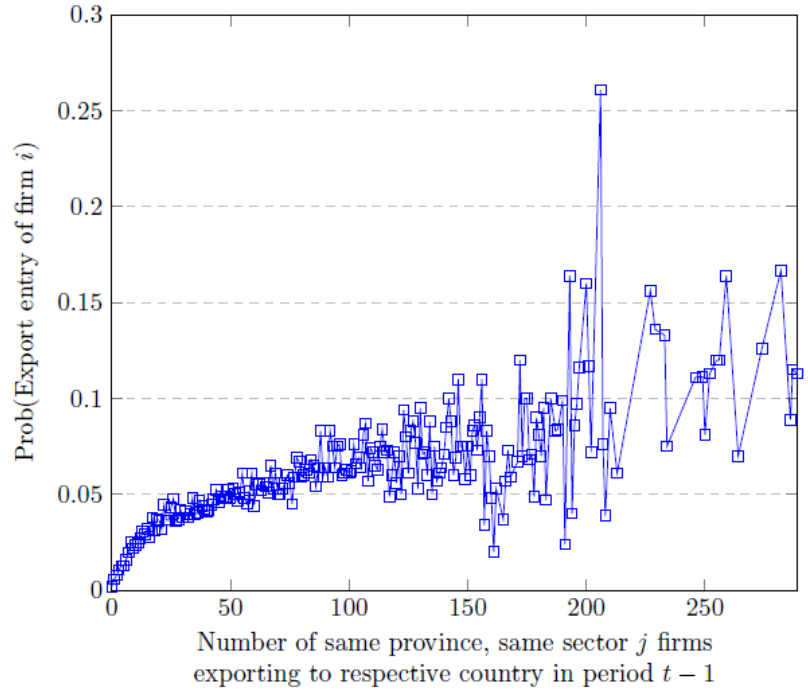

Figure 3: Schematization of the geographical levels

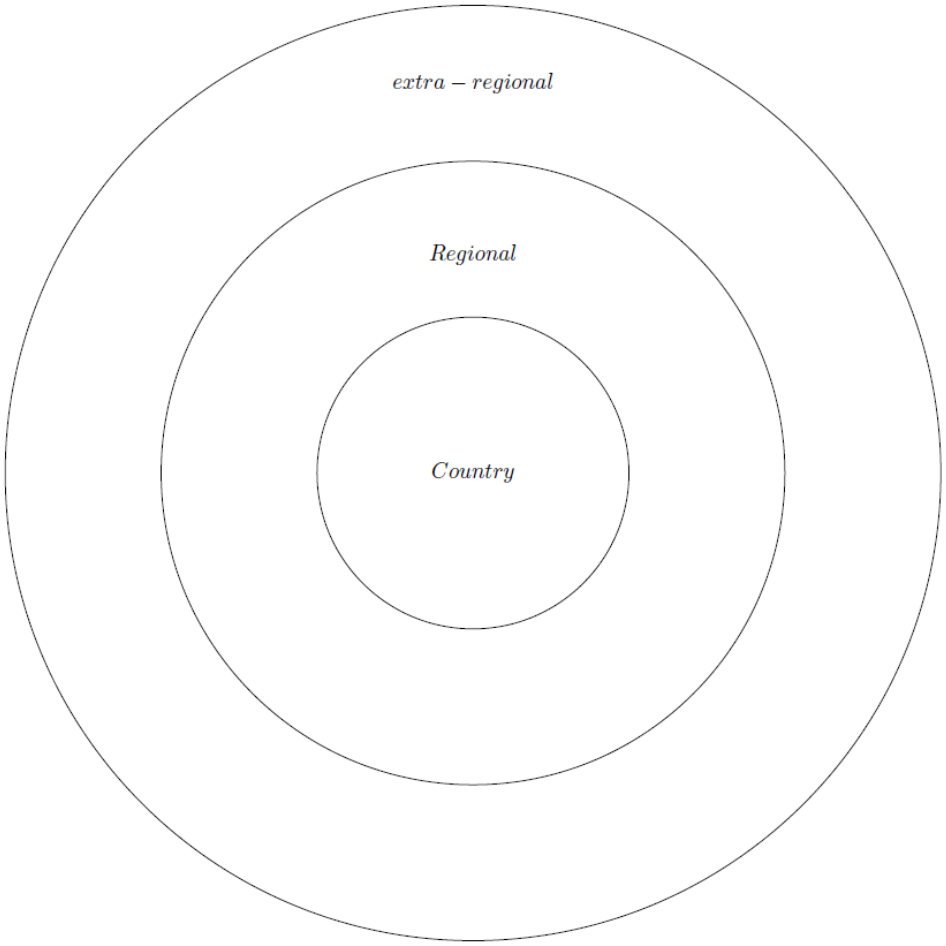

Table 3 Summary statistics of medium and large firms

Variable	Observations	Mean	Std. Dev.	Min.	Max.
Export participation	3014900	0.0931	0.291	0	1
Export entry	1803589	0.016476	0.127	0	1
Export value	3014900	0.250	9.039	0	7539.267
Log(Sales)	2293050	15.896	2.166	2.197	23.875
Log(FTEs)	3014850	4.837	1.081	-4.239	10.990
Log(Labor productivity)	2293050	11.121	2.294	-3.592	18.739
Value of country exports in t − 1	2447950	0.245	8.217	0	7539.267
Value of regional exports in t − 1	2447950	4.846	56.736	0	8195.563
Value of extra-regional exports in t − 1	2447950	7.151	80.205	0	9267.949
Number of firms exporting to country t− 1	2447950	986.449	493.987	53	2405
Number of firms exporting to region t − 1	2447950	1186.403	600.354	0	2508
Number of firms exporting to extra-region t − 1	2447950	1102.325	807.202	269	2818
Number of firms in same sector exporting to country t − 1	2447950	152.097	254.092	0	1331
Number of firms in same sector in same sector exporting to region t − 1	2447950	166.057	247.013	0	1186
Number of firms in same sector exporting to extra-region t − 1	2447950	141.997	244.044	0	1143
Number of firms in same province exporting to country t − 1	2447950	131.110	95.0142	0	475
Number of firms in same province in same sector exporting to region t − 1	2447950	157.888	114.694	0	511
Number of firms in same province exporting to extra-region t − 1	2447950	147.880	134.665	0	593
Number of firms in same sector and province exporting to country t − 1	2447950	20.695	38.474	0	289
Number of firms in same sector and province in same sector exporting to region t − 1	2447950	22.683	37.390	0	256
Number of firms in same sector and province exporting to extra-region t − 1	2447950	19.530	36.794	0	250
Value of other firms' country exports in t 1	2447950	2761.988	5297.907	5.507	39863.640
Value of other firms' regional exports in t− 1	2447950	55141.280	51495.25	0	131225.100
Value of other firms' extra-regional exports in t - 1	2447950	80201.21	53827.150	17760.690	1651.800
Value of other, same sector firms' country exports in t − 1	2447950	433.519	1616.832	0	23970.750

Table 3 Summary statistics of medium and large firms (continued)

