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FDI SPILL-OVERS IN THE ESTONIAN ECONOMY: A TRADE PERFORMANCE ANALYSIS

IMESS Master's Thesis

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This thesis conforms to the requirements for a Master's thesis

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Abstract

The present thesis investigates the hypothesis of FDI export spill-overs from foreign multinationals to domestic Estonian companies by using a dataset comprising both exporters and non-exporters in the manufacturing sectors in a time-span ranging from 1999 to 2009. Estonia is an excellent case study in the field thanks to its historically high levels of FDI per capita. The study assesses both horizontal and vertical spill-overs, distinguishing the latter between backward and forward linkages. It starts by analysing FDI dynamics, previous studies on export spill-overs and the historical evolution of the Estonian economy. A Heckman selection model is then described and employed in order to distinguish between two different decisions, namely whether firms decide to start exporting or not (export-propensity) and how much they export (export-intensity).

The results reveal a scarce significance of spill-overs in the decision to engage in exports, but various robustness checks confirm a strong relevance of backward linkages in export-intensity. These externalities seem to be stronger after EU accession. In contrast to the main findings of previous studies, horizontal spill-overs appear generally as insignificant even when controlled for time or technological heterogeneity in the dataset. Contrary to what usually found for developing and transitional markets, export-intensive Estonian firms are both younger and larger firms. This can be seen as a confirmation of successful institutional reforms during the years of transition, especially when integrated with earlier findings on Estonia by Sinani and Meyer (2004).

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1. INTRODUCTION

Foreign Direct Investment (henceforth FDI) has been a major cause of debate in economics, as for instance Havránek and Iršová (2012) found out that more than 100 researchers engaged in analysing it since the beginning of the new millennium, and such number might even be higher. Part of its uniqueness comes from the persistent, bolted-down nature of its capital flows, which are compared to good cholesterol by Hausmann and Fernández-Arias (2000); another element of interest is given by its consistently rising levels, particularly in developing countries (World Bank, 2006); and last, its role in bringing new technology and know-how in the recipient economy is often considered as pivotal, as it alters directly local firms' production function (Borensztein et al., 1998). The capital and technological transfers seemed as particularly intriguing in the case of developing countries, due to the potential for catching-up with developed economies (Radosevic, 1999). Even before 2000, academics set to assess its direct impact on growth. Results on the matter are often mixed (e.g., Campos and Kinoshita, 2002; Herzer et al., 2008), due to the highly heterogeneous nature offered not only by FDI itself, but also by the studied geographical area (which also includes local institutions and education) and the chosen econometric technique. Therefore, studies have focused increasingly on indirect effects, namely information, technological and managerial externalities that FDI is deemed to generate in the host country, in an effort to find stronger and less ambiguous evidence of the benefits stemming from it. Meanwhile, globalization was already ensuing and FDI became more and more popular for competing governments, a phenomenon that does not appear to have come to an end (UNCTAD, 2014) and which produced a further branch of analysis in discovering FDI determinants. Again, due to high levels of heterogeneity, results were often contingent.

The present thesis aims at disclosing the spill-overs stemming from FDI in relation to the export performance of a former transition economy, i.e. Estonia, in a time-span covering the 10 years ranging from 1999 to 2009. The rationale behind this geographical

choice is given by the remarkable levels of FDI flows received by Estonia during its privatization and transition process (OECD, 2001), which make the Baltic country particularly effective in assessing FDI indirect effects and spill-overs. Exports are one important channel of growth enhancement that FDI can produce, via informational externalities (Bernard and Jensen, 1999; Aitken et al., 1997).

Research on the topic has been promising yet quite limited, considering that roughly 20 papers, including developed countries, have analysed the matter. These studies provide mixed results (Ruane and Sutherland, 2005; Barrios et al., 2003; Aitken et al., 1997). None specifically tackled Central and Eastern European Countries (CEECs), and none profited from the *tabula rasa* argument that these transition economies are providing (Bevan and Estrin, 2004). Instead, they have focused more on China as both a developing and transitional economy (Du and Girma, 2007; Sun, 2010). This adds another intriguing rationale to the analysis in this dissertation. The dataset used here comprises both exporters and non-exporters, which are included in the model by adopting a sample selection model. The thesis specifically assesses only domestic-owned firms that are able to provide at least 5 years of consecutive data during the time-span considered, including only manufacturing sectors (in NACE-2 digit code, industries ranging from 15 to 36), on the two dimensions of the decision to export and the intensity of exporting. The results highlight a persistent significance of backward linkages, which appear as significant in the main model and seem to be particularly acute after Estonia entered the EU; an overall insignificance of horizontal spill-overs, despite attempts at disclosing heterogeneity; and a contingent negative role of forward linkages in technologically-intensive industries. A further result suggested by the estimations is the relevance of innovation in flexible firms, and the peculiar characteristics of flexibility for Estonian firms.

The thesis is composed as follows: chapter two offers a literature review, divided into three sub-chapters which analyse respectively the existing literature on FDI and productivity, while also offering definitions to key concepts on FDI; the relationship between FDI and trade, assessing in closer detail the structure, methodology and results of previous papers on the matter; and FDI in transition countries, inspecting its role in the development of CEECs and previous papers on related FDI matters targeting Estonia specifically. Chapter three consists of the original contribution the present work aims at offering. First, it provides a general analysis of possible model specifications, opting for

a Heckman maximum likelihood method; and then defines the employed proxies for spill-overs and the control variables. Summary statistics to assess the data are provided, as well as general estimation results and comments on them. Further robustness checks are performed by analysing the spill-over relevance including also foreign-owned firms, and by dividing the available dataset first into high- and low-technology intensive to analyse underlying differences between the two manufacturing sectors, and then before and after Estonia's EU accession. A further estimation using the volume of exports as the dependent variable is conducted to check for consistency. Last, a concluding chapter finally summarizes the thesis and offers remarks on the limitations of the research and suggestions for future studies.

2. LITERATURE REVIEW

2.1. FDI and Productivity: Definitions and Analysis

FDI is defined as the investment from one nation into another, which involves both establishing new operations, i.e. greenfield FDI, and acquiring already existing tangible assets, including stakes, e.g. merge and acquisitions (M&As); most commonly, it refers to companies rather than governments. A key element of this definition is control: the investor has a certain power over the operation, or organisation. Such power is sometimes defined numerically and has a threshold offered by the 10 per cent ownership of voting shares, but does not limit to it, as any technological or any input exclusivity that comes from the ownership is a potential factor for *de facto* control (OECD, 2013).

In economic studies, however, the emphasis is given on the consequences of this control; that is, on the different kinds of transfers that a subsidiary starts to receive as a result of FDI. The multi-national enterprise (MNE) inserts it in a global value chain (henceforth GVC), dividing the production and its consequent tasks (e.g., marketing, distribution, and so on) into different aims for different firms, with different extents of dependence and autonomy within the single GVC and within distinct GVCs (Backer and Miroudot, 2011). The firm is converted then into the centre of a network of relationships, rather than being the owner of a clearly specific set of capital assets (Holmström and Roberts, 1998). According to the degree of freedom, MNEs can have either horizontal or vertical subsidiaries; the latter distinguishes the production into different stages with more autonomy, whereas the former is distinguished by similar firms in different countries exploiting the proximity-concentration trade-off (Horstmann and Markusen, 1992). Brainard (1997) defines this trade-off as a foreign firm entry in a national market caused by higher advantages arising from the closer access to the destination market over the

exploitation of economies of scale. The higher transport costs and trade barriers are, the more likely the firm is going to be accessing the national market directly, as the advantages stemming from their economies of scale from producing in their home economy are offset. These are exploited when the converse is true, i.e. when concentrating the production in a single plant is more efficient than accessing the target market more closely, by engaging simply in trade. Bair (2005) comments on the historical evolution of the concept of GVC, which dates back to 1970s, gradually acquiring the relevance it has nowadays and related to a behavioural framework that was not so thoroughly defined yet.

Following from the definition of FDI, it is possible then to distinguish its impact on the economic progress of the recipient economy in two forms: direct and indirect. Blomström et al. (2000) define the direct impact of FDI as a boost in employment, capital, exports, and new technology stemming directly from the transfers that the MNE is responsible for to its subsidiaries, generally taking the form of greenfield investment. Indirect effects are non-voluntarily effects of the MNE, which is guided by the simple will to make more profits, but is at the same time responsible for macroeconomic changes. They are mostly related to different kinds of knowledge and information. Stiglitz (1999) synthetises how knowledge is a global public good. Knowledge sharing is non-rivalrous and yet can be exclusive, but only in the strictly regulated and time-limited form of patents. Kogut and Zander (2003) discovered how a dominant MNE stems from the market imperfection approach of capabilities, or knowledge-based theory of the firm. The present thesis aims at capturing the knowledge flows, or externalities, that are called spill-overs. They can be either dependent on the MNE's decision to share specific knowledge openly along the GVC (what I called previously direct impact), or independent (indirect).

Both impacts are supposed to affect the productivity of the recipient economy. Syverson (2011) distinguishes between different, single-factor productivities (for instance, labour), to then define total factor productivity as a residual, namely a measure of the researcher's ignorance targeted at the firm. In order words, total factor productivity is that part of production that cannot be explained by observable inputs, i.e. capital, labour and intermediate goods. Spill-overs are expected to enhance the firm's productivity.

Internationalization theories assist us in understanding why MNEs decide to enter a foreign market via FDI. The case offered by CEECs debatably seems to bear a similarity

to the so-called Flying Geese Model, theoretically defined for the economic rise of Asian markets (Kalotay, 2004; Damijan et al., 2013a). Kojima (2000) updated and defined the model. This consists of an economy where a leading market force decides to relocate its labour-intensive production, due to the pressure on rising wages in the home country; as such, it is primarily an industrial replacement. Dowling and Cheang (2000) divide the process into five stages: (i) the introduction of a new product, importing it from a leading country; (ii) domestic production starts to replace imports, and small amounts of FDI appear; (iii) the production peaks, so exports become strong and inward FDI is considerable, as the former leading country lost its competitive advantage; (iv) then, exports slow down due to increasing costs and competition from other later-starting countries, contingent to a local fall in FDI inflows; (v) and last, competitiveness is lost and production is fully relocated to later-starting countries. This framework, based on regional development, would be highly beneficial for indirect, spill-over effects (Kasahara, 2013).

Dunning (1993) established another famous framework in internationalization theory, the eclectic paradigm or OLI model. He finds three advantages needed for investing into foreign countries, whose acronym gave the model its name: (i) ownership advantages, stemming from a firm-specific asset, therefore a competitive advantage in production technique or skills; (ii) location advantages, thereby a specific comparative advantage given by the place the firm locates in, such as low wages or natural resources; (iii) internalization advantages, linked to the benefits of directly entering the market rather than engaging in trade or joint ventures, to exploit the firm's core competences. FDI arises when the three are joined together in the firm's decision on which channel to use to enter the foreign market. Baldwin (2012) upgrades the theory, taking into account globalization's second unbundling (Baldwin, 2006): internationalizing is no more a full industrial reestablishment, but an offshoring of specific stages, due to a shift in the analysis from industrial sector to stage of production[1]. Ownership advantages usually

[1] The process can also be labelled Global Supply Chain (GSC), which encapsulates a rather similar concept as GVCs, just shifting the main point of view: the former is a bottom-top approach, from the customer to the producer, as the customer is the one from which value flows. GSC is the opposite, as supply goes along the chain conversely (Feller et al., 2006). As the distinction is of little relevance here, the former will be used.

ensue spill-overs and knowledge transfers, as they are related to the transmission of a competitive advantage along the GVC.

From the OLI model, four kinds of FDI are found: resource seeking (both physical and human resources); market seeking (domestic and adjacent); efficiency seeking; and strategic asset seeking, where the firm invests to protect or improve its specific advantage, while reducing those of competitors (Faeth, 2009). The purpose of the affiliate allows for a previously mentioned distinction, namely horizontal and vertical FDI, which reflects the extent of the autonomy. The former relates to replicating the firm's activity in other markets (Markusen, 1984), the latter to a real slicing up of the production chain (Helpman, 1984). These general definitions are needed so as to understand how FDI is a heterogeneous phenomenon in its nature.