Variable	Observations	Mean	Std. Dev.	Min.	Max.
Value of other, same sector firms' regional exports in t – 1	2447950	8682.527	18370.020	0	69841.660
Value of other, same sector firms' extra-regional exports in t − 1	2447950	12565	23089.960	0	91892.340
Value of other, same province firms' country exports in t − 1	2447950	403.643	1006.145	0	14942.010
Value of other, same province firms' region exports in t − 1	2447950	8065.917	10367.400	0	36141.450
Value of other, same province firms' extra-regional exports in t − 1	2447950	11717.660	12022.740	69.717	43489.970
Value of other, same sector and same province firms' country exports in t − 1	2447950	64.593	304.237	0	9958.050
Value of other, same sector and same province firms' regional exports in t − 1	2447950	1286.002	3339.815	0	81514.59
Value of other, same sector and same province firms' extra-regional exports in t−1	2447950	1884.152	4368.952	0	29277.09
Contiguous borders	3014900	0.040	0.196	0	1
Common language	3014900	0.020	0.140	0	1
Colonial linkage	3014900	0.040	0.196	0	1
Foreign Direct Investment	3014900	61751.190	104876.2	-4790	565759.4

Table 4 Export entry with experience effects

	(1)	(2)	(3)
Log (Labor productivity)	0.349***	0.0171	0.100***
	(32.12)	(1.73)	(10.86)
Log (FTE)	0.259***	0.0284	0.0756***
	(19.97)	(1.68)	(4.91)
Exported to region in t–1		2.513***	3.348***
		(22.94)	(26.29)
Exported to extra-region in t–1		1.718***	1.889***
		(21.31)	(19.82)
# of countries within region exported to in t–1		0.108***	
		(10.89)	
# of countries outside region exported to in t–1		0.0510***	
		(11.19)	
Value of regional exports in t–1			0.00127***
			(3.62)
Value of extra-regional exports in t–1			0.0000506
			(0.82)
Constant	–10.36***	-6.197***	-7.528***
	(-43.69)	(-34.69)	(-37.78)
Observations	1678647	1678647	1678647
Pseudo R^2	0.157	0.295	0.262

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table 5 Export entry with experience and sector- or province-specific effects

	(1)	(2)	(3)	(4)
Log(Labor productivity)	0.0163	0.0238*	0.0167	0.0228*
	(1.63)	(2.40)	(1.68)	(2.36)
Log(FTE)	0.0310	0.0384*	0.0287	0.0371*
	(1.88)	(2.27)	(1.70)	(2.19)
Exported to region in t–1	2.475***	2.492***	2.499***	2.504***
	(22.21)	(22.42)	(22.86)	(23.02)
Exported to extra-region in t–1	1.711***	1.725***	1.707***	1.717***
	(21.37)	(21.38)	(21.13)	(21.51)
# of countries within region exported to in t–1	0.104***	0.104***	0.108***	0.107***
	(11.26)	(11.17)	(10.90)	(10.87)
# of countries outside region exported to in t–1	0.0557***	0.0556***	0.0512***	0.0523***
	(12.73)	(12.73)	(11.22)	(11.65)
# of firms in same sector exporting to country in t–1	-0.00579***			
	(-3.87)			
# of firms in same sector exporting to region in t–1	-0.00727***			
	(-4.94)			
# of firms in same sector exporting outside region in t–1	-0.00736***			
	(-4.96)			
Value of other, same sector firms' country exports in t–1		0.000540**		
		(4.61)		
Value of other, same sector firms' regional exports in t–1		0.000452**		
		(3.76)		
Value of other, same sector firms' extra-regional exports in		0.000445**		
		(3.71)		
# of firms in same province exporting to country in t–1			-0.0121***	
			(-4.31)	
# of firms in same province exporting to region in t–1			-0.0137***	
			(-5.02)	
# of firms in same province exporting outside region in t–1			-0.0125***	
			(-4.50)	
Value of other, same province firms' country exports in t–1				0.000441**
				(3.54)
Value of other, same province firms' regional exports in t–1				0.000440**
				(3.60)
Value of other, same province firms' extra-regional exports				0.000454**
				(3.71)
Constant	-6.027***	-6.161***	-2.909***	–12.83***
	(-31.85)	(-33.38)	(-3.80)	(-7.17)
Observations	1678647	1678647	1678647	1678647
Pseudo R2	0.297	0.296	0.295	0.296

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table 6 Export entry with experience and all spillover effects

	(1)	(2)	(3)	(4)
# of firms in same sector exporting to country in t–1	0.00270		0.00979	
	(0.35)		(1.78)	
# of firms in same sector exporting to region in t–1	0.00121		0.00906	
	(0.15)		(1.63)	
# of firms in same sector exporting outside region in t–1	0.00157		0.00906	
	(0.20)		(1.65)	
# of firms in same province exporting to country in t–1	-0.0149		-0.0268**	
	(–1.13)		(-2.84)	
# of firms in same province exporting to region in t–1	-0.0169		-0.0281**	
	(–1.27)		(-2.95)	
# of firms in same province exporting outside region in t–1	-0.0148		-0.0268**	
	(–1.11)		(-2.81)	
# of firms in same sector and province exporting to country in t–1	0.00105*		0.000909	
	(2.09)		(1.91)	
# of firms in same sector and province exporting to region in t–1	0.000506		0.000345	
	(0.81)		(0.64)	
# of firms in same sector and province exporting outside region in t–1	-0.00236***		-0.00125**	
	(-5.35)		(-3.05)	
Value of other, same sector firms' country exports in t–1		0.000531***		0.00239***
		(4.39)		(228.67)
Value of other, same sector firms' regional exports in t–1		0.000451***		0.00236***
		(3.63)		(1186.45)
Value of other, same sector firms' extra-regional exports in		0.000450***		0.00235***
		(3.63)		(1284.64)
Value of other, same province firms' country exports in t–1		0.00000804		-0.0000111
		(0.60)		(-0.95)
Value of other, same province firms' regional exports in t–1		-0.00000468		-0.0000146***
		(–1.22)		(-3.50)
Value of other, same province firms' extra-regional exports in t–1		0.0000175***		0.00000125
		(5.52		(0.38)

Table 6 (continued)

	(1)	(2)	(3)	(4)
Value of other, same sector and province firms' country exports in t–1		0.0000694**		0.0000716**
		(2.94		(2.75)
Value of other, same sector and province firms' regional exports in t–1		0.0000139***		0.00000986**
		(3.38)		(2.64)
Value of other, same sector and province firms' extra-regional exports in t–1		-0.0000153***		-0.00000999***
		(-5.78)		(-4.11)
Constant	-2.192	-6.488***	-0.575	-5.272***
	(-0.64)	(-34.04)	(-0.23)	(–13.36)
Observations	1678647	1678647	1678647	1678647
Pseudo R2	0.297	0.297	0.263	0.262

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table 7 Export value with experience effects

	(1)	(2)	(3)
Log(Labor productivity)	1.101***	0.930***	0.777***
	(30.15)	(20.59)	(16.60)
Log(FTE)	0.923***	0.926***	0.694***
	(11.70)	(9.75)	(19.25)
Exported to country in t–1		5.125***	5.200***
		(19.69)	(28.63)
Exported to region in t–1		1.662***	1.654***
		(7.54)	(8.71)
Exported to extra-region in t–1		0.318	0.737***
		(1.53)	(3.76)
# of countries within region exported to in t–1		0.0471***	
		(3.56)	
# of countries outside region exported to in t–1		-0.0257**	
		(-2.91)	
Value of country exports in t–1			0.00439**
			(2.78)
Value of regional exports in t–1			0.000369***
			(3.45)
Value of extra-regional exports in t–1			-0.000316
			(–1.35)
Constant	-23.791***	-23.281***	-20.684***
	(-23.00)	(-20.43)	(-21.67)
Observations	2273100	1874950	1874950
R2	0.091	0.255	0.549

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table 8 Export value with experience and sector- or province-specific effects

	(1)	(2)	(3)	(4)
	(1)	(2)	(3)	(4)
Log (Labor productivity)	0.926***	0.905***	0.932***	0.916***
	(21.72)	(25.77)	(20.51)	(23.66)
Log (FTE)	0.929***	0.895***	0.921***	0.902***
	(9.93)	(11.62)	(10.03)	(10.89)
Exported to country in t–1	5.037***	4.976***	5.084***	5.123***
	(20.59)	(20.51)	(20.20)	(19.64)
Exported to region in t–1	1.551***	1.496***	1.629***	1.670***
	(7.32)	(7.14)	(7.57)	(7.62)
Exported to extra-region in t–1	0.233	0.229	0.307	0.319
	(1.08)	(1.06)	(1.49)	(1.53)
# of countries exported within region to in t–1	0.0496***	0.0516***	0.0467***	0.0494***
	(3.77)	(3.86)	(3.57)	(3.60)
# of extra-regional countries exported to in t–1	-0.0291**	-0.0300***	-0.0252**	-0.0264**
	(-3.20)	(-3.34)	(-2.98)	(-3.01)
# of firms in same sector exporting to country in t–1	-0.00692			
	(–1.22)			
# of firms in same sector exporting to region in t–1	-0.00664			
	(–1.16)			
# of firms in same sector exporting to extra-region in t–1	-0.00469			
	(-0.83)			
Value of other, same sector firms' country exports in t–1		-0.000129		
		(–1.41)		
Value of other, same sector firms' regional exports in t–1		-0.000130		
		(–1.38)		
Value of other, same sector firms' extra-regional exports in t–1		-0.0000975		
		(–1.07)		
# of firms in same province exporting to country in t–1			-0.0106	
			(–1.13)	
# of firms in same province exporting to region in t–1			-0.00942	
			(–1.03)	
# of firms in same province exporting to extra-region in t–1			-0.00772	
			(-0.85)	
Value of other, same province firms' country exports in t–1				-0.000108
				(–1.12)
Value of other, same province firms' regional exports in t–1				-0.0000804
				(-0.92)
Value of other, same province firms' extra-regional exports in t–1				-0.0000883
				(-0.98)
Constant	-23.876***	-23.979***	-21.00***	-21.643***
	(-20.12)	(-23.67)	(-9.02)	(–14.77)
Observations	1874950	1874950	1874950	1874950
R2	0.278	0.302	0.278	0.245

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table 9 Export value with experience and all spillover effects

	(1)	(2)	(3)	(4)
# of firms in same sector exporting to country in t–1	-0.00955		-0.00127	
	(-0.55)		(-0.07)	
# of firms in same sector exporting to region in t–1	-0.0103		-0.00231	
	(-0.60)		(-0.13)	
# of firms in same sector exporting to extra-region in t–1	-0.00758		-0.000649	
	(-0.44)		(-0.04)	
# of firms in same province exporting to country in t–1	0.00444		-0.00368	
	(0.15)		(-0.13)	
# of firms in same province exporting to region in t–1	0.00236		-0.00568	
	(0.08)		(-0.20)	
# of firms in same province exporting to extra-region in t–1	0.00608		-0.00459	
	(0.21)		(-0.16)	
# of firms in same sector and province exporting to country in t–1	-0.00100		-0.000888	
	(-0.74)		(–1.09)	
# of firms in same sector and province exporting to region in t–1	0.00651		0.00376*	
	(1.83)		(2.22)	
# of firms in same sector and province exporting to extra-region in t–1	0.000807		-0.00268	
	(0.41)		(–1.37)	
Value of other, same sector firms' country exports in t–1		-0.000116		0.0103***
		(–1.25)		(901.16)
Value of other, same sector firms' regional exports in t–1		-0.000114		0.0103***
		(–1.15)		(2303.37)
Value of other, same sector firms' extra-regional exports in t–1		-0.0000987		0.0103***
		(–1.07)		(1498.39)
Value of other, same province firms' country exports in t–1		-0.0000267**		-0.0000342
		(-2.75)		(–1.48)
Value of other, same province firms' regional exports in t–1		-0.00000345		-0.0000294**
		(0.41)		(-2.62)
Value of other, same province firms' extra-regional exports in t–1		-0.0000387***		-0.0000415**
		(-3.37)		(-2.56)
Value of other, same sector and province firms' country exports in t–1		-0.0000258		-0.00000182
		(-0.61)		(-0.05)
Value of other, same sector and province firms' regional exports in t–1		0.0000307*		0.00000263*
		(-2.40)		(2.42)

	(1)	(2)	(3)	(4)
Value of other, same sector and province fi intra-regional exports in t–1		-0.0000623***		-0.0000131
		(2.65)		(-0.85)
Constant	-24.937***	-23.133***	–19.578***	-9.61***
	(3.53)	(25.82)	(-2.77)	(-4.91)
Observations	1874950	1874950	1874950	1874950
Pseudo R2	0.310	0.313	0.276	0.275

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Appendix A Robustness checks

To check the consistency of our results, we conducted several robustness checks, the results of which are reported in this Appendix.

First of all, we considered export participation instead of export entry at the extensive margin. Export participation equals 1 in period t if the firm serves this specific market in period t. Hence, this definition does not dependent on previous periods:

$$Participation_{i,k,t} = \begin{cases} 1 & \text{if } X_{i,k,t} > 0 \\ 0 & \text{otherwise} \end{cases}$$

Second, we modelled the inclusion of experience and spillover effects in squared terms, but this did not enhance the explanatory power of the model. The regression outcomes are not presented here, but are available upon request. On theoretical grounds it is expected that, for example, spillovers in terms of the number of firms exporting to the respective market during the previous period enhances the chances of subsequent entry when a low number of firms enter this market. However, for some number of firms, when the export market's demand is met, each additional firm entering the respective market in period $t - 1$ reduces subsequent entry. The coefficients on these squared terms were therefore generally positive.

The third robustness check we performed was the inclusion of so-called 'absorptive capacity' variables. The inclusion of these variables is based upon the notion that the export experience of other firms can only fully be exploited once a firm itself has exported . The specification of the absorptive capacity variables in our model equal the value of other firms' export value conditional on the fact that the respective firm exported in the previous period. Although some of the model estimations, not presented in this paper, but available upon request, reported statistically significant coefficients on the absorptive capacity variables, the explanatory power of the model barely changed. More importantly, the economic and statistical significance of the experience and spillover effects initially employed remained unchanged.

Also, a separate analysis has been conducted on a sample which excludes the top 10 destinations for foreign direct investment (FDI). FDI is yet another channel which can stimulate firms to engage in exporting. For example, if a large Dutch manufacturer moves one of its plants abroad then its suppliers may engage in international trade when they continue to cooperate with this firm. Because FDI stocks are not explicitly covered in our model other than through the fixed effects this may inhibit unbiased estimation as experience and spillover effects may be overstated when these pick up some of these effects caused by FDI.

Unfortunately no firm-specific data on foreign investments nor information on forward and backward linkages is available for the considered sample. Therefore, aggregate Dutch FDI data are used for this analysis. This version of the model excludes the top 10 destinations of Dutch FDI.