At a macroeconomic level, the question attached to FDI has often been summed up to whether or not it spurs economic growth, with three main responses, and groups, as identified by Moran et al. (2005): (i) the "Washington Consensus" enthusiasts; (ii) sceptical academics; (iii) and those who stand for a *de facto* resurrection of *dirigisme*. For the first ones, FDI bears a positive substantial effect on growth anytime; this view has of course often been backed by investors and business groups. Williamson (2003), the drafter of the original Washington Consensus, tackles the obvious counterargument that it has clearly not always been the truth by stating that the document was misinterpreted by governments and academics. The Washington Consensus was of course simple and concise, and it needed further implementation and analysis. It was not to be interpreted as a one-size-fits-all list carved in stone. Academic scepticism has often been embodied in its extreme by Dani Rodrik, who famously wrote in 1999 (p. 37) that "one dollar of FDI is worth no more (and no less) than a dollar of any other kind of investment". This implies that, following the neoclassical growth theory and therefore diminishing returns to capital, FDI has an impact on growth only in the short-run, exactly as domestic investment (Herzer et al., 2008). In general, they focus on the singularity and insecurity of FDI effects, which are linked to and due to many factors at once; a singular prescription is therefore impossible to make. The last group is represented by those advocating to impose some numerical target for multinational investors, as urged by UNCTAD (2003). Scholars have criticized this approach as well, remarking again on the main problem developing countries have: the frequent lack of a central, skilled, unbiased and strong

government, which then cannot go against MNEs or is not able to operate for an active wealth redistribution via specific policies (Blomström and Kokko, 2003). Reinart (2011, p. 399) probably ends this debate in an exhaustive way: "Can FDI generate net benefits for host countries? Yes. Does it always do so? No". In that no, in the need for confirmation and contingent assessment of FDI effects, lie as a consequence the staggering magnitude of related studies.

General macroeconomic studies have offered mixed results when analysing the impact of FDI on productivity. This is due to issues such as, but not limited to, econometric definition of the variables and inner difficulty of separating FDI effects from other highly correlated growth-promoting factors (e.g., trade and/or investment ratio), or to simply distinguish whether the mechanism of causality goes from FDI to growth or conversely. Carkovic and Levine (2002) first stressed the importance for FDI-related studies to tackle simultaneity bias, as well as control for country specific effects, and use lagged dependent variables. A failure in tackling these issues would result in biased estimations. Blonigen and Wang (2005) further commented on the urge to differentiate countries according to their stage of development and to account for the distinct effects of FDI between developed and developing nations. Indeed, Nair-Rechert and Weinhold (2001) already undisclosed a remarkable heterogeneity of results in the link between FDI and growth. Ghosh and Wang (2009) found that OECD countries in the period from 1980 to 2004 experienced a moderate effect from FDI flows (both inward and outward) in their growth patterns. For developing countries, De Mello (1999) linked this country-specific dimension to absorptive capacity (Zahra and George, 2002), and therefore to a measurement of the technological gap between the MNE and the subsidiary, while Nunnenkamp and Spatz (2003) emphasise the relevance of both the industrial sector considered and the kind of FDI. Alfaro (2003) notices that FDI seems to exert a positive influence mostly on the manufacturing sector. Bruno and Campos (2013) reaffirm the conditionality of FDI impact, but observe that it seems lagged-behind countries are achieving most substantial growth effects from it; a rationale is offered by the existing gap between private and social returns in low income countries, due to the deficiencies of their economy and redistribution system. In concert, Selaya and Sunesen (2012) stress that even foreign aid seems to be ineffective for the poorest countries to help their FDI-seeking policies, or in general to achieve higher FDI levels. Bellak (2004) found that,

when controlled for firm and industry characteristic, it is not foreign ownership that causes a real shift in production level; the multi-nationality status of the firm acquires a relevant significance, as these firms are able to achieve higher levels of output than single- or uni-national firms. A result confirmed by Mebratie and Van Bergeijk (2013), who recognize that the most neglected causes of heterogeneity are levels of research & development (R&D) and exports. Late results by Iwasaki and Tokugawa (2014) via a meta-analysis study conclude that FDI was a driver of growth in CEECs, as most of the defying studies dealing with the area fail to assess the econometric issues aforementioned.

Micro-data, at the firm level, can be used as well to assess the macroeconomic consequences of FDI. If firms are benefiting from FDI at a micro-level, it is reasonable to assume growth is spurred; Bruno and Campos (2013) relate micro and macro-data as the same measure, considering the former as a net and the latter as a gross measurement of the relationship between FDI and productivity. Macroeconomic effects would then always tend to be larger. An example of microeconomic studies can be offered by Damijan et al. (2013b), where an endogenous growth model allows for the introduction of a technology parameter, which can be increased by both internal and external factors that the model accounts for. Marin and Bell (2006), analysing the case offered by Argentina, found out that the autonomy of the subsidiary was pivotal in creating technological spill-overs, thus reaffirming the interplay of the two factors at once. Birkinshaw et al. (1998) further indicate that the role the subsidiary plays is not always determined by the headquarters, but evolves as it engages in autonomous innovatory activities. The MNE strategy, rather than its mandate, still is a fundamental aspect (Dörrenbächer and Gammelgaard, 2006).

The present thesis has so far outlined studies focusing on FDI and growth, mainly to offer an insight on how mixed results are. This contingency in results has been mostly ascribed to the different development stages among countries, which should reflect the available technology and know-how. Thus, one can already notice by this analysis how the role of FDI in creating relatively autonomous competence, and therefore spill-overs, gained more and more importance along time. As this is the main core of the dissertation, it appears crucial to offer closer definitions and inspect the different varieties of spill-overs in their relationship with the GVC and better assess these externalities. In the next page, figure 1 summarizes them.

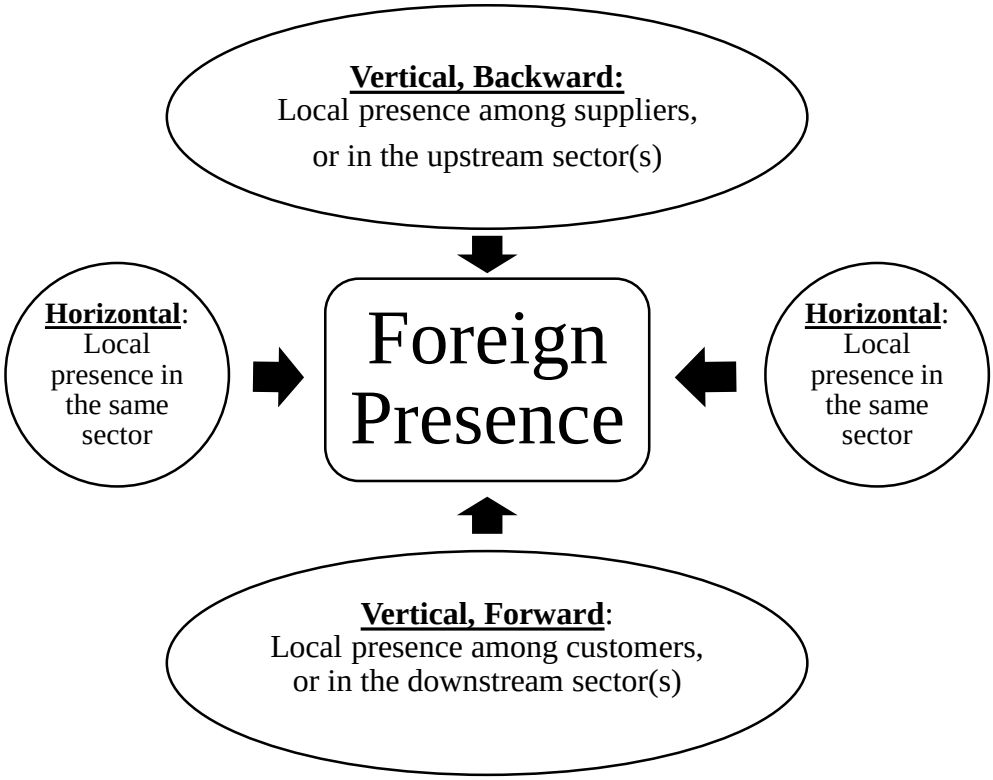

Figure 1. Horizontal and Vertical Spill-overs.

Graphic elaboration by the author, based on the works by Caves (1974), Markusen and Venables (1999), Smarzynska Javorcik (2004), Aitken and Harrison (1999).

Caves (1974) first recognized a so-called horizontal spill-over (or intra-industry), for firms that are actually not inserted in the GVC. A competitor of any MNE in the recipient economy has basically two options: to strengthen its position, by reducing costs or improving the product; or to exit the market, by closing operations down (Aitken and Harrison, 1999). In the former case, the potential spill-over offered by new technology in the MNE can be captured and used for its own improvement by the competitor in different ways, such as copying the new technology, e.g. adopting reverse-engineering practices; or hiring workers with a new skill-set to challenge the existing difference and reduce the gap between the two firms (Kneller and Pisu, 2007). Horizontal spill-overs have then a sectorial dimension.

Vertical spill-overs (or inter-industry) from FDI have first been studied by McAleese and McDonald (1978), and their definition has later been refined by Markusen and Venables (1999). They concern firms who are actively involved in the GVC, i.e. that

are suppliers or buyers of the related MNE, and thus can be distinguished respectively into backward and forward linkages. The former relates to firms which are providing the MNE with a certain output; the latter to firms which are provided with a certain output by the MNE, and as such even consumers. Upstream relationships such as backward linkages include not only technological know-how, but also managerial (Giroud, 2007). Moreover, despite the potential headquarters' reluctance, the overt transfer of selected knowledge is cause of mutual benefits (Hoekman and Smarzynska Javorcik, 2005; Smarzynska Javorcik and Spatareanu, 2008). Downstream, or forward, linkages-related spill-overs are incorporated in the product itself, and might cause an improved productivity (Smarzynska Javorcik, 2004), also in services (Miozzo and Grimshaw, 2008). The latter is however not necessarily a positive phenomenon, considering it is doubtful that most successful firms in the field opt for FDI in entering foreign markets (Wagner, 2014).

Kugler (2006) notices that inter-industry spill-overs are more substantial in the growth of recipient economies, possibly due to an effective protection of specific technology in intra-industry relationships. Alfaro et al. (2004) already found that the linkages of the former are higher than the latter. Smarzynska Javorcik (2008) notes that firm-survey analyses conducted in Czech Republic and Latvia witness how local enterprises are aware of the positive features brought along by FDI. In general, it seems that horizontal spill-overs present higher difficulties to disentangle in the analysis. First, in the beginning of the foreign entry period domestic firms are facing a short-run negative effect on their productivity, which is due to competitive pressure (Smarzynska Javorcik and Spatareanu, 2005). And then there is a possible heterogeneity of effects, as only certain firms or sectors are involved in spill-overs and datasets do not allow for further differentiation (Görg and Greenway, 2004). An example of these specific cases is offered by Kee (2011) for the Bangladeshi garment industry, where sharing the common local-input supplier led to horizontal spill-overs when accounted for. The MNE can also simply be successful at guarding and securing their own specific asset.

According to meta-analysis, the possible non-linear effects of spill-overs results in a U-shaped relationship between horizontal spill-overs and economic development, distinguished between income, human capital, and institutional development (Meyer and Sinani, 2009). However, using the same technique with a larger number of studies,

Havránek and Iršová (2011) do not find any significant horizontal impact. They find an economically significant effect of backward linkages and a smaller impact of forward spill-overs. Similarly to horizontal spill-overs, vertical spill-overs might not come out as significant despite their presence. The reasons are outlined by Smarzynska Javorcik and Spatareanu (2005): (i) a "cherry-picking" effect, where FDI flows to the already successful local firms; (ii) a contingent productivity shock in local firms; (iii) an improvement in the firm during the working stage, due to more stringent requirements; (iv) and a mixture of all these effects at the same time. As a further example, Suyanto and Salim (2010) distinguish total factor productivity growth into efficiency change and technological advancement in two different sectors of the Indonesian economy, resulting in FDI spill-overs to have opposite effects. Integrating spill-over effects into overall productivity studies leads therefore to facing similar issues and showing similar patterns of contingent results as previously described.

As a result, econometric problems are still an important issue to deal with. Eapen (2013) contributes evidence to the importance of consistent datasets, and a sound econometric strategy, in the reliability of the results. Incomplete databases might lead to biased estimates if not properly tackled. Evaluating 32 researches, Wooster and Diebel (2010) similarly hint at the possibility that identification issues resulting in model misspecification could be the cause of at least part of the studies claiming positive and significant FDI spill-overs in developing countries. In the case of Ireland, Barrios et al. (2011) transform an insignificant spill-over value to a positive and significant one by econometrically tackling the unrealistic assumptions that MNEs: (i) use the same proportion of imported and domestically produced inputs; (ii) have all the same input sourcing behaviour as local firms; (iii) and demand for locally produced inputs proportionally to their share of locally produced output. Thus, a sound econometric strategy is key to reaching substantial and, even more importantly, closer-to-reality results.

Finally, were FDI always leading to spill-overs, it would be safe to assume that governments would engage in international competition for it, in a prisoner's dilemma type of bidding war, which is potentially highly detrimental (Oman, 1999). The main element in this regard would probably be taxation competition, which would result in benefits for MNEs at the expenses of social welfare (Morriset and Pirnia, 2000). Taxation

surely affects MNE decision, as found in a meta-analysis by Feld and Heckermeyer (2011), but it is still difficult to disclose at which level. Donath and Slavin (2009) for instance believe MNEs might just consider the statutory tax rate as it is the easiest indicator to obtain. Furthermore, due to the inner difficulties of related studies[2] and the higher relevance of other endowments such as infrastructure in the longer run both according to econometric studies (Bellak et al., 2009 for the European Union area; Hajkova et al., 2006 for OECD members) and firm surveys (Culahovic, 2000), taxation competition can possibly and simply be defined as an immediate and temporary FDI-boost, which does not last unless the host government undertakes other reforms. However, Harding and Smarzynska Javorcik (2007) highlight the relevance of a good investment promotion policy, which has the potential to attract FDI not only via subsidies but also by facilitating integration with the local rules and regulations; still, to limit losses from taxation competition, it calls for geographical cooperation at the regional level.