The results may initially be surprising as an increase of the economic magnitude of the experience and spillover effects is reported (the estimations tables are not presented in this paper, but available upon request). Moreover, sector-specific spillover effects now enter the model significantly when both the extended or intensive margin of exporting is considered. However, a potential explanation for this observation is embedded in the main destinations of Dutch FDI. That is, Dutch FDI is mainly targeted to developed countries. Once some of these countries are excluded from the sample the share of less developed countries increases in the sample increases. As outlined in the literature review, experience and spillover effects tend to be more prominent for distant or less developed countries (Dutt et al., 2014; Morales et al., 2011). Therefore, it is no surprise that the reported experience and spillover effects are actually larger in terms of magnitude.

Finally, extended gravity variables have been included in the model as well as a broader sample size has been considered to review the robustness of our results. These extensions will be outlined in more detail in the next subsections.

A.1 Export participation

Besides export entry also export participation has been considered to study the impact of experience and spillover effects at the extensive margin of exporting. We include this as a robustness check. Whereas the specification of the export entry variable is contingent on export behaviour the previous period, export participation is dependent just on whether a firm exports in the current period. The first model presented in Table 10 just includes firm-specific variables, namely the log of a firm's labor productivity and size, measured in number of FTEs. Both variables are highly statistically significant.

Given the coefficient of labor productivity equals 0.567, a doubling in labor productivity would result into an odds ratio of $2^{0.567} \approx 1.48$. This means that the odds of export participation increase by approximately 48 percent. Endorsing a similar approach reveals that doubling the number of FTEs enhances the odds of export participation by approximately 34 percent.

When firm's experience effects, captured through dummy variables indicating whether the firm exported to the respective country, respective region or merely to other regions and the number of countries exported to at the (extra-)regional level in period $t - 1$, are added to the model the economic significance of the firm-specific variables is considerably lower, see column 2. It should be noted that in contrast to the export entry models the models considering export participation do include a binary variable indicating whether the respective firm exported to the respective country last period. This variable turns out to be highly economically and statistically significant which may suggest that some of the firm's fixed costs of exporting are sunk since exporting to the country last period substantially increases a firm's likelihood of exporting to this country in period t.

In fact, exporting to the respective country the previous period raises the odds of export participation by $e5.537 - 1 \approx 25290$ percent. This implies that if a firm's odds of export participation would, for example, 1 the chance of exporting to this particular country would be equal to 1 percent. If this firm would have exported to this country last period its odds of export participation would

increase to 1 multiplied by 252.9, or a little higher than 7 which would mean that the firm's probability of exporting to this country in the current period would be approximately 70 percent. The incremental effect of exporting to the respective region or to any other region roughly translate to an increase in the odds of export participation of 1084 and 507 percent, respectively. Also when experience effects are considered in binary and numerical form these are highly statistically significant, see the third column of Table 10. The reported magnitudes are synonymous to those reported for export entry. Whereas before the value of country-specific exports could not be included in the equivalent export entry model, this variable can be considered when export participation is employed as the dependent variable. The regression results show that the value of country-specific exports is economically more significant than exports to other countries in the region.

Spillover effects are added to the model in Table 11. The model specification across the models is the same as Table 5. That is, experience effects are included in terms of dummy variables indicating whether the firm exported to the respective country, respective region or merely to other regions as well as the number of additional countries exported to inside and outside the respective region. The regression outcomes of column 1 show that sector-specific spillover effects are negative to export participation when considered in the number of firms exporting to the respective geographical zone. More specifically, statistically significant, negative sector-specific spillovers are found for the number of firms exporting to other countries within the respective region and the number of firms exporting to other regions in period $t - 1$. Column 2 also includes sector-specific spillover effects, but in export value terms. Evidence is found of positive spillover effects on the country level which suggests that some spillover effects are country-specific. In contrast, the models outlined in columns 3 and 4 show that only some province-specific spillover effects seem to exist. More specifically, a negative spillover effect for other countries within the region when the number of firms exporting in the previous period are considered and a positive impact of spillovers from exports to other regions in terms of export value in period $t - 1$. Throughout all models the experience effects are consistent and similar to those reported in column 2 of Table 6 in which experience effects are included in the same form.

The inclusion of sector-province-specific spillovers besides sector and province-specific spillover effects does not alter the statistical and economic significance of the experience effects as Table 11 shows. While the sector-specific spillover effects that indicate the number of firms exporting to the respective geographical zone are again statistically insignificant, some evidence of province and sector-province-specific spillovers is also reported (columns 1 and 3). The coefficients on the statistically significant province-specific effects are negative. More specifically, a positive partial effect on the country-level is found, while an additional firm operating in the same sector and located in the same province exporting to another region in period $t - 1$ has a negative effect on export participation. Still, the aggregate effect cannot be retrieved as the sector and/or province-specific spillover effects are statistically insignificant for a given geographical criterion.

Statistically significant spillover effects are found across all qualitative dimensions when export value rather than the number of firms is considered (columns 2 and 4). However, only the aggregate, incremental effect of an additional one million exports can be calculated at the country level by summing the three relevant coefficients in column 2. The positive effect on the odds of export participation equals $e^{0.0001761} - 1 \approx 0.017$ percent.

A.2 Inclusion of small firms

The model discussed before included only those firms with fifty or more FTEs. This means that in this model the spillover effects of smaller firms are picked up by the bigger firms that are included in the sample. Also, this model does not provide insights on the impact of learning and spillover effects on export behaviour of smaller firms. This section discusses the same model, but employs a different sample. That is, now all firms with more than ten rather than fifty FTEs are included in the sample. This sample selection was chosen for multiple reasons. First of all, the spillover effects of so-called micro firms, those that employ less than 10 FTE, on other firms may not be particularly large because these firms tend not to export as much as bigger firms. Also, many of these micro firms are in fact idle meaning that including these in the model would understate the propensity to export as well as the true effect of experience and spillover effects. Finally, due to computational limits it was not possible to run the model on the entire population of Dutch firms.

Tables 16 and 17 present the regression results for the most extensive model at the extensive margin of exporting. That is, sector, province and sector-province-specific spillover effects are included. Experience effects are captured in binary and number form for the models presented in columns 1 and 2 and in terms of binary and value variables for the models outlined in columns 3 and 4.

In both tables, all firm-specific variables are highly statistically and economically significant across all model specifications. The higher economic significance of the firm-specific variables can be explained by reviewing the data. First of all, the average labor productivity of exporting, small firms is higher than that of medium and large firms. Secondly, a relatively large share of small firms does not engage in exporting at all, hence the larger magnitude of firm size.

The magnitude of the binary experience variables is larger compared to the main model for all models considered. The experience effects captured in number and value terms are similar and, again, highly significant. Particularly the country-specific experience variables are now higher in terms of economic significance when export participation is considered. This observation is due to the fact that many small, exporting firms export to one or only a small number of countries.

While also for this sample hardly any evidence is found of spillovers when considered in the number of firms (columns 1 and 3), the coefficients on the spillover variables are larger in size when considered in export value terms (column 2 and 4). This suggests that smaller firms benefit more from spillover effects than their larger peers which makes sense given their personal export experience is often more limited which means that the potential value of other firms' prior export experience may be particularly high. Similar as before, the magnitude of the province-specific spillover effects is compared to the sector-specific spillover rather small, while they are statistically significant.

The regression outcomes in column 4 reveal a synonymous pattern. That is, the effect of sector-specific and sector-province-specific spillovers are all positive and statistically significant, but the sector-province-specific, extra regional variables. However, just like the province-specific variables

the economic significance is rather small compared to the coefficients on the sector-specific spillovers.

Altogether, the results confirm the existence of spillover effects within a sector and also show that some of these spillovers are country-specific. That is, the largest positive effects are found at the country-level.