Another form of competition highly used is subsidies; Charlton (2003) offers proof of how this competition occurred both in emerging and developed countries. Bjorvatn and Eckel (2006) offer proof on how it becomes harsher in case countries are endowed with a similar location advantage, possibly confirming the idea that government intervention in general is not that important for MNE decision in undertaking FDI. Havránek and Iršová (2010) found no international subsidy competition.

The previously mentioned results by Bruno and Campos (2013) eventually shed light on the fact there is, at least in general, some competition for FDI, as welfare reduction is noticeable, confirming also both Blomström and Kokko (2003) and Albornoz et al. (2009) results. Nevertheless, such a conclusion is still disputed (see for instance Chor, 2009), and moreover subjected to the macroeconomic environment, e.g. in the case of regional integration (Albornoz and Corcos, 2007).

In this sub-chapter, I have provided key definitions for the research on FDI and the reasons why it arises according to internationalization theories. I have then assessed several empirical papers on the relationship between FDI and productivity, to later introduce in closer detail the indirect effects of FDI. I have outlined the reasons why economic studies on the matter have failed in achieving a consensus on its effect. In

[2] For more information on the matter, see for instance Leibrecht and Hochgatterer, 2012, p. 641.

concluding the chapter, I mentioned the macroeconomic and social consequences of the competition for FDI at a governmental level. The next sub-chapter will use these concepts as a basis, to introduce new views, more closely related to the relationship between FDI and export spill-overs. They constitute the main core of the present dissertation, but need to be integrated with the overall FDI literature I presented insofar.

2.2. FDI and Trade

The implications of FDI spill-overs are not limited to those already mentioned. Indeed, they also have an effect on trade performance. For what concerns intra-industry spill-overs, it is possible to identify three effects, respectively competition effect, demonstration effect and labour mobility. According to the first one, competitors managing not to exit the market and thus surviving foreign presence would nevertheless find less domestic market for themselves. As a result, the increased competition should induce domestic firms outside of the GVC to engage more in trade, namely in exporting to find new markets (Kneller and Pisu, 2007). Furthermore, according to Aitken et al. (1997), a similar effect is brought about by information externalities from the MNE. As MNEs might already be accessing other foreign markets, Kneller and Pisu (2004) infer that their presence leads local firms to obtain an easier access to information about those specific MNE-served foreign markets. Such knowledge also includes distribution and serving facilities. This is defined as the demonstration effect. Bernard and Jensen (2004) further synthetize these externalities as a reduction of the sunk costs of exporting, such as logistics, becoming used to local regulations, and foreign market research[3]. This statement is also supported by Poncet and Mayneris (2013), who demonstrate that in the case of French firms the high entry costs associated to Asian markets are offset by local potential spill-overs effects. Last, these information externalities are also brought along

[3] This statement is however not undisputed. Lawless (2009) discusses the sunk costs of exporting as an overestimation by the previous literature, due to the observed high rates of entry, exit and year-to-year export market refinement, with a remarkable change in firms' destination market portfolios. The results suggest that size is the factor that matters: small firms start from a single foreign market to add further ones as time goes by, whereas bigger firms are changing markets at a faster pace. As such, exporting would be a more dynamic phenomenon.

by labour mobility, i.e. hiring new workers from entering MNEs. They can concern both product- and market-related knowledge. These spill-over effects are expected to show as well on the vertical dimension, even more overtly, considering the related local firm would be directly linked to a more knowledge-endowed MNE headquarter. The MNE would then openly share a firm-specific asset with the subsidiary. Keeping in mind how such clear distinction between horizontal and vertical spill-over is often practically a simplistic reduction, figure 2 below recaps the ways in which spill-overs might occur.

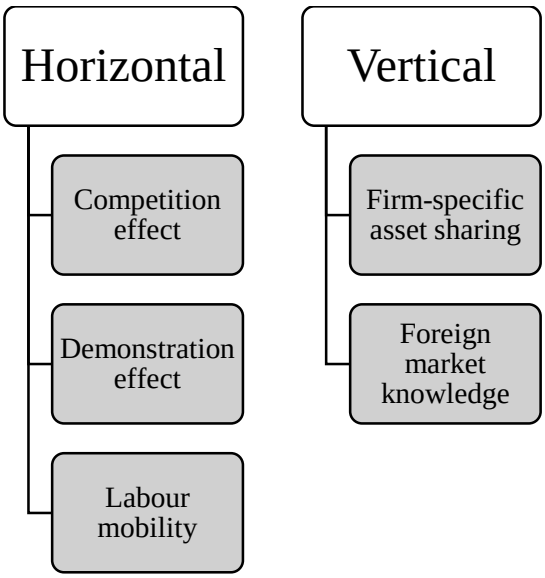

Figure 2. FDI Spill-overs on Trade.

Graphic elaboration by the author, based on the works by Smarzynska Javorcik (2004), Aitken et al. (1997), Kneller and Pisu (2007), Bernard and Jensen (2004).

UNCTAD (2002) however asserts how FDI could potentially have a detrimental effect on exports, by channels such as: (i) decreasing or substituting de facto domestic savings and investment; (ii) concerning technologies not suited for the recipient economy; (iii) discouraging local expanding firms from becoming exporters; (iv) aiming at the host country's domestic market and not at exports; (v) being attracted only by the possibility of exploiting local cheap labour and resource endowments, thereby possibly causing the so-called Dutch disease. The latter arises when revenues coming from natural resources ensue an appreciation of local currency, which ultimately erodes the competitiveness of the country's manufacturing sector (The Economist, 2012).

The relevance of this analysis is further presented by the fact that potential direct effect of FDI on the export performance can be seen as an indirect effect on growth. Export-led growth has been first investigated by Krueger (1985) and its econometric methods have been majorly reviewed by Giles and Williams (2000a, 2000b). The theory believes that an increase in the flows of exports should cause growth as "exporters have more workers, proportionally more white collars, higher wages, higher productivity, greater capital intensity, high technology intensity and are more likely to be part of a multi-plant firm" (Bernard and Jensen, 2004, p. 3); shortly put, because exporters are good firms (Bernard and Jensen, 1999). Melitz (2003) formalize this statement in a dynamic industry model with heterogeneous firms. Exporting firms are also already stronger than domestic firms, as they would not only be affected much by the pressure exerted on their local market by the MNE (Blomström and Sjöholm, 1999), but would actually even have a stronger capacity to counter a new foreign presence in their economy, due to their higher experience as a result of previous exposure to foreign competition (Crespo and Fontoura, 2007).

A seminal pioneering paper by Aitken et al. (1997) analyse Mexico in a post-trade reform period, from 1986 to 1990. Their results show how proximity to MNE activity led to further exports, whereas the concentration of exporting firms did not; they account for other variables such as distance to the capital city and border regions, regional industrial activity, as well as price and cost variables. Furthermore, their findings are confirmed by two different econometric approaches, namely a probit model and a two-stage conditional maximum likelihood method. Thus, they conclude calling for policies to support the creation of export processing zones. Another famous study is provided by Ruane and Sutherland (2005). They assess Ireland on two different dimensions: first, whether foreign presence has any effect on the decision of local firms to export or not (export-propensity); and then, whether it affects its intensity, i.e. how much they are exporting, or not (export-intensity). Thus, the paper uses two equations, where the first one basically acts as a sample selection for the second. They find evidence to support the hypothesis that higher levels of FDI leads more local firms to start exporting, thus achieving a more competitive nature in the market; on the intensity dimension, foreign presence was however detrimental, leading to negative spill-overs. This is linked to the status of Ireland, which is a country used as an export platform by MNEs. Barrios et al. (2003) checked for spill-

overs from R&D, MNEs, and other domestic firms' activity in Spain; they assess export-propensity via a logit model which find a strong non-linear positive significance of proxies for size and age; the skillset of workers, represented by the average wage bill, leads to further exports as well, but only foreign firms are stimulated to export more as a result of FDI. The analysis on export-intensity, conducted via a Tobit model, holds similar results for the control variables, but no significant spill-over associated to MNE activity. Karpaty and Kneller (2011), using a Heckman selection model, show that FDI had a remarkably important role in improving Sweden's export performance from 1990 to 2001, especially in export-intensity. The effect seems to be stronger for intra-industry effects; moreover, it seems that spill-overs are more pronounced when considering the most R&D intensive-firms in the host economy and the most productive foreign investors.

United Kingdom in the 1990s has been extensively studied, given the remarkable inflows of FDI and the presence of a thorough database such as OneSource. Greenaway et al. (2004) assess the years from 1992 to 1996, again dividing the investigation into the decision and the extent of exporting, in a model adopting a similar fashion as aforedescribed for Ruane and Sutherland (2005). Their results highlight the relevance of horizontal spill-overs, i.e. MNE and sector relevance in both export dimensions, whereas no information spill-overs are found. Girma et al. (2007) evaluate how much productivity was enhanced by exports spill-overs from FDI in recipient firms in the time span ranging from 1988 to 1996. They adopt a combined matching and difference-in-differences estimator to generate a coefficient of how much changes in productivity growth can be imputed to foreign acquisition, and how long its effect lasts. Reverse causality and cherry picking are thus tackled, as MNEs might be interested only in local firms already exhibiting a higher productivity. Host-country firms acquisitioned by foreign firms show an unconditional increase in the growth of productivity after a year, and such trend usually stops after the second year; after that, acquired and non-acquired firms experience similar trends again, perhaps as intuitively: it seems feasible to assume by then the latter would already be forced out of the market if not competitive. This finding supports the idea of inter-industry effects as the main vehicle for FDI-caused export spill-overs. Pisu and Kneller (2007) again assess export-propensity and -intensity, using data from 1992 to 1999, focusing on both inter- and intra-industry spill-overs. The results show how the decision to export is less affected by spill-overs than the amount of exports. Focusing on

the latter, findings by Aitken et al. (1997) on horizontal spill-overs are confirmed, linking spill-overs to a leakage of foreign market knowledge; furthermore, they find evidence for positive and significant backward linkages, whereas forward comes out as negative and significant. Finally, the paper endorses the idea that export-oriented foreign companies result in higher spill-overs than foreign firms targeting the host-market. Greenaway et al. (2012) find that export-intensity is negatively related to exchange rate fluctuations; a result that seems harsher for domestic- and EU-based companies rather than non-EU MNEs, and that could be described also as a difference in the motives of FDI: EU-based MNEs are able to shift production easily in the case of an unfavourable exchange rate. Franco (2013) scrutinizes the possibility that the type of FDI has a relevance on the export-intensity dimension of the host economy by analysing the effect of U.S. outflows to 16 OECD countries in the last decade of the past millennium. The hypothesis proves true, yet counterintuitive. Market-seeking FDI are found to affect exports more than any other; it is argued this is due to the establishment of stronger linkages, which lead the subsidiary to offset the tendency to low exports of firms engaging in this type of FDI. Resource-seeking FDI and R&D expenditures in general are found not to affect the exporting performance; yet, the results concern developed countries, and the paper remarks on the possibility of different results when tackling developing nations, or low-tech sectors.

In general, studies focusing on developed nations however are still able to provide a general picture of the difficulties faced by researchers, and the main common elements in the field. While pioneering studies were somehow limited by the available datasets, later studies attempted at distinguishing the decision of exporting and its intensity by using either a Heckman selection model or by combining a probit and a Tobit model. As such, the most compelling issues in the analysis should be cherry picking and endogeneity, which Heckman does not fully account for. Results are again mixed and contingent, not only according to the nation considered, but also according to the main variables of interest. This is exemplified by the different and sometimes diverging results offered by the United Kingdom. Furthermore, this highlights how a sound and complete dataset is pivotal in this kind of research.

Making an exception for the first described study by Aitken et al. (1997), only developed countries have been mentioned insofar. Estonia could arguably be considered

as more similar to developing countries, as also current and former transition economies are often included among them. However, fewer studies are devoted to developing countries, and these economies present a rather different economic situation compared to the country of interest here. One example is offered by China. Du and Girma (2007) use an instrumental variable approach integrated with a Tobit model examining the period from 1999 to 2002, i.e. immediately after China's WTO accession, to assess firm export-intensity only. Their results support the idea that export-oriented horizontal FDI helps in achieving higher levels of exports, especially if the firm is labour-intensive and/or has an easier access to bank loans. Vertical linkages are found to have non-significant scope, and that leads to a situation where only labour-intensive domestic enterprises that can borrow more are able to protect their local market share from foreign companies. Sun (2010) decides instead to adopt a Heckman sample selection model covering the period 2000–2003. In the participation equation, it is found that firms' characteristics matter significantly. Size, non-state-ownership and being coastal (the more developed area) is positively related, whereas age, capital intensity and wage are negatively related. In the second regression, the latter negative effects are confirmed, and size becomes negatively significant as well. State- and collectively-owned firms tend to export more. FDI spill-overs are found to be highly heterogeneous according to the sub-region analysed, possibly implying an at least temporary failure in policies to cause an industrial advancement in the less competitive Western China. The econometric results thoroughly describe the Chinese economic situation: a market endowed with a competitive advantage in labour-intensive markets, with many smaller firms created just to serve foreign markets, and younger companies that are more export-dependent. Buck et al. (2007) exhibit a strong presence of all kinds of spill-overs (namely competition, technology and labour mobility) in both export-propensity and -intensity in manufacturing firms from 1998 to 2001. However, the used dataset might be cause of concern as a bias is present; only firms with more than 5 million Renminbi in sales in 2001 are considered.

Franco and Sasidharan (2010) analyse demonstration and imitation effects in the Indian manufacturing industry from 1994 to 2006, thus excluding competition impact in their study. The paper then specifically assesses information, or market access spill-overs, R&D and wage externalities, again in a Heckman selection model. The imitation effect, via R&D externalities, is the only spill-over from FDI that is found to have an impact on

the decision to export; demonstration, via information externalities, is the only one affecting the intensity of exports. Other firm characteristics seem to confirm the young and small firm as the successful one in exporting, as well as the relevance of internalizing a foreign technology before starting to export. Anwar and Nguyen (2011) tackle the Vietnam manufacturing sector in 2000 only. As such, their results are possibly time-dependent. State-owned firms seem to perform better in exporting, perhaps due to an easier access to credit and financing. Horizontal spill-overs are positive and significant in both decision and intensity, whereas vertical linkages are causing higher concern: forward linkages are found only in low-tech companies for export-decision, and backward linkages are negative and significant in export-intensity. Vietnam, as the other two Asian markets considered here, presents a regional FDI inequality that denotes the geographical concentration of industries as a relevant and positive variable in the analysis. Kokko et al. (2001) analyse the Uruguayan market in 1988. Their spill-over results are highly dependent on the year in which the firm was established, due to a trade liberalization reform enacted in 1973. They find that firms established before then are more inward-oriented, and as such brought new technology to the country, but no considerable productivity spill-overs. Export spill-overs are conveyed by firms established later, which are more outward-oriented. The results are more pronounced if the analysis is not limited to the two stronger commercial partners in the area, i.e. Argentina and Brazil. The trend of younger firms being more flexible and adaptive to international markets is again confirmed. In their investigation on the Chilean manufacturing industry from 2001 to 2004, Duran and Ryan (2014) add a third dimension, export-quantity; export-intensity is related to the proportion of production that the firm decides to export, whereas export-quantity is simply how much the firm exports. Their analysis is conducted via a Heckman selection model and an instrumental variable estimate for robustness. They find that MNE activity has a negative effect on export-propensity, and that domestic firms are the ones leading other domestic firms to export, probably due to a stronger competition effect. Opposite to the majority of studies, the main spill-over channel seems to be the one related to human capital, i.e. MNEs are not able to prevent their workers from joining domestic firms. Foreign capital participation is also found to foster higher levels of exports. Abor et al. (2008) do not consider spill-overs from FDI, but notice how FDI led to higher export levels in Ghana, from 1991 to 2002.

Tackling developing countries therefore seem to present further difficulties in the analysis. Most of these economies are endowed with a deep regional inequality that needs to be taken into account by the inclusion of regional dummies in the models. Estonia presents a similar peculiarity, perhaps less pronounced but only considering its geographical size in relation to Vietnam and especially China and India. Furthermore, these studies tend to integrate more the time-span of analysis with policy reforms, so as to evaluate critically their actual impact. A further difference in the results is usually a stronger emphasis given to flexibility at the company level, as young and smaller firms are more export-intensive, possibly due to a smoother process in adoptive innovative measures (e.g., technological, or managerial). In this respect, it appears unlikely that Estonia completely follows suit, due to its good performance in business-related indexes (e.g., World Bank's Ease of Doing Business). Apart from this, the econometric model mostly used is the one previously outlined, i.e. the Heckman selection model.

Latest research on the matter has refined the export-led growth theory, particularly by emphasising the relevance of product quality and export diversification. These works mostly move from the articles by Taylor (2007) and Matthee and Naudé (2007). The former distinguishes between horizontal and vertical export diversification defining them respectively as an expansion in the variety of exports and as a remarkable change in the share and refinement of exports; the latter use a similar distinction to label product quality as a higher number of tradable goods and services and export diversification as a transfer of the export basket from primary to manufacturing products. Following this idea, Hausmann et al. (2007) developed an index to control for product quality in an econometric model. The cost uncertainty a pioneering entrepreneur has to face in a developing economy leads to appreciable positive externalities for other producers, and as more entrepreneurs are involved in the process of disclosing the underlying cost structure of the economy, the economy draws closer towards its productivity frontier. Santos-Paulino (2010) links the growth-enhancing effect from exports to more technologically advanced product categories. In the case of China, the export-related spill-overs embedded by local firms seem to be the only force that exerted an effect on aggregate growth, rather than any activity from foreign firms in the area (Jarrau and Poncet, 2012). Nonetheless, this result confirmed an idea that Amiti and Freund (2007) already summed up as "computer chips are better than potato chips". Minondo (2010)

challenges this statement, remarking that rather than investing in products characterized by higher productivity levels, developing economies should invest in products that are supported by larger room for quality improvement. Evidence for the relevance of quality improvement is offered also by Iacovone and Smarzynska Javorcik (2012) in the case of Mexico, where the latter is found to be a pre-requisite for exports engagement. In the same country, Eckel et al. (2010) describe and find evidence for a model that links quality-product to the core of an industry in the differentiated-goods sector, but not in the non-differentiated, or cost-based, goods sector; this leads the former to higher gains, and profits, due to higher mark-ups, and the latter to strive mainly for cost reduction, due to the indifference of consumers that poses the competition only on the offer of the lowest price in the market. Last, for developing and emerging countries in general, the effect is confirmed to be positive and significant according to Saadi (2014).

A further interesting element in this perspective is not only provided by these results, but also by the fact that government intervention seems to be more practical. Harrison and Rodríguez-Clare (2009) show that export subsidies are indeed more distortionary than production subsidies for local firms, but they require less burdensome fiscal demands. Moreover, they are also a means by which the government: (i) encourages firms to be more productive by entering foreign markets and subjecting themselves to the discipline of the international market; (ii) allocates an efficient subsidization, as only firms with high productivity are financed; (iii) and avoids potential problems related to a still unsophisticated local demand. Pack and Saggi (2006), analysing FDI subsidies, remark on how these flows to foreign investors could possibly distort the market enough to offset potential rising competitive firms in their own nation, if not simply becoming the target of rent-seeking.

In this sub-chapter, I have analysed in closer detail how FDI spill-overs should induce firms to export, and to export more. I have then summarised the main papers in the field to analyse the difficulties of this study, dividing them according to the economic stage of development as this proves to be relevant in results and partly defining the model. I also integrated the export-led growth theory to connect export spill-overs and export-led growth to the overarching topic of FDI-led growth. Last, I mentioned the relevance of the exporting product and how government intervention on export subsidies could be better targeted than FDI subsidies, thus highlighting the potential benefits of the research

in this field. The next sub-chapter aims at further narrowing the scope of this dissertation, evaluating the economy of the country of interest: Estonia.

2.3. FDI in Estonia and Transitional Countries

It is useful to remind that Estonia was a transition economy, i.e. it moved from a centrally-planned, top-down driven economy to a market, supply and demand-based economy. The Estonian economy emerged as capitalist after the dissolution of Soviet Union in 1991, and the structural changes that needed were multifold (a comprehensive spectrum is offered by Hannula, 2001, p. 98). Restructuring enterprises was amongst the most difficult tasks, as the main element transition economies needed in this respect was identified in the Schumpeterian entrepreneur, a figure that was difficult to conceive with the Soviet mentality (Mickiewicz, 2010). In fact, the communist legacy left some specific hurdles for change, which were: (i) motivation-related, due to the intensely bureaucratic and rank-dependent structure that discouraged change and in general modernization; (ii) qualification-related, due to a difference in education that reflected in a scarcity of workers competent to work with new, or complex, machines; (iii) and cultural distance-related, which led to misunderstandings or plain errors in the firm's activity (Fabry and Zeghni, 2003). Bennich-Björkman and Likić-Brborić (2012) remark on how a relatively loosened Soviet repression on the informal public sphere, namely circles and clubs, is the roots of the successful Estonian transition; such clubs were the means by which intellectuals, and sometimes future politicians in the beginning of the path to capitalism, could start to share ideas of liberalism and liberal economic models, which were associated to Estonian national identity. They conclude by stating that this cultural dimension led the way to a consensus-driven transition. Mart Laar (2008), who served as the Estonian Prime Minister twice, defines the successful transition of Estonia a "miracle".

Nonetheless, the need to re-introduce the figure of the businessman into Estonian culture made it nowadays a rather peculiar one, sometimes perhaps exasperating the

external perception of this concept, as analysed by Elenurm et al. (2014); for instance, they find that the collectivist Estonian culture is less prone to teamwork than the highly individualistic US culture, a difference that might be explained by the peculiar absorption of a foreign figure. EBRD (2002) asserts how FDI facilitates bringing this about; not only by both the conversion of administrative production centres into modern and performing business units and the adoption of targeted training programmes, both on- and off-the-job (Fabry and Zeghni, 2003), but also injecting real capital into the economy, physical as well as human (Kukeli et al., 2006). Hannula (2001) also remarks on the creation of linkages and the creative destruction at the industrial, and therefore macroeconomic, level that FDI brought about.

FDI-led growth theory studies have found transition economies as a fertile territory, for the aforementioned reasons: such national markets were seen as a *tabula rasa* where to assess if the economic theory was backed by the actual data (Bevan and Estrin, 2004), for instance with the neoclassical economic hypothesis of growth and productivity convergence among similar countries (Solow, 1956). Such convergence was analysed both inner groups of transition economies, with results supporting the hypothesis offered by Kočenda (2001) and Kutan and Yigit (2007); and with respect to the EU-15, as assessed by Bijsterbosch and Kolasa (2010), whose results yield a particularly relevant convergence trend in the Baltic area, highlighting the relevance of technological evolution over time in helping to achieve FDI spill-overs for productivity gains in the area.

Further integration with the European area has been another complicated process. In the case of Estonia, Purju (1997) indicates how during the Soviet occupation more than 90% of trade was to or from the USSR. As such, gaining new trade partners and investors posed an additional tough challenge: a period of hard budget and constraints to achieve a stable level of inflation, which was a necessary pre-condition to gain international investors' trustworthiness (Mickiewicz, 2010). Meanwhile, the new trade-path started from the establishment of the Baltic Free Trade Area (BAFTA) in 1994. Its aim was to foster an official intra-regional trade platform that could serve as a training ground to familiarize with the rules of free trade before obtaining a full EU membership (Seric, 2011). Mayhew (1998) defined the former as the epitome of the political relevance of the re-integration into Europe. Economically, openness to trade is already deemed as pivotal for higher levels of growth, i.e. transitioning without opening is proved to be dampening

economic success (Nannicini and Billmeier, 2011). Often, the large-scale privatization programs transition economies started in the beginning of their path to capitalism (1991-1993) were, indeed, driven by foreign investment (Estrin et al., 2009). The creation of private property rights was, again, a highly innovative factor in all these economies, which, as a result, benefited from higher levels of investments; in general, current direct privatization, i.e. the one mostly open to foreign bidders, also seems to have performed better than non-direct privatization schemes (Merlevede and Schoors, 2009).

FDI determinants in the area are the ones consistent with the overall literature in the field, i.e. market potential, a skilled workforce, relative endowments and especially relatively low labour costs (Carstensen and Toubal, 2004). Belke and Hebler (2000) infer that the latter mattered as much as to drive a potentially detrimental competition in the field. Indeed, they are also responsible for the relationship between geographical distance and FDI, with lower distance associated with higher flows (Bevan and Estrin, 2004); partly for this, the reorientation of trade towards the EU was indeed deemed as fully achieved already in 1997 by Brenton and Gros. Seric (2011) indeed confirms that minor improvement in labour costs, as well as productivity, a duo that he synthetizes as comparative advantage, can lead to significantly higher levels of FDI. Additionally, Lefilleur and Maurel (2010) show the importance of the considered production stage, as upstream industries are found to relocate in CEECs. For intermediate goods, being close to local input suppliers and EU-15 countries is FDI-enhancing, whereas proximity to suppliers from the EU-15 and towards CEEC markets bears no significance; the effect is stronger for Central European countries, and such seems to favour the creation of backward linkages in the local economy and forward linkages with foreign partners. Ekholm et al. (2003), referring to US-outward FDI flows, identified then small countries with low-cost labour like Belgium and the Netherlands as possible FDI export-platforms; despite those similarities, the different dynamics of trade involving Estonia seem enough to neglect the possibility of a similar hypothesis nowadays.