Also the results for the intensive margin of exporting support the conclusions based on the main model, see Table 14. The firm-specific and experience variables are very similar in terms of economic and statistical significance as before, see Table 9. In contrast, the sector-specific spillover effects in terms of number of firms are now statistically significant and negative. This suggests that smaller firms either cannot exploit all available spillovers or that smaller firms are more strongly adversely affected by competitive pressures from their industry peers. That is, on theoretical grounds it is unlikely that the spillovers from small to medium and large firms cause the recorded change in the effect of these spillovers. Also, at the province-level positive spillovers are recorded which fits the explanation outlined above. That is, positive province-specific spillovers may suggests that smaller firms can actually learn from the experience of other firms, but that the competitive pressures, outlined before, only exist within the respective sector. This claim is substantiated by the fact that the coefficients at the country-level are more negative where competitive pressures are likely to be the most substantial. A similar pattern emerges when export value is considered. Generally, sector-specific spillovers are negative whereas province-specific spillovers tend to be positive.

A.3 Extended gravity

Morales et al. (2011) showed in their paper that not just similarities between the home country and potential export markets make firms more likely to export to the respective foreign markets, but also similarities between current and potential export destinations are relevant. That is, the authors show that firms are more likely to export to those markets that share characteristics with their current export destinations.

In the models outlined before we do not distinguish markets entered by firms in period t in terms of the similarities these share with the firms' export markets in $t-1$. Consequently, experience or spillover effects may pick up some of the effect that is actually embedded in these underlying commonalities at the destination-country level. For example, if a firm exports to Argentina in period $t-1$ then because of its familiarity with the Argentinian culture exporting to Chile may be particularly interesting for this firm. If these so-called 'extended gravity' variables are excluded from the model then the experience effect ascribed to its prior Argentinean exports are likely to be overstated if this particular firm would enter the Chilean market in period t. In order to mitigate this potential bias we run similar models as before, but now also include extended gravity variables besides the experience and spillover effects employed before.

The four extended gravity variables that are included in the models indicate whether one of a firm's served export markets in period $t-1$ shares a border, a language, belongs to the same income

group or similar region with the export markets it exported to in period t. Hence, all extended gravity variables are included in binary form.

The results at the extensive margin of exporting are presented in Tables 19 and 20. When export entry is employed as the dependent variable, the statistical significance of the firm-specific variables and the experience and spillover effects is very similar to Table 6, while the reported coefficients on the variables are lower than before, as expected. When a firm has prior experience exporting to similar countries the effective costs of exporting are likely to lower. As a result, the required productivity and size to enter a comparable market drops, ceteris paribus. Irrespective of the specification, all reported coefficients on the experience effects are lower. Combined with the high statistical as well as economic significance of the extended gravity variables this suggests that indeed commonalities between export markets were initially picked up as experience effects. The coefficient on the sector-province-specific spillover effect at the country-level also has a lower magnitude which suggests that due the exclusion of extended gravity variables this effect was initially overstated.

The extended gravity variables are economically most significant in columns 3 and 4, or when experience effects are captured in value terms. Indeed the regression outcomes show that not just the statistical significance of these experience effects is lower, but also the magnitude has declined substantially at the regional level. From all extended gravity variables employed the contiguous borders indicator has the largest effect on export entry to the respective market.

All the extended gravity are also highly statistically significant and have the expected sign when export participation is considered, see Table 16. While the coefficients on the statistically significant experience and spillover effects are approximately similar in columns 1 and 2, the respective variables in columns 3 and 4 are generally smaller than those reported in Table 11. This suggests that firms indeed learn from their or others' previous exporting experiences even though some effects embedded in underlying similarities among countries were initially picked up by the respective variables. Finally, the firm-specific variables are more or less unaffected in terms of economic and statistical significance by the inclusion of extended gravity variables.

Not just at the extensive margin do similarities between country-pairs affect export behaviour. Table 17 shows that firms tend to export more to countries that belong to the similar income group as the countries the respective firm exported to the period before. As belonging to a similar income group may imply that demand for goods is relatively synonymous this implies that if a firm can export a high value of goods to one country it is likely to be able to do so to the other as well. In contrast, a common language or a proximate location to a firm's export market last year may favor initial entry or export participation as the fixed costs of doing business are reduced, these factors are not very likely to impact the intensive of margin of exporting on theoretical grounds. This is indeed what the results seem to indicate.

A similar reasoning can explain why the firm-specific variables are hardly affected in terms of economic significance. The included extended gravity models mainly influence the extensive margin of exporting through a reduction in fixed costs of exporting whereas a firm's intensive margin of exporting is dependent on its productivity and variable export costs, see equation 9.

This analogy is substantiated by the reported coefficients on experience and spillover effects. Those experience effects in terms of binary and number of countries exported to last period, which in turn may be influenced by the fixed costs of exporting, are affected whereas the economic significance of experience effects in value terms seem robust to the inclusion of the extended gravity variables (columns 3 and 4). Simultaneously, those spillover effects that did significantly impact the intensive margin of exporting (as in Table 9) still have the same economic and statistical significance as before.

Altogether, the models discussed in this section suggest that the extended gravity variables affect the firm-specific, experience and spillover effects when the extensive margin of exporting is considered but have a relatively small effect when the intensive margin of exporting is considered. As discussed before, this is likely to be embedded in the fact that the extended gravity variables included are, on theoretical grounds, more likely to affect the extensive margin on exporting to begin with.

Regression tables

Table A. 1 Export participation with experience effects

	(1)	(2)	(3)
Log(Labor productivity)	0.567***	0.0669***	0.109***
	(29.64)	(6.22)	(16.75)
Log(FTE)	0.419***	0.0373***	0.0609***
	(50.94)	(3.94)	(4.50)
Exported to country in t–1		5.537***	6.483***
		(46.31)	(43.21)
Exported to region in t–1		2.472***	3.099***
		(22.30)	(25.18)
Exported to extra-region in t–1		1.804***	2.012***
		(22.86)	(20.13)
# of countries exported within region to in t–1		0.111***	
		(14.11)	
# of extra-regional countries exported to in t–1		0.0386***	
		(9.58)	
value of country exports in t–1			0.674***
			(6.44)
Value of regional exports in t–1			0.00195***
			(5.14)
Value of extra-regional exports in t–1			0.0000312
			(0.53)
Constant	–13.14***	-6.393***	-7.338***
	(-42.73)	(-42.64)	(-40.07)
Observations	2273100	1874950	1874950
Pseudo R2	0.329	0.696	0.685

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table A. 2 Export participation with experience and sector- or province-specific effects

	(1)	(2)	(3)	(4)
Log(Labor productivity)	0.0661***	0.0681***	0.0668***	0.0680***
	(6.09)	(6.21)	(6.20)	(6.28)
Log(FTE)	0.0379***	0.0390***	0.0373***	0.0389***
	(3.93)	(4.07)	(3.92)	(4.09)
Exported to country in t–1	5.507***	5.519***	5.529***	5.531***
	(46.80)	(45.84)	(46.07)	(46.31)
Exported to region in t–1	2.454***	2.462***	2.464***	2.467***
	(22.23)	(22.07)	(22.29)	(22.30)
Exported to extra-region in t–1	1.800***	1.808***	1.798***	1.805***
	(22.61)	(22.51)	(22.75)	(23.01)
# of countries exported within region to in t–1	0.109***	0.109***	0.111***	0.111***
	(14.78)	(14.80)	(14.10)	(14.08)
# of extra-regional countries exported to in t–1	0.0415***	0.0409***	0.0387***	0.0391***
	(10.83)	(10.61)	(9.60)	(9.80)
# of firms in same sector exporting to country in t–1	-0.00267			
	(–1.45)			
# of firms in same sector exporting to region in t–1	-0.00399*			
	(-2.22)			
# of firms in same sector exporting to extra-region in t–1	-0.00385*			
	(-2.08)			
Value of other, same sector firms' country exports in t–1		0.000148***		
		(3.70)		
Value of other, same sector firms' regional exports in t–1		0.0000758		
		(1.95)		
Value of other, same sector firms' extra-regional exports in t–1		0.0000726		
		(1.88)		
# of firms in same province exporting to country in t–1			-0.00628	
			(–1.77)	
# of firms in same province exporting to region in t–1				
			(-2.01)	
# of firms in same province exporting to extra-region in t–1			-0.00601	
			(–1.71)	
Value of other, same province firms' country exports in t–1				0.0000481
				(1.26)
Value of other, same province firms' regional exports in t–1				0.0000685
				(1.82)
Value of other, same province firms' extra-regional exports in t–1				0.0000789*
				(2.09)
Constant	-6.242***	-6.247***	-4.757***	-7.565***
	(-38.91)	(-41.37)	(-5.12)	(–13.39)
Observations	1874950	1874950	1874950	1874950
Pseudo R2	0.697	0.697	0.696	0.696

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

	(1)	(2)	(3)	(4)
# of firms in same sector exporting to country in t–1	0.00273		0.0129	
	(0.36)		(1.82)	
# of firms in same sector exporting to region in t–1	0.00140		0.0123	
	(0.18)		(1.73)	
# of firms in same sector exporting to extra-region in t–1	0.00204		0.0123	
	(0.27)		(1.74)	
# of firms in same province exporting to country in t–1	-0.00959		-0.0239*	
	(-0.72)		(–1.97)	
# of firms in same province exporting to region in t–1	-0.0106		-0.0244*	
	(-0.80)		(-2.00)	
# of firms in same province exporting to extra-region in t–1	-0.00862		-0.0230	
	(-0.64)		(–1.89)	
# of firms in same sector and province exporting to country in t–1	0.000967*		0.000738*	
	(2.18)		(2.02)	
# of firms in same sector and province exporting to region in t–1	0.000629		0.000240	
	(1.18)		(0.59)	
# of firms in same sector and province exporting to extra-region in t–1	-0.00256***		-0.00185***	
	(-6.91)		(-5.15)	
Value of other, same sector firms' country exports in t–1		0.000133***		0.00278***
		(3.37)		(464.03)
Value of other, same sector firms' regional exports in t–1		0.0000690		0.00276***
		(1.74)		(1976.57)
Value of other, same sector firms' extra-regional exports in t–1		0.0000712		0.00275***
		(1.81)		(1804.18)
Value of other, same province firms' country exports in t–1		-0.0000253**		-0.0000280*
		(-3.24)		(-2.53)
Value of other, same province firms' regional exports in t–1		-0.00000843**		-0.0000205***
		(-2.89)		(-5.95)
Value of other, same province firms' extra-regional exports in t–1		0.0000116***		-0.00000757*
		(5.15)		(-2.35)
Value of other, same sector and province firms' country exports in t–1		0.0000684***		0.0000416
		(3.46)		(1.90)
Value of other, same sector and province firms' regional exports in t–1		0.0000112**		0.00000493*
		(-3.27)		(1.71)

	(1)	(2)	(3)	(4)
Value of other, same sector and province firms' extra-regional exports in t–1		-0.0000160***		-0.0000967***
		(8.91)		(-5.40)
Constant	-3.921***	-6.495***	–1.317***	-4.309***
	(–1.15)	(-41.67)	(-0.42)	(-8.05)
Observations	1874950	1874950	1874950	1874950
Pseudo R2	0.697	0.697	0.685	0.684

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table A. 3 Export entry with experience and all spillover effects

	(1)	(2)	(3)	(4)
Log(Labor productivity)	0.0520***	0.0610***	0.161***	0.0709***
	(2.84)	(3.31)	(8.43)	(3.60)
Log(FTE)	0.0862***	0.0961***	0.213***	0.191***
	(8.29)	(8.78)	(34.88)	(27.40)
Exported to region in t–1	2.842***	2.844***	3.624***	3.688***
	(20.82)	(20.75)	(24.10)	(24.47)
Exported to extra-region in t–1	2.078***	2.070***	2.236***	2.285***
	(24.69)	(24.40)	(23.18)	(23.43)
# of countries exported within region to in t–1	0.113***	0.113***		
	(10.38)	(10.32)		
# of extra-regional countries exported to in t–1	0.0585***	0.0586***		
	(12.93)	(13.10)		
Value of regional exports in t–1			0.00102**	0.00180***
			(3.04)	(4.61)
Value of extra-regional exports in t–1			-0.0000322	0.00212***
			(-0.40)	(–15.09)
# of firms in same sector exporting to country in t–1	0.000666		-0.000535	
	(0.61)		(-0.45)	
# of firms in same sector exporting to region in t–1	0.0000457		-0.000781	
	(0.04)		(-0.65)	
# of firms in same sector exporting to extra-region in t–1	0.0000782		-0.000836	
	(0.07)		(-0.71)	
# of firms in same province exporting to country in t–1	-0.00395		-0.00302	
	(–1.82)		(–1.28)	
# of firms in same province exporting to region in t–1	-0.00488*		-0.00372	
	(-2.22)		(–1.55)	
# of firms in same province exporting to extra-region in t–1	-0.00430		-0.00329	
	(–1.95)		(–1.38)	
# of firms in same sector and province exporting to country in t–1	-0.000373		-0.000216	
	(–1.59)		(–1.00)	
# of firms in same sector and province exporting to region in t–1	0.000431		0.000318	
	(1.90)		(–1.60)	
# of firms in same sector and province exporting to extraregion in t–1	-0.000300***		-0.000163*	
	(-3.39)		(-2.04)	

	(1)	(2)	(3)	(4)
Value of other, same sector firms' country exports in t–1		0.00107***		0.00202***
		(4.70)		(269.39)
Value of other, same sector firms' regional exports in t–1		0.00103***		0.00201***
		(4.49)		(1675.74)
Value of other, same sector firms' extra-regional exports in t–1		0.0000103***		0.00000200***
		(4.49)		(1278.17)
Value of other, same province firms' country exports in t–1		-0.0000162		-0.0000303*
		(–1.22)		(-2.09)
Value of other, same province firms' regional exports in t–1		-0.0000369		-0.0000165***
		(–1.45)		(-8.05)
Value of other, same province firms' extra-regional exports in t–1		0.0000119***		-0.00000563
		(5.73)		(-2.13)
Value of other, same sector and province firms' regional exports in t–1		0.0000845***		0.0000817***
		(3.64)		(3.40)
Value of other, same sector and province firms' regional exports in t–1		0.00000793*		0.00000564
		(2.37)		(1.80)
Value of other, same sector and province firms' extra regional exports in t–1		-0.0000122***		-0.00000769***
		(-7.65)		(-4.77)
Constant	-4.762***	-8.125***	-7.195***	-6.803***
	(-3.01)	(-30.89)	(-4.21)	(–15.09)
Observations	8099622	8099622	8099622	8099622
Pseudo R2	0.314	0.314	0.283	0.282

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table A. 4 Export participation with experience and all spillover effects