Furthermore, low labour costs are inferred to be responsible for a taxation competition triggered by their local competitor, i.e. the EU-15, as a response to the attractiveness of such feature (Overesch and Rincke, 2009). The debate on the matter is however far from conclusive, as rather opposite conclusions are stated for instance by Goodspeed (2009), who finds taxation competition is taking place still and only in the

EU-15 due to their general higher level of endowments. In comparison, infrastructure endowments seems to be extremely more relevant in CEECs (Leibrecht and Riedl, 2010), and if properly developed, decrease the relevance of taxation over time in a hypothetical FDI-seeking framework (Bellak et al., 2009). As mentioned before, few matters seem relatively undisputed in the difficulties related to the taxation debate[4]. They include the previously recalled relevance of statutory tax rates; the insignificant relevance of tax holidays, or incentives, against the general perception of a successful transition (Beyer, 2002); and the adverse effects of a complex or, even worse, an uncertain tax system in reaching higher levels of FDI, or in other words the FDI-enhancing position given by a simplified bureaucratic process (Edmiston et al., 2003). The last two elements can be seen as part of a broader concept: well-developed and smoothly running institutions are also found to be a cause of higher levels of FDI, although their effect seems to matter less with EU accession, thus representing a valid minimum benchmark for international investors (Fabry and Zenghni, 2006). The concept is somehow reaffirmed by the initial relevance of specific institutional changes, including the development of elements such as private-owned businesses to substitute state-owned firms, the banking sector, and legal institutions; and the liberalization of foreign exchange and trade. Such unfolding was further complicated by the occasionally contrasting interests between the ruling government and the investing foreign firms, for instance in the draft of competition policies (Bevan et al., 2004). As a result, Curwin and Mahutga (2014) outline also how a weak institutional environment is responsible for a negative association between FDI and growth in the transition period; surprisingly however, their results display no underlying difference in such negative effect by distinguishing EU and non-EU members. Last, Krammer (2014) provides evidence for the intuition that transition economies experience a substantial trade-off in institution refinement. In fact, while on one hand it improves FDI and allegedly productivity, on the other it reduces the scope for free imitation, as such limits domestic firms' performance and grasping technological, FDI-related spill-overs. However, as the dataset used in this study is highly heterogeneous, caution in tailoring these results to the Estonian economy is required. Furthermore, the so-called e-Estonia policy, and in general internet diffusion in the country, might have had a

[4] For more information on the matter, see for instance Devereaux and Griffith, 2002, p. 87.

remarkable impact on FDI flows, as Choi (2003) infers on a heterogeneous pool of economies.

Recalling these macroeconomic difficulties seem to bear a particular relevance. Not only it sheds light on the many macroeconomic consequences of FDI in a transition economy, but also offers a comprehensive picture of the interconnection between political, institutional and economic reforms connected to FDI. In the latter respect, FDI played a fundamental and helpful role in the Estonian economy.

Notwithstanding, technological and innovation spill-overs are among the most sought for, possibly due to the linked creation of a competitive advantage with respect to regional challengers. Using survey data from 5 CEECs including East Germany, Giroud et al. (2012) assess local technological spill-overs and development potential from MNE subsidiaries, allowing for non-linearity between the share of local inputs and technology externalities. Such choice allows to target in closer detail the influence of the subsidiary's integration into the GVC, and take into account a possible limited local transfer of knowledge due to domestic suppliers being padlocked into providing intermediate goods whose production is dependent on standardized parts and processes. An example is offered by the so-called mega-suppliers present in the automotive industry. The results support this hypothesis, with a plateau-shaped relationship; knowledge appears to flow more intensively when associated with imported intermediate inputs, possibly due to a competition effect that forces domestic suppliers to upgrade their product. Other relevant factors can be found in the autonomy over basic and applied research and the importance the subsidiary believes to be endowed with, as well as the creation of a local networking in technology-sharing between the MNE subsidiary and its supplier.

Innovation is peculiarly relevant in the Estonian economy. Meriküll (2008) mentions how Estonia distinguished itself from other CEECs in the field, as it displayed a 36% of enterprises engaging in innovative activities in 1998-2000, the highest proportion observable in the process by which innovation influenced post-soviet economies. Sinani and Meyer (2004) are the first ones to analyse the Estonian manufacturing sector. Their results suggested an existing technological gap that signalled a lack of absorptive capacity to convert spill-overs into enhanced productivity; and a predominant innovating trend manifested by smaller firms, due to their inherently lower

level of bureaucracy, allowing them to adopt new technologies faster. Vahter (2011), better assessing endogeneity and attrition issues than the previous paper, finds that FDI is significantly correlated with both process and product innovation activities of the local firms, without fully disclosing whether such result is due to competition effects or knowledge transfer. Furthermore, the result holds while considering the distance from the productivity frontier, but is sensitive to the proxy for FDI spill-overs; and, while direct FDI-productivity spill-overs are not found, the FDI-innovation channel is deemed as possibly indirectly responsible for overall productivity growth. Masso and Vahter (2008) recognize a macroeconomic time-dependence in innovation spill-overs on overall productivity growth: initially (1998-2000), product innovation accounted more for it, as signalled by high export growth rates; later (2002-2004), due to a rising internal demand, firms decided to engage less in innovating their product. They rather conceded to the pressure of lowering production costs, thus concentrating on process innovation, and as such the latter was linked to productivity growth. Further linking product innovation to export performance, Miranda et al. (2012) found that Estonian firms in the period ranging from 1997 to 2005 were able to seize market opportunities by switching their core product or even their industrial sector, rather than exiting, a decision that appears to be driven only by firm characteristics. Estonian firms proved to adopt an offensive and self-selective attitude in response to perceived favourable circumstances offered by market knowledge, rather than a defensive strategy against low-cost competition, ultimately driving an industrial reallocation towards the medium-high technological sectors. Such attitude appears to be more relevant for smaller firms, possibly due to the sunk costs of the perceived product-specific human capital, which turn out to be undoubtedly higher for larger enterprises. Masso et al. (2010) test innovation effects through four different models, allowing for a differentiation of firms according to their ownership status. They find that the probability of foreign-owned firms to engage in innovation is higher than other firms, but their level is lower; overall, foreign-owned firms demonstrate the marked existence of intra-firm knowledge transfer dynamics, while highlighting a weak local innovation networking participation, as their main source for innovation can be found in university research. A rationale offered at a survey level relies in the small dimension of the Estonian market, which might act as an impediment towards undertaking higher levels of innovation. Domestic outward investors and foreign outward investors spend more for

R&D, denoting a certain relevance of internationalization. Again, less innovation is found in the period 2002-2007, due to the decreasing marginal returns to innovation expenditure and the contingent growth of demand.

Analysing the relevance of innovation in the Estonian economy therefore assists us in understanding how flexibility could be a key element in the export performance of Estonian firms. As previously stressed, in developing countries the relationship between FDI and exports seem to reward young and smaller firms, with less bureaucratic burdens, and deemed as more flexible. In this respect, the similarity between these two elements intuitively corroborates the idea that Estonia might resemble more closely a developing economy. However, this is a simple and intuitive assertion that needs further, more solid confirmation.

In regards to the export performance of transition economies, Damijan et al. (2011) assess the historical evolution of the influence of building local supply capacity vis-à-vis the improvement in foreign market access, with the former gaining more importance over the latter in the long-run. The reasons outlined for this look similar to FDI determinants, and are namely the improved access to EU markets, particularly relevant for first EU-accessing countries; structural economic changes, especially in the creation of technology-intensive manufacturing industries, which were progressively endowed with more medium- and high-skilled workers; the increased levels of productivity; the importance of FDI and foreign subsidiaries, which seem to engage more in exports; and macroeconomic stabilization, which somehow implied the effective creation of sound and market-supportive institutions. Despite reaffirming the efficiency improvements FDI is responsible for through both closer integration with international networks and easier access to financial markets, by individually targeting the Polish economy using a matching technique, Hagemejer and Tyrowicz (2012) found evidence of a cherry picking trend in the case of export-intensity. Furthermore, again against the prevailing literature, they found both partial and total foreign ownership effects to reveal immediately and to remain stable henceforth. In a glimpse, direct export-increasing FDI effects are confirmed, but they are usually overstated due to endogeneity-related issues.

The dynamics of Estonian exports were analysed by Masso and Vahter (2012), focusing on export product churning, i.e. the redefinition of exports from old products to

new, different ones. They find that, on average, previous exporters providing the old product are always more numerous than new exporters or previous exporters providing new products, excepting a temporary peak in the latter two in conjunction with EU accession. At the same time, firms engaging in trade with a static export mix do not appear to have an impact on economic growth, and productivity reaches higher levels in case of a more dynamic firm that redefines its export portfolio over time. They deem a variety up to 15 products as a threshold for higher productivity, thus suggesting a core product specialization at the firm level. Masso and Vahter (2011) previously assessed the impact of multi-product and multi-national simultaneous market entry against the hypothesis of sequencing. Undoubtedly the multi-dimensionality of entry imply higher sunk costs to be tackled by the new exporter, but the results demonstrate how it includes a relatively higher productivity, thus shedding light on the phenomenon of learning-by-exporting. Masso et al. (2014) investigate the importance of human capital in explaining export performance, particularly by hiring managers and high-wage employees. They find an export premium in wages when hiring specialists of a foreign market. However, a raise in exports is appreciated only when exporting to what they define as distant foreign markets, i.e. neither EU nor CIS area. Exports to these markets are fostered by region-specific knowledge rather than previous exporting experience in other markets. Hiring workers with previous experience in specific areas still proves significant in incurring the sunk costs of exporting.

This sub-chapter ends the literary review. Here I have analysed what role FDI had in the Estonian economic transition, emphasising its benefits and considering its potential negative impacts. After providing information on the relocation of Estonian trade and exports, I have tried to connect the Estonian case to the FDI and growth literature. I stressed the relevance of low labour costs as a FDI determinant, and its potential social downfalls; and then highlighted innovation as a key-driver of the good economic performance. In conclusion, I mentioned the available studies on the Estonian export performance and FDI. None directly shared the aim of the present thesis, indirectly reaffirming the relevance of the topic this dissertation tackles.

3. ECONOMIC MODEL

3.1. Preliminaries

In the exercise of assessing the relevance of FDI spill-overs on domestic firms' export performance, usually two dimensions of interest are found. The first one is whether the firm decides to export or not, and is called then export-propensity; the subsequent one is then how much a firm opts to export, i.e. export-intensity. As such, the two decisions are deemed to be different yet interdependent, and to take place in different time-spans (Kneller and Pisu, 2007). Early researches, such as Aitken et al. (1997) and Kokko et al. (2001), focused only on the decision to export, whereas later studies opted to include both by following a two-stage or maximum likelihood sample selection model as proposed by Heckman (1979). The latter is usually favoured due to a higher efficiency of the estimation. It is described by the following equations.

$$d_{it}^{*} = \beta x_{it} + u_{it}, \tag{1}$$

and consequently,

$$d_{it} = 1 \text{ if } d_{it}^{*} > 0$$
$$d_{it} = 0 \text{ if } d_{it}^{*} \leq 0;$$

$$y_{it}^{*} = \gamma z_{it} + v_{it}, \tag{2}$$

recalling that

$$y_{it} = y_{it}^{*} \text{ if } d_{it} = 1$$
$$y_{it} = 0 \text{ if } d_{it} = 0.$$

Equation (1) describes a Probit model, with a latent dependent variable d_{it}^{*}. It measures the probability that local firms decides to export. When the probability is higher than 0, the variable takes the value of 1, and stays 0 otherwise. As such it creates a dichotomous variable that takes the value of 1 when firm *i* is exporting at time *t*, and 0 otherwise. In early studies, it was the only equation of interest; in later studies, it acquired the purpose to act as a sample selection for a heterogeneous pool of firms, both exporters and non-exporters, thus limiting the analysis to those firms that, according to the model, are exporting. Equation (2) displays as the dependent variable a numerical value of exports, which can take various forms, including but not limited to: shares; volumes; various quotients (e.g., exports divided by total turnover or sales); insofar as the firm is not exporting, the value of *y* will be zero. y_{it}^{*} is a further latent variable that assumes the value of 0 when the latent variable d_{it}^{*} is 0, as firms that decide not to engage in export according to the probit are thus excluded from the model. When the value is a share (i.e., ranging from 0 to 1), it can be deemed as a Tobit II type model. As such, it tackles a problem that only exporters are facing, i.e. the intensity of their export engagement. By adopting the two-stage procedure, selectivity bias by choosing only exporting companies in the analysis are avoided (Greenaway et al., 2004). The distribution of the error terms (u_{it} and v_{it}) is considered to be bivariate normal, with correlation ρ. When the latter is different from zero, the two equations are confirmed to be related and necessary. The vectors of covariates β and γ could potentially be the same (e.g., as in Anwar and Nguyen, 2011), implying that the two decisions are driven by the same variables. As Kneller and Pisu (2007) underline, if that is the case, the model is reduced to a single Tobit when ρ = 1, and the two decisions would reduce to one, affecting in the same way both exporters and non-exporters. To avoid this identification problem, minor differences between the covariates can be considered; examples of various added to β may include a lagged dummy for the decision to export, which is the most used (as in, e.g., Karpaty and Kneller, 2011); but also a proxy for the profitability of the firm (as in Franco and Sasidharan, 2010). Both variables found their rationale in the need to account for the sunk costs of exporting, which either have already been faced by previous exporters or are better handled by higher profitable firms.

The main drawback associated to the Heckman selection model is recalled by Karpaty and Kneller (2011): it does not take into consideration unobserved firm level characteristics, as a panel fixed effect model for instance would.

The present thesis aims at model the two export decisions of domestically owned firms in Estonia. The interest of the research might call for some further econometric assessments, as especially in latest years such an economy proved to be heavily relying on exports. For instance, World Bank indicators display how in 2012 exports in goods accounted for almost 90% of GDP. As such, it might be an opportunity worth considering to implement a model only for equation (2), i.e. assessing only export-intensity. The rationale to considering propensity almost as taken might be offered by the characteristics of the market; the context would drive firms somehow forcedly to export in order to increase their profitability and revenues, and as such could not be seen as a sample selection bias put into place by the researcher.

A model to tackle this hypothesis should first consider firm-level panel data fixed effects analysis, which however displays obvious limits, such as the impossibility to disclose causality, as well as endogeneity or simultaneity bias; to address these issues, a dynamic panel analysis such as the Generic Method of Moments (GMM), using lagged values of FDI as an instrument, can be considered as a panacea to the drawbacks of static panel data analysis. The possible scope for usage of such a technique will be better addressed in the next sub-chapters.

3.2. Data and Variables Description

The database used in the present thesis comes from the Estonian Commercial Register (*Äriregister*) and covers a time-span ranging from 1999 to 2009, for a rough total of 524771 observations on all industries. The database comprises the whole population of Estonian firms. It offers information on various firm-level variables linked to employment, costs, productivity, exports, ownership and sector engagement consistently both across firms and time. The database allows for sectorial distinction at the EMTAK-

2 digit level, which is the Estonian national version of the international harmonised NACE classification. Due to the nature of the analysis, i.e. exports, only manufacturing industries will be taken into account, thus industries whose codes are ranging from 15 to 37. Code number 16, i.e. Tobacco products, is immediately dropped due to the fact that the data only captures how cigarettes stopped being produced in Estonia in 1996 (World Health Organization, 2011).

The main variables of interest are the three proxies for FDI spill-overs from foreign firms to domestic firms; one at the intra-industry level, one for backward linkages and one for forward linkages.

$$HS_{jt} = \frac{Y_{jt}^{F}}{Y_{jt}} \tag{3}$$

Equation (3) is the proxy used for horizontal spill-overs, which aims at seizing the potential effects of foreign firms' presence in each industrial sector. The dividend is the total turnover only of foreign firms producing in Estonia in sector *j* at time *t*, whereas the divisor is the same variable but including also domestic firms with time- and sector-level consistency. Horizontal spill-over is their quotient, and thus represents the proportion of production by foreign firms in a certain sector and in a certain year. Real values of turnover are used to account for inflation. An increase in the variable along time in the same industry implies that foreign production is expanding the national output faster than domestic firms. It is a reasonably standard proxy, as it has already been adopted among others by Girma et al. (2008) in a productivity study, and Kneller and Pisu (2007) in an export-related research. As in the latter, it could be expanded to include a regional dimension in the proxy, but due to the scope of the research and the geographical dimensions of the Estonian market, such decision has been rejected. Some authors (e.g., Nguyen et al., 2008) also use the ratio of employment in foreign firms to better assess the impact of labour mobility, but the present thesis decides not to. In order to conduct a similar analysis, arguably the dataset would need to offer some closer detail (i.e., managers rather than general workers), as similarly done by Masso et al. (2014).

To account for backward and forward linkages, the available dataset needed to be integrated with the Input-Output (I-O) tables provided by Statistics Estonia, i.e. the

national statistics office, on their website. The I-O table provides a value of the output each industry yearly endows other industries with as inputs. The sector classification it uses is the EMTAK-2 digit level, thus allowing for a smooth integration with the database. It needs to be acknowledged that this is a first cause of limitation, as it does not allow for a further differentiation that might better capture the integration between domestic and foreign-owned firms. For instance, milk and dairy producers might follow a different spill-over pattern from other food industries; however, failing to differentiate between the two as is the case here might result in an overall insignificant sectorial value, which accordingly would not capture the economic reality. The selected I-O table is tagged by the code NAT005, as it is the one accounting for domestic output only[5]. The exclusion of imported inputs is pivotal as those do not relate to the domestic sector; only intermediate products fabricated in Estonia and used in other production processes in Estonia should be used to explore the linkages between domestic Estonian firms and foreign MNEs Estonian-based (Kneller and Pisu, 2007).

$$BL_{kt} = \sum_{\forall k \neq j} \alpha_{kjt} \, HS_{jt} \tag{4}$$

and

$$\alpha_{kjt} = \frac{Y_{kjt}}{Y_{kt}} \tag{5}$$

Equation (4) is the proxy adopted for backward linkages. Equation (5) describes how the ratio α is constructed; it is the quotient obtained by dividing the output of industry *k* provided to industry *j* by the overall inputs provided by industry *k* to other industries. Supplies from industry *k* to the same industry are excluded to avoid double-counting issues, as they are already captured by the proxy for horizontal spill-overs (Lenaerts and Merlevede, 2011). As a result, the sum of all ratios is 1. The backward index is higher when the proportion of supplied output is greater, as proxied by α, and/or the foreign firms' activity in the sector receiving intermediate goods from industry *k* is higher, as

[5] Coefficients in the I-O table are expressed in euros while the successively defined variables are in Estonian kroons; for this reason, they are transformed into the Estonian currency, multiplying them by the fixed exchange rate of 15.6466, in order to avoid econometric inconsistency.

represented by the horizontal spill-over proxy. The variable is constructed following most of the existing literature in the field, e.g. Smarzynska Javorcik (2004).

$$FL_{jt} = \sum_{\forall h \neq j} \beta_{hjt} \, HS_{ht} \tag{6}$$

and

$$\beta_{hjt} = \frac{Y_{hjt}}{Y_{jt}} \tag{7}$$

The fashion in which forward linkages are constructed is similar. Equation (6) is the formula to derive forward linkages, and equation (7) displays how the ratio β is computed. The latter is obtained as a ratio between all the inputs used by sector *j* that are supplied by sector *h* and the total inputs used by sector *j*. Again, double-counting is excluded. A larger proportion of output provided by an industry where foreign MNEs are present and/or a higher proportion of the output of supplying industries manufactured by foreign firms should then result in a higher value of the proxy. Examples of usage of such proxy are plentiful in the existing literature (e.g., Anwar and Nguyen, 2011; Kneller and Pisu, 2007).

A further caveat that needs to be acknowledged is that the NAT005 I-O table only covers two years, 2000 and 2005. Smarzynska Javorcik (2004) mentions how multiple matrices would be ideal in this type of analysis as relationships between sectors might change over time, but also relaxes this statement as radical changes are deemed as unlikely. Therefore, the values present in the I-O table are expected to be relatively stable over the assessed time-span. As such, the matrix for 2000 is used on the years ranging from 1999 to 2004, whereas the values for 2005 are used for the variables from 2005 onwards. The horizontal spill-over values by which the matrix is multiplied are, instead, actually time-specific as previously defined, thus leaving the possibility to obtain numerically different vertical linkages for each year. The procedure is consistent with most previous researches in the field, as I-O tables are more likely not to be provided yearly.

The equations that construct the model are then defined as follows:

$$EP_{ijt} = f(HS_{jt}, BL_{jt}, FL_{jt}, Age_{it}, Size_{it}, Capital_{it}, Wage_{it}, Liquidity_{it}, ED_{it}, u_{ijt}) \quad (8)$$

$$EI_{ijt} = f(HS_{jt}, BL_{jt}, FL_{jt}, Age_{it}, Size_{it}, Capital_{it}, Wage_{it}, Liquidity_{it}, v_{ijt}) \quad (9)$$

Equation (8) aims at capturing the export-propensity (EP_{ijt}) of firm *i* in industry *j* at time *t*, whereas equation (9) analyses the export-intensity (EI_{ijt}) in the same dimension. The dependent variable in (8) is a binary dummy variable that takes the value of 1 if the firm is exporting and 0 if it is not; the observations over which (9) is regressed are then only exporters according to equation (8) that selects the sample group. The export-intensity equation presents as the main dependent variable export share, which is computed as the ratio between export volume and the turnover of each firm. Shares higher than 1 are dropped from the computation as it seems unrealistic to witness that firms are exporting more than what they sell, and those values are imputed to poor data reporting. In a specification for robustness checks, the dependent variable in (9) is export value deflated, to analyse the impact on the volume of exports. This is also done in order to assess differences between how much firms export (export value) and how much of the production is allocated to exports (export share). Previously described spill-over proxies are then all included and have a sector- and time-dependence.

Other variables included are assessing firm-specific characteristics, mainly for control. Age_{it} is easily defined as the database offers as a variable the year in which the firm was registered, and as such is constructed by a simple subtraction and then logged. The possibility of a non-linear behaviour is assessed, consistent with previous findings by Barrios et al. (2003). The same is accounted for in the case of $Size_{it}$, which is defined as the natural logarithm of the number of employees. The expecting signs for these two variables might not be straightforward. Bernard and Jansen (1999) observe how older and bigger firms are inclined to be better performers, and as such exporters, than younger and smaller firms; the theory of learning-by-doing (Arrow, 1962) further supports this idea, affirming that the best way for firms to gain knowledge is achieved by experience. In

developing countries however the results might differ, as the results by Sun (2010) and Kokko et al. (2001) offer evidence for a more important role played out by flexibility. As previously stated, it is the author's belief that Estonia's economic performance is, at least partly, been driven by flexibility (also in labour, as in Haltiwanger and Vodopivec, 2002), and as such a negative sign would eventually be more fitting, particularly considering the time-span of analysis.

$Capital_{it}$ is measured as capital stock per worker, and as such is a ratio; the log of the variable is used in order to smooth its distribution. An increase in it should induce the firm to export as well as increase its export share, as more capital per worker is at hand when the productivity of labour increases (Anwar and Nguyen, 2011). In accordance with the findings by Greenaway and Kneller (2004), more productive firms should engage more in exports. As such, the expected sign of this variable is positive.

$Wage_{it}$ is an average generated by two variables present in the dataset, i.e. total employee costs divided by the number of employees. Similarly to $Capital_{it}$, the logged value of the variable is used in the model. Average wage is often considered as a gauge of absorptive capacity, or skill intensity (Bleaney and Wakelin, 2002; Damijan et al., 2013b). The relevance of absorptive capacity in determining FDI effects was already inferred by De Mello (1999). Human capital bears a substantial role in affecting wage rates (Willis, 1999); skilled workers are usually endowed with a higher wage, especially in technology-intensive sectors. In developing markets, this usually results in a boost in demand for skilled workers, especially if the firm is exporting, or part of a GVC (e.g., assessing China and Brazil, Fajnzylber and Fernandes, 2004). The impossibility to differentiate between skilled and unskilled workers at the single firm-level is a further caveat to the dataset. Nevertheless, the underlying assumption that an increase in the overall average wage can be seen as an increase in skilled human capital, and therefore a higher scope for absorptive capacity, seems reasonably holding. Human capital is thus a second channel by which productivity can be increased.

Non-linearity is again tested for in both $Capital_{it}$ and $Wage_{it}$, as consistent with the existing literature (e.g., Kneller and Pisu, 2007).

$Liquidity_{it}$ is the cash-asset ratio for each firm. It is defined as the current value of liquid assets, i.e. cash and marketable securities, divided by the current firm's liabilities.

It captures how much liquidity the firm has at its disposal, or in other words it proxies its ability to face short-term obligations. The higher the ratio, the more economically stable the firm is, being able to account for liabilities even in period of contraction. It also serves as a proxy for financial constraints of firms, which have previously been found as highly detrimental for the investment of Estonian firms (Mickiewicz et al., 2004) and as such might also impede firms to face the sunk costs of exporting. Its expected value should therefore be positive. Again, due to poor data reporting, some observations are unrealistically high and therefore excluded from the computation.

ED_{it} is a lagged dummy variable used only in the selection equation in order to avoid identification issues. It takes the value of 1 when the firm is exporting, and 0 otherwise. The rationale has been previously outlined, as previous exporters are more likely to continue exporting; it is expected to affect only export decision, and not intensity, as the fixed export cost has already been tackled. Sun (2010) offers an example on how this decision is consistent with the existing literature.