	(1)	(2)	(3)	(4)
Log(Labor productivity)	0.105***	0.107***	0.165***	0.0318***
	(5.66)	(5.74)	(13.89)	(1.53)
Log(FTE)	0.0780***	0.0812***	0.184***	0.0985***
	(9.48)	(9.52)	(30.38)	(6.77)
Exported to country in t–1	6.036***	6.036***	6.908***	6.614***
	(45.75)	(45.47)	(40.47)	(49.29)
Exported to region in t–1	2.914***	2.914***	3.447***	3.155***
	(21.83)	(21.88)	(25.19)	(31.63)
Exported to extra-region in t–1	2.203***	2.193***	2.394***	2.084***
	(25.46)	(25.32)	(22.53)	(21.30)
# of countries exported within region to in t–1	0.110***	0.110***		
	(13.11)	(13.09)		
# of extra-regional countries exported to in t–1	0.0412***	0.0406***		
	(10.43)	(10.34)		
Value of country exports in t–1			0.823***	0.916***
			(7.22)	(7.24)
Value of regional exports in t–1			0.00170***	0.00357***
			(4.84)	(7.12)
Value of extra-regional exports in t–1			-0.0000856	0.00343***
			(–1.19)	(34.38)
# of firms in same sector exporting to country in t–1	0.000982		-.0.000379	
	(0.94)		(-0.32)	
# of firms in same sector exporting to region in t–1	0.000532		-0.000538	
	(0.51)		(-0.46)	
# of firms in same sector exporting to extra-region in t–1	0.000583		-0.000631	
	(0.57)		(-0.54)	
# of firms in same province exporting to country in t–1	-0.00300		-0.00122	
	(–1.40)		(-0.49)	
# of firms in same province exporting to region in t–1	-0.00355		-0.00160	
	(–1.63)		(-0.63)	
# of firms in same province exporting to extra-region in t–1	-0.00305		-0.00123	
	(–1.40)		(-0.49)	

	(1)	(2)	(3)	(4)
# of firms in same sector and province exporting to country in t–1	-0.0000968		-0.0000531	
	(-0.54)		(-0.33)	
# of firms in same sector and province exporting to region in t–1	0.000346*		0.000238	
	(2.03)		(1.70)	
# of firms in same sector and province exporting to extra region in t–1	-0.000327***		-0.000259***	
	(-4.71)		(-4.45)	
Value of other, same sector firms' country exports in t–1		0.0000223***		0.00320***
		(5.47)		(378.57)
Value of other, same sector firms' regional exports in t–1		0.0000201***		0.00319***
		(4.60)		(2581.65)
Value of other, same sector firms' extra-regional exports in t–1		0.000203***		0.00000166
		(4.63)		(2168.05)
Value of other, same province firms' country exports in t–1		-0.000018*		-0.0000136***
		(-2.31)		(0.15)
Value of other, same province firms' regional exports in t–1		-0.00000600***		0.00000592**
		(-3.31)		(-6.62)
Value of other, same province firms' extra-regional exports in t–1		0.00000740***		-0.00000449
		(5.41)		(-2.88)
Value of other, same sector and province firms' regional exports in t–1		0.000052***		0.00000227
		(4.48)		(-0.21)
Value of other, same sector and province firms' regional exports in t–1		0.00000723*		0.00000598***
		(2.75)		(1.13)
Value of other, same sector and province firms' extraregional exports in t–1		-0.0000114***		-0.00000769***
		(-9.23)		(-4.17)
Constant	-5.63***	-7.977***	-8.134***	-5.342***
	(-3.65)	(-36.07)	(-4.64)	(-9.50)
Observations	8497800	8497800	8497800	8497800
Pseudo R2	0.697	0.697	0.685	0.684

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table A. 5 Export value with experience and all spillover effects

	(1)	(2)	(3)	(4)
# of firms in same sector exporting to country in t–1	-0.00361*		-0.00322*	
	(-2.26)		(-2.18)	
# of firms in same sector exporting to region in t–1	-0.00351*		-0.00352*	
	(-2.18)		(-2.34)	
# of firms in same sector exporting to extra-region in t–1	-0.00369*		-0.00342*	
	(-2.31)		(-2.30)	
# of firms in same province exporting to country in t–1	0.00429		0.00502*	
	(1.99)		(2.40)	
# of firms in same province exporting to region in t–1	0.00422*		0.00431*	
	(1.91)		(2.08)	
# of firms in same province exporting to extra-region in t–1	0.00488*		0.00453*	
	(2.27)		(2.18)	
# of firms in same sector and province exporting to country in t–1	-0.000316		-0.000493	
	(-0.52)		(–1.27)	
# of firms in same sector and province exporting to region in t–1	0.000862		0.000925	
	(1.02)		(1.51)	
# of firms in same sector and province exporting to extra region in t–1	0.000919***		-0.0000902	
	(1.24)		(-0.16)	
Value of other, same sector firms' country exports in t–1		-0.000121***		0.00506***
		(–1.35)		(654.09)

Table A. 6 Export entry with experience, all spillover effects, and extended gravity variables

	(1)	(2)	(3)	(4)
Log(Labor productivity)	0.0164	0.0235*	0.0805***	0.0121
	(1.65)	(2.39)	(8.60)	(1.05)
Log(FTE)	0.0315	0.0390*	0.0725***	0.00620
	(1.93)	(2.32)	(4.90)	(0.32)
Exported to region in t–1	2.225***	2.229***	2.326***	2.130***
	(21.08)	(21.50)	(19.06)	(18.89)
Exported to extra-region in t–1	1.568***	1.572***	1.354***	1.194***
	(21.02)	(21.35)	(16.52)	(14.74)
# of countries exported within region to in t–1	0.0890***	0.0883		
	(9.44)	(9.24)		
# of extra-regional countries exported to in t–1	0.0519***	0.0516***		
	(12.31)	(12.36)		
Value of regional exports in t–1			0.000369	0.000794**
			(1.68)	(2.74)
Value of extra-regional exports in t–1			-0.00000731	0.00113***
			(-0.11)	(17.59)
# of firms in same sector exporting to country in t–1	-0.00809		0.000519	
	(–1.25)		(0.08)	
# of firms in same sector exporting to region in t–1	-0.00951		-0.000297	
	(–1.46)		(-0.04)	
# of firms in same sector exporting to extra-region in t–1	-0.00917		-0.000139	
	(–1.41)		(-0.02)	
# of firms in same province exporting to country in t–1	0.00855		-0.00827	
	(0.78)		(-0.76)	
# of firms in same province exporting to region in t–1	0.00655		-0.00982	
	(0.59)		(-0.90)	
# of firms in same province exporting to extra-region in t–1	0.00860		-0.00832	
	(0.78)		(-0.77)	
# of firms in same sector and province exporting to country in t–1	0.000968*		0.000691	
	(1.96)		(1.45)	
# of firms in same sector and province exporting to region in t–1	0.000556		0.000456	
	(0.90)		(0.81)	
# of firms in same sector and province exporting to extra region in t–1	-0.00234***		-0.00158***	
	(-5.41)		(-3.96)	
Value of other, same sector firms' country exports in t–1		0.000526***		0.00108***
		(4.49)		(83.94)