Equations (8) and (9) display the variables of interest and the error terms (u_{ijt} and v_{ijt}), but the model accounts also for sectorial, year and geographical dummies, rounding up to an overall amount of 33 further variables, in order to account for unobservables and for a better model specification. Another aspect which would be worth to account for is the firm's investment in R&D, or at least R&D expenditure at the sectorial level (e.g., as done by Franco and Sasidharan, 2010), but unluckily the dataset is not able to provide a suitable proxy; the limitation is here acknowledged, as a related proxy could not only better capture dynamics such as the imitation effect or reverse engineering, but would assess the possible relevance of innovation in the Estonian export performance. There might have been further proxies for taxation and/or infrastructural endowment, but due to the scope of the thesis, it seems more reasonable to exclude them. Productivity is not included either, so as to analyse a net effect of spill-overs on exports: including it would require the model to tackle the impact of spill-overs on productivity first. The scope of the dissertation is however focused on export-related spill-overs.

Export share, capital and wage are transformed into their real value by using a value-added deflator and therefore account for inflation. All these variables are expressed in Estonian kroons.

A screening of the data is deemed as necessary. Bearing in mind the time-span considered, only firms that stayed in the Estonian market for at least 5 years consecutively are used for the estimations. This is mainly done in order to account for intermittent firms, whose behaviour probably reflects specific temporary needs rather than a stable trend from companies, which is what this dissertation is focusing on. Furthermore, the present thesis aims at capturing primarily the impact of the variables on domestic firms; for this reason, foreign-owned companies are excluded from the main computations. Foreign firms are excluded only after screening for the availability of consecutive consistent data. This implies that the dataset might include firms that, along the time-span considered, have later been acquired by foreign companies, and only the data after the foreign acquisition is then excluded. It seems a reasonable assumption, as the firm was domestic for a relatively long period of time and their performance should have not been influenced by the later-to-come foreign acquisition.

3.3. General Statistics and Pre-estimation Analysis

	Status	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
FO	Exp	298	351	394	420	436	403	386	368	357	308	310	4031
	Non	52	53	51	57	69	89	144	146	142	130	119	1052
	Total	350	404	445	477	505	492	530	514	499	438	429	5083
DO	Exp	1089	1255	1386	1519	1643	1331	1056	947	899	817	815	12757
	Non	1276	1500	1693	1900	2095	2528	3155	3084	3093	2915	2678	25917
	Total	2365	2755	3079	3419	3738	3859	4211	4031	3992	3732	3493	38674
Both	Exp	1387	1606	1780	1939	2079	1734	1442	1315	1256	1125	1125	16788
	Non	1328	1553	1744	1957	2164	2617	3299	3230	3235	3045	2797	26969
	Total	2715	3159	3524	3896	4243	4351	4741	4545	4491	4170	3922	43757

Table 1. Number of Firms by Ownership Status, 1999–2009.

Author's elaboration.

Notes: FO: Foreign-owned; DO: Domestic-owned; Exp: Exporters; Non: Non-Exporters.

EMTAK-2 Code	Industrial Classification	Domestic	Foreign	All	Foreign, %
15	Food Products and Beverages	401	28	429	6,53%
17	Textiles	163	36	199	18,09%
18	Wearing Apparel; Furs	373	49	422	11,61%
19	Leather and Leather Products	57	13	70	18,57%
20	Wood and Products of Wood	914	67	981	6,83%
21	Pulp, Paper and Paper Products	48	13	61	21,31%
22	Printed Matter and Recorded Media	474	32	506	6,32%
24	Chemicals and Chemical Products	91	15	106	14,15%
25	Rubber and Plastic Products	142	45	187	24,06%
26	Other Non-metallic Mineral Products	173	29	202	14,36%
28	Fabricated Metal Products	711	67	778	8,61%
29	Machinery and Equipment	208	46	254	18,11%
31	Electrical Machinery and Apparatus	76	21	97	21,65%
32	Radio, TV and Communication Equipment	61	35	96	36,46%
33	Medical and Optical Instruments	124	15	139	10,79%
35	Other Transport Equipment	101	12	113	10,62%
36	Furniture, Other Manufactured Goods	467	55	522	10,54%
Total		4584	578	5163	11,19%

Table 2. Firms per Sector, 1999–2009.

Author's elaboration.

Tables 1 and 2 refer to the dataset after applying the aforementioned screening of at least 5 years of observations. Table 1 displays the total number of firms per year, and is then a flow; the same firm might then be counted every year. It divides the yearly observations into two main categories, foreign- and domestic-owned, and thus subdividing into exporters, non-exporters, and the total. It is clearly noticeable how the former group is relatively small as compared to the latter, as foreign-owned companies are roughly 11% of the overall number of firms observed in the database. The inverted U-shape in distribution of the number of firms observed per year can find an explanation in the screening, which after 2005 does not allow for newly founded firms to appear due to its requirements. As expected, foreign-owned firms are more likely to be exporters than domestic-owned firms; it is quite staggering to notice in the latter group how large the

gap between exporters and non-exporters grew as time went by, from 200 in 1999 to more than 2000 a decade later. This seems to be in accordance with Masso and Vahter (2008), as from 2002 on firms operating in Estonia had more and more devoted themselves to catering for local demand rather than looking for foreign markets by engaging in exports. The number of non-exporters in the dataset leaves out the previously mentioned possibility to account for the dimension of export-intensity only, as the decision to export appears to bear a clear relevance in the analysis. This possibility still might be explored with data covering later years, as firms operating after this period should have found a rather served internal demand and therefore more and more decided to undertake exports in order to achieve higher profits. As this does not appear to be the case here, the Heckman selection model is confirmed as the potential best suited model to analyse the dataset and the related dynamics of this firm-level decision. Unfortunately, endogeneity and the phenomenon of cherry picking are not fully tailored by this method, and as such results must be interpreted with stronger caution.

Table 2 divides the total number of firms in the dataset by ownership and according to the sector the firm is operating in, as from the first year in which firms start to operate. A first inspection of the dataset leads to a further needed screening. Indeed, apart from the already stated exclusion of tobacco, other sectors are forced to be dropped due to a poor number of available observations and firms. Those are specifically number 23, 27, 30 and 34. They related respectively to coke and refined petroleum products; basic metals; office machinery and computers; and motor vehicles. The firms uniquely assessed are then 5163, of which 578 are initially foreign owned. The number of foreign-owned firms assessing the last observation, rather than the first, is however 732; if a firm has been domestic for at least 5 years, it is going to be included in the later regressions as FDI spill-overs might have influenced its performance. At the same time, its years as a foreign-owned company will be used to construct the proxies for both linkages. The underlying assumption is that the change in ownership brings new knowledge to the firm, which is able in turn to offer new knowledge, technological and managerial spill-overs immediately to the sector as a whole. It is quite a strong inference, but a rationale is offered. In case the previously domestic firm was simply acquisitioned, and as such was object of a cherry picking investment, it can imply that challengers start to actively seek spill-overs from such firm because of its success in the market. Even if there is no real

knowledge improvement directly caused by FDI, the latter indirectly certifies the higher productivity of the domestic firm, and arguably can be regarded to as one of FDI's indirect effects. In the case of an active sharing of any know-how, other firms in the market can be object of spill-overs through the previously mentioned channels. Nevertheless, it is acknowledged here that, conversely, the possibility of timing issues might turn out to be true: in this context, spill-overs would arise only after a certain period of time and not immediately after the acquisition, and therefore the choice of immediately integrating spill-over data from firms that just changed their ownership status might lead to an insignificant spill-over coefficient. The proxies for spill-overs are here computed and analysed.

EMTAK-2 and Industrial Classification			ES, DO	ES, FO	Hor	Back	For
15	Food Products and Beverages						
		Mean	0.333	0.316	0.316	0.488	0.452
		Sd	0.319	0.299	0.043	0.047	0.023
17	Textiles						
		Mean	0.411	0.740	0.618	0.298	0.331
		Sd	0.333	0.280	0.148	0.037	0.022
18	Wearing Apparel; Furs						
		Mean	0.398	0.591	0.279	0.409	0.510
		Sd	0.316	0.338	0.039	0.050	0.095
19	Leather and Leather products						
		Mean	0.451	0.578	0.281	0.352	0.494
		Sd	0.340	0.359	0.050	0.059	0.063
20	Wood and Products of Wood						
		Mean	0.453	0.718	0.307	0.350	0.460
		Sd	0.320	0.256	0.067	0.058	0.045
21	Pulp, Paper and Paper Products						
		Mean	0.121	0.476	0.787	0.342	0.437
		Sd	0.187	0.349	0.083	0.021	0.036
22	Printed Matter and Recorded Media						
		Mean	0.148	0.205	0.135	0.413	0.524
		Sd	0.195	0.270	0.027	0.043	0.064
24	Chemicals and Chemical Products						
		Mean	0.376	0.531	0.695	0.403	0.363
		Sd	0.287	0.319	0.059	0.037	0.073
25	Rubber and Plastic Products						
		Mean	0.362	0.625	0.352	0.355	0.505
		Sd	0.326	0.300	0.067	0.022	0.092
26	Other Non-metallic Mineral Products						
		Mean	0.221	0.423	0.604	0.320	0.432
		Sd	0.245	0.329	0.046	0.039	0.073
28	Fabricated Metal Products						
		Mean	0.320	0.562	0.341	0.395	0.524
		Sd	0.286	0.333	0.110	0.063	0.038
29	Machinery and Equipment						
		Mean	0.430	0.684	0.400	0.465	0.445
		Sd	0.303	0.321	0.030	0.073	0.064
31	Electrical Machinery and Apparatus						
		Mean	0.490	0.578	0.660	0.514	0.384
		Sd	0.366	0.312	0.082	0.084	0.065
32	Radio, TV and Communication Equipment						
		Mean	0.424	0.656	0.856	0.392	0.322
		Sd	0.331	0.305	0.039	0.034	0.297
33	Medical and Optical Instruments						
		Mean	0.281	0.690	0.558	0.373	0.507
		Sd	0.287	0.330	0.043	0.023	0.026
35	Other Transport Equipment						
		Mean	0.291	0.411	0.196	0.373	0.263
		Sd	0.347	0.406	0.086	0.042	0.126
36	Furniture, Other Manufactured Goods						
		Mean	0.443	0.726	0.348	0.303	0.372
		Sd	0.333	0.284	0.061	0.039	0.031

Table 3. Exports by Ownership and Sector, FDI Spill-overs, 1999–2009.
Author's elaboration.
Notes: ES, DO: Export Share, Domestic-Owned companies; ES, FO: Export Share, Foreign-Owned companies; Hor: Horizontal Spill-overs; Back: Backward Linkages; For: Forward Linkages.

Table 3 offers an overview on the means and the standard deviations of export share by ownership, and then adds the same statistic for the spill-over proxies over time. It is easy to notice how foreign firms engage with a higher intensity in exporting, as only sector 15 (food products and beverages) displays a higher percentage of exports from Estonian firms. The sector with less exports by domestic firms is paper products, whereas on average almost half of the total turnover from electrical machinery and apparatus goes into exports. Foreign-owned firms appear to be far more export-oriented, as only five sectors display less than half of their turnover as sold to foreign markets.

For what pertains to horizontal spill-overs, textiles appear as the more unstable sector; the highest value is recorded in the radio, television and communication equipment sector, and the lowest in the printed matter and recorded media. The results are consistent with Table 2, as the percentage of foreign firms is the highest in the former sector, and the lowest in the latter. Other sectors where horizontal spill-overs are particularly strong are pulp, paper and paper products; chemicals and chemical products; and electrical machinery and apparatus. The generally low standard deviations might be explained by both the low observations (as spill-overs are computed yearly and have a sectorial dimensions, 11 different coefficients are found) and a certain stability of the established relationships.

Backward linkages appear as highest in electrical machinery and apparatus, and lowest in textiles; they seem to display quite little standard deviation values on average, as hinted at by their construction design. Forward linkages are highest in fabricated metal products; and printed matter and recorded media. They display their lowest value in sector number 35, other transport equipment. Again, standard deviations appear to be relatively low.

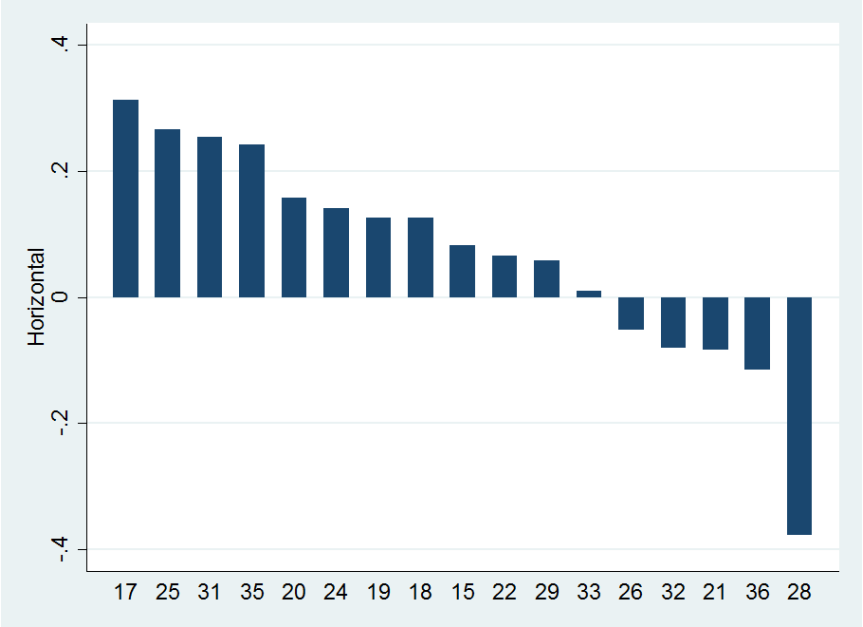

Figure 3. Horizontal Spill-overs Sorted by Sector, 1999–2009.