	(1)	(2)	(3)	(4)
Value of other, same sector firms' regional exports in t–1		0.000448***		0.00103***
		(3.73)		(562.90)
Value of other, same province firms' country exports in t–1		0.00000886		-000000550
		(0.64)		(-0.04)
Value of other, same province firms' regional exports in t–1		-0.00000443		-0.0000153***
		(–1.16)		(-3.55)
Value of other, same province firms' extra-regional exports in t–1		0.0000174***		0.00000363
		(5.46)		(1.12)
Value of other, same sector and province firms' country exports in t–1		0.0000686**		0.0000628*
		(2.77)		(2.31)
Value of other, same sector and province firms' regional exports in t–1		0.0000135**		0.0000119**
		(3.28)		(2.78)
Value of other, same sector and province firms' extra-regional exports in t–1		-0.0000152***		-0.0000111***
		(-5.74)		(-4.53)
Contiguous borders	0.333***	0.344***	0.807***	0.839***
	(4.51)	(4.68)	(10.40)	(10.88)
Common language	0.0603***	0.0619***	0.278***	0.297***
	(4.05)	(4.16)	(15.96)	(16.71)
Common income group	0.145***	0.146***	0.387***	0.476***
	(6.65)	(6.75)	(16.66)	(15.96)
Common region	0.0771***	0.0772***	0.327***	0.362***
	(4.73)	(4.69)	(15.27)	(15.30)
Constant	8.095**	-6.407***	-4.727	-4.847***
	(-2.86)	(-32.92)	(–1.70)	(–14.38)
Observations	1678277	1678277	1678277	1678277
Pseudo R2	0.298	0.298	0.278	0.276

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table A. 7 Export participation with experience, all spillover effects, and extended gravity variables

	(1)	(2)	(3)	(4)
# of firms in same sector exporting to country in t–1	-0.00473		0.00444	
	(-0.71)		(0.58)	
# of firms in same sector exporting to region in t–1	-0.00602		0.00374	
	(-0.90)		(0.49)	
# of firms in same sector exporting to extra-region in t–1	-0.00539		0.00396	
	(-0.81)		(0.52)	
# of firms in same province exporting to country in t–1	0.00841		-0.00675	
	(0.79)		(-0.58)	
# of firms in same province exporting to region in t–1	0.00733		-0.00747	
	(0.69)		(-0.64)	
# of firms in same province exporting to extra-region in t–1	0.00932		-0.00595	
	(0.87)		(-0.51)	
# of firms in same sector and province exporting to country in t–1	0.000878*		0.000512	
	(2.01)		(1.34)	
# of firms in same sector and province exporting to region in t–1	0.000692		0.000523	
	(1.32)		(1.19)	
# of firms in same sector and province exporting to extra-region in t–1	-0.00250***		-0.00192***	
	(-6.84)		(-5.36)	
Value of other, same sector firms' country exports in t–1		0.0001387***		0.00186***
		(3.42)		(227.19)
Value of other, same sector firms' regional exports in t–1		0.0000749		0.00183***
		(1.85)		(1314.80)
Value of other, same sector firms' extra-regional exports in t–1		0.0000773		0.00183***
		(1.91)		(1323.50)
Value of other, same province firms' country exports in t–1		-0.0000233**		-0.0000271**
		(-3.13)		(-2.71)
Value of other, same province firms' regional exports in t–1		-0.00000803**		-0.0000193***
		(-2.83)		(-5.83)
Value of other, same province firms' extra-regional exports in t–1		0.0000114***		-0.00000482
		(5.10)		(–1.62)
Value of other, same sector and province firms' country exports in t–1		0.0000658***		0.0000426*
		(3.40)		(2.09)

	(1)	(2)	(3)	(4)
Value of other, same sector and province firms' regional exports in t–1		0.0000108***		0.00000620*
		(3.19)		(1.99)
Value of other, same sector and province firms' extra- regional exports in t–1		-0.0000157***		-0.0000106***
Contiguous borders	0.360***	0.368***	0.889***	0.921***
	(6.25)	(6.50)	(18.12)	(18.45)
Common language	0.0521**	0.0526***	0.231***	0.245***
	(4.82)	(4.84)	(19.50)	(20.69)
Common income group	0.0945***	0.0950***	0.341***	0.406***
	(4.96)	(5.01)	(16.84)	(16.07)
Common region	0.525***	0.0529**	0.308***	0.336***
	(2.98)	(2.99)	(14.14)	(14.63)
Constant	-8.409**	-6.389***	-4.992	-4.088***
	(-3.11)	(-39.54)	(–1.70)	(-9.25)
Observations	1874500	1874500	1874500	1874500
Pseudo R2	0.698	0.698	0.692	0.692

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

Table A. 8 Export value with experience, all spillover effects, and extended gravity variables

	(1)	(2)	(3)	(4)
# of firms in same sector exporting to country in t–1	-0.00473		0.00444	
	(-0.71)		(0.58)	
# of firms in same sector exporting to region in t–1	-0.00602		0.00374	
	(-0.90)		(0.49)	
# of firms in same sector exporting to extra-region in t–1	-0.00539		0.00396	
	(-0.81)		(0.52)	
# of firms in same province exporting to country in t–1	0.00841		-0.00675	
	(0.79)		(-0.58)	
# of firms in same province exporting to region in t–1	0.00733		-0.00747	
	(0.69)		(-0.64)	
# of firms in same province exporting to extra-region in t–1	0.00932		-0.00595	
	(0.87)		(-0.51)	
# of firms in same sector and province exporting to country in t–1	0.000878*		0.000512	
	(2.01)		(1.34)	
# of firms in same sector and province exporting to region in t–1	0.000692		0.000523	
	(1.32)		(1.19)	
# of firms in same sector and province exporting to extra- region in t–1	-0.00250***		-0.00192***	
	(-6.84)		(-5.36)	
Value of other, same sector firms' country exports in t–1		0.0001387***		0.00186***
		(3.42)		(227.19)
Value of other, same sector firms' regional exports in t–1		0.0000749		0.00183***
		(1.85)		(1314.80)
Value of other, same sector firms' extra-regional exports in t–1		0.0000773		0.00183***
		(1.91)		(1323.50)
Value of other, same province firms' country exports in t–1		-0.0000233**		-0.0000271**
		(-3.13)		(-2.71)
Value of other, same province firms' regional exports in t–1		-0.00000803**		-0.0000193***
		(-2.83)		(-5.83)
Value of other, same province firms' extra-regional exports in t–1		0.0000114***		-0.00000482
		(5.10)		(–1.62)
Value of other, same sector and province firms' country exports in t–1		0.0000658***		0.0000426*
		(3.40)		(2.09)

	(1)	(2)	(3)	(4)
Value of other, same sector and province firms' regional exports in t–1		0.0000108***		0.00000620*
		(3.19)		(1.99)
Value of other, same sector and province firms' extra- regional exports in t–1		-0.0000157***		-0.0000106***
		(-8.88)		(-6.50)
Contiguous borders	0.275	0.242	0.265	0.366
	(0.98)	(0.92)	(1.38)	(1.82)
Common language	0.0412	0.0396	-0.0117	0.0145
	(0.82)	(-0.82)	(-0.32)	(0.37)
Common income group	0.0812**	0.0797*	0.104**	0.171***
	(2.8)	(2.37)	(2.64)	(3.45)
Common region	0.0602	0.0556	0.00185	0.0377
	(0.98)	(0.96)	(0.05)	(0.89)
Constant	-25.342***	-22.994***	-20.483***	-9.441***
	(-4.31)	(-27.27)	(-3.60)	(-4.77)
Observations	1874500	1874500	1874500	1874500
R2	0.319	0.361	0.55	0.526

z statistics in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001; Standard errors clustered by destination country

seo amsterdam economics

Roetersstraat 29 . 1018 WB Amsterdam . T (+31) 20 525 16 30 . F (+31) 20 525 16 86 . www.seo.nl