Author's elaboration.

Figure 3 assesses the evolutionary trends of horizontal spill-overs over time ordered by sector, from the highest to the lowest value, computed as a difference between the first and the last year considered in the analysis. The graph confirms the high volatility associated to textiles and fabricated metal products, respectively the best and the least performing in gaining higher levels of horizontal spill-overs. The majority of the sectors considered are distinguished by an increasing trend, and the magnitude of the positive impact appears as numerically higher and more substantial than the negative impact. As a result, it is possible to state that the average value of horizontal spill-overs grew over time. Quite surprisingly, some sectors that are endowed with a higher percentage of foreign firms as described by Table 2, are displaying negative trends; this is the case of industries as, for instance, radio, television and communication equipment and pulp, paper and paper products.

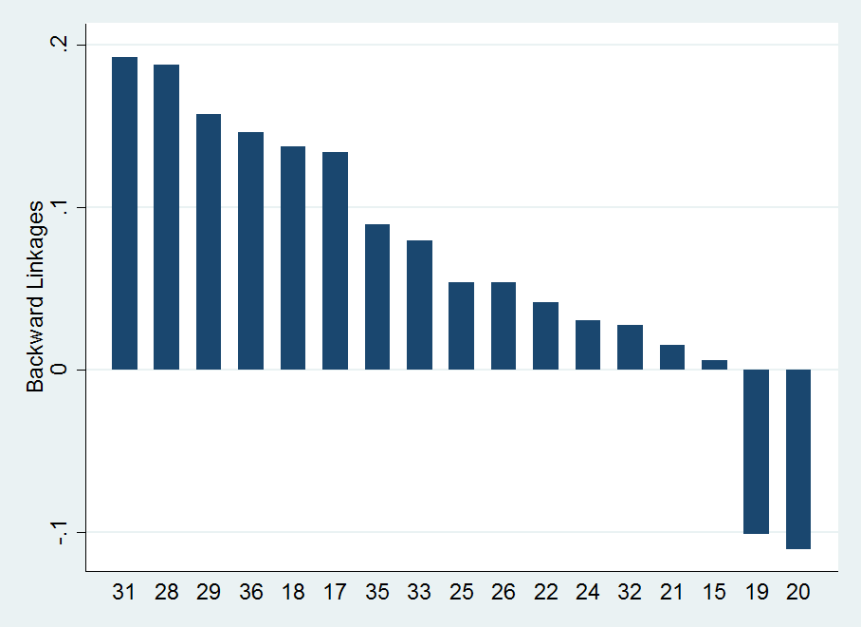

Figure 4. Backward Linkages Sorted by Sector, 1999–2009.

Author's elaboration.

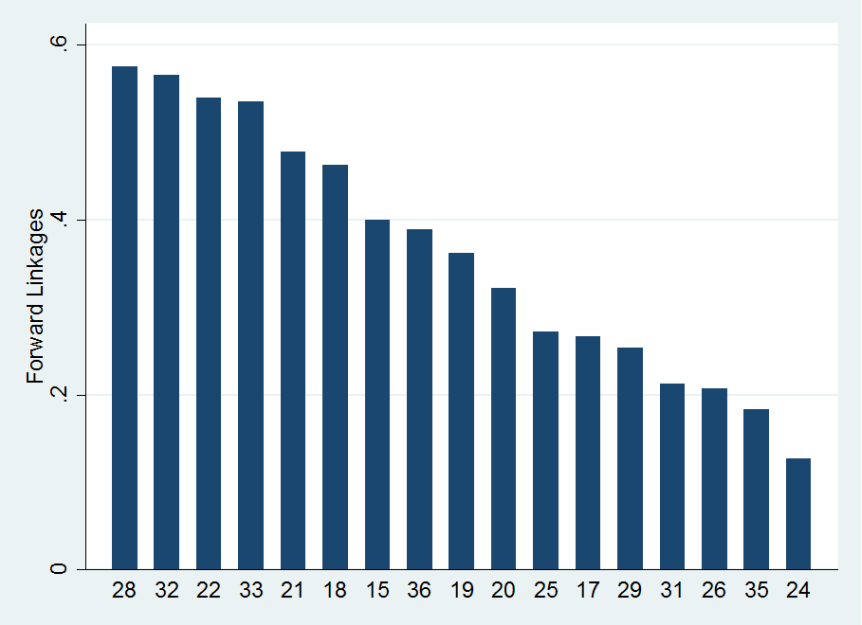

Figure 5. Forward Linkages Sorted by Sector, 1999–2009.

Author's elaboration.

Vertical spill-overs show a different behaviour over time, as shown by figures 4 and 5. Backward linkages display only two deteriorating levels in 2009 as compared to

1999, namely leather and leather products (19), and wood and products of wood (20). Forward linkages, on the contrary, never display negative values; they all display increasing interconnections between local and foreign-owned firms. Sector 28 (metal and metal products) increased substantially in both, which can appear as quite puzzling considering it was also the worst performer over time in horizontal spill-overs. This might imply that firms operating in this field decided to enter foreign GVCs rather than becoming their competitors. Electrical machinery and apparatus increased the most over time in backward linkages, whereas chemicals and chemical products was the worst performer in forward linkages.

	Export	Age	Size	Capital	Wage	Liquidity	Hor	For	Back
Export	1.000								
Age	0.004	1.000							
Size	0.150	0.223	1.000						
Capital	0.105	0.219	0.736	1.000					
Wage	0.073	0.246	0.337	0.424	1.000				
Liquidity	-0.006	0.001	-0.009	-0.013	-0.023	1.000			
Hor	0.042	0.043	0.025	0.042	0.073	-0.010	1.000		
For	-0.040	0.075	0.035	0.045	0.070	0.005	-0.172	1.000	
Back	-0.087	0.012	-0.029	-0.043	0.035	0.006	-0.333	0.290	1.000

Table 4. Correlation Coefficients for Fully Screened Data.

Author's elaboration.

Notes: Hor: Horizontal Spill-overs; For: Forward Linkages; Back: Backward Linkages.

Table 4 displays the correlation coefficients for the 9 main variables used in the model specifications, as after screening to exclude foreign companies. The value that is cause of higher concern is between capital stock per worker and size. The two variables seems furthermore to correlate at concerning levels also with wage. The low correlation between exporters and age might lead us to think the relation might actually be non-linear, but this will need further confirmation later. Spill-over proxies appear to be relatively uncorrelated with the control variables, but slightly between themselves, possibly also due to the way in which they are constructed. Liquidity seems overall to be mostly uncorrelated with the other variables. On the other hand, size appears as a possible cause

of multicollinearity. Reminding that the latter does not cause biased coefficients, but merely unstable and highly contingent to the dataset and the model specifications, causing also an enlargement of the standard errors, nevertheless it is still acknowledged it severely limits the conclusions and results of a model. The inclusion of squared and later interaction terms to check for non-linearities and analyse possible indirect effects of spill-overs is likely to worsen the situation, but choosing the Heckman maximum-likelihood rather than the two-step selection model seems already a feasible way to tackle the issue; especially while already accounting for the identification problem by adding a lagged dummy for exports in the selection equation (Nawata and Nagase, 1996).

Last, table 5 offers general summary statistics for the variables employed in the model.

	Mean	Sd	Min	Max
Export Share	0.360	0.314	0.000	1.000
Age	2.011	0.652	0.000	2.996
Size	2.036	1.350	-0.693	12.801
Horizontal	0.356	0.166	0.004	0.906
Forward	0.458	0.091	0.000	0.632
Backward	0.383	0.076	0.186	0.602
Liquidity	0.484	0.396	-3.484	4.988
Capital	12.584	2.275	0.842	23.449
Wage	10.958	0.801	-0.287	15.543
Export Dummy	0.293	0.455	0.000	1.000
Export Value	14.257	2.402	3.794	20.607

Table 5. Summary Statistics for Fully Screened Data.

Author's elaboration.

3.4. Model Estimation

The seven attempted model estimations are displayed in the next pages. The first part of the regression table is devoted to the selection export decision model, whereas the second one assesses the export-intensity dimension.

Export-Propensity	(1) Base Model	(2) Capital*Hor	(3) Capital*Back	(4) Capital*For	(5) Wage*Hor	(6) Wage*Back	(7) Wage*For
Age	-0.488*** (0.143)	-0.488*** (0.143)	-0.484*** (0.143)	-0.487*** (0.143)	-0.487*** (0.143)	-0.483*** (0.143)	-0.488*** (0.143)
Age squared	0.091** (0.038)	0.091** (0.038)	0.090** (0.038)	0.090** (0.038)	0.091** (0.038)	0.089** (0.038)	0.091** (0.038)
Size	0.276*** (0.040)	0.276*** (0.040)	0.278*** (0.041)	0.277*** (0.040)	0.276*** (0.040)	0.273*** (0.041)	0.277*** (0.040)
Size squared	-0.009 (0.009)	-0.009 (0.009)	-0.009 (0.009)	-0.009 (0.009)	-0.009 (0.009)	-0.008 (0.009)	-0.009 (0.009)
Horizontal	-0.033 (0.187)	0.927* (0.550)	-0.033 (0.186)	-0.031 (0.187)	-0.056 (1.288)	-0.050 (0.187)	-0.035 (0.186)
Forward	0.102 (0.231)	0.093 (0.229)	0.110 (0.231)	-0.090 (0.972)	0.102 (0.231)	0.101 (0.231)	-1.152 (2.402)
Backward	-0.283 (0.273)	-0.265 (0.274)	-2.565** (1.255)	-0.282 (0.273)	-0.280 (0.277)	-2.892 (2.847)	-0.277 (0.274)
Liquidity	-0.081** (0.036)	-0.080** (0.036)	-0.082** (0.036)	-0.081** (0.036)	-0.080** (0.036)	-0.081** (0.036)	-0.081** (0.036)
Capital	-0.249*** (0.060)	-0.216*** (0.065)	-0.301*** (0.067)	-0.256*** (0.066)	-0.250*** (0.060)	-0.244*** (0.060)	-0.249*** (0.060)

Export-Propensity *(cont.)*	(1) Base Model	(2) Capital*Hor	(3) Capital*Back	(4) Capital*For	(5) Wage*Hor	(6) Wage*Back	(7) Wage*For
Capital squared	0.014***	0.014***	0.013***	0.014***	0.014***	0.014***	0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Wage	-0.077	-0.090	-0.074	-0.077	-0.078	-0.178	-0.119
	(0.187)	(0.187)	(0.189)	(0.188)	(0.190)	(0.216)	(0.193)
Wage squared	0.012	0.013	0.012	0.012	0.012	0.013	0.012
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Export lagged	2.057***	2.056***	2.058***	2.057***	2.057***	2.057***	2.057***
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
Capital*Hor		-0.074*					
		(0.040)					
Capital*Back			0.174*				
			(0.093)				
Capital*For				0.014			
				(0.074)			
Wage*Hor					0.002		
					(0.115)		
Wage*Back						0.235	
						(0.255)	
Wage*For							0.112
							(0.212)
Constant	-1.260	-1.604	-0.506	-1.175	-1.250	-0.237	-0.742
	(1.170)	(1.213)	(1.218)	(1.186)	(1.272)	(1.605)	(1.379)

Export-Intensity	(1) Base Model	(2) Capital*Hor	(3) Capital*Back	(4) Capital*For	(5) Wage*Hor	(6) Wage*Back	(7) Wage*For
Age	0.087 (0.056)	0.087 (0.056)	0.087 (0.056)	0.086 (0.056)	0.087 (0.056)	0.086 (0.056)	0.087 (0.056)
Age squared	-0.028* (0.016)	-0.028* (0.016)	-0.028* (0.016)	-0.028* (0.016)	-0.028* (0.016)	-0.028* (0.016)	-0.028* (0.016)
Size	-0.067*** (0.020)	-0.067*** (0.020)	-0.068*** (0.020)	-0.067*** (0.020)	-0.067*** (0.020)	-0.067*** (0.020)	-0.067*** (0.020)
Size squared	0.015*** (0.004)	0.015*** (0.004)	0.015*** (0.004)	0.015*** (0.004)	0.015*** (0.004)	0.015*** (0.004)	0.015*** (0.004)
Horizontal	0.025 (0.055)	-0.129 (0.217)	0.025 (0.055)	0.021 (0.055)	0.528 (0.459)	0.027 (0.054)	0.025 (0.054)
Forward	-0.096 (0.067)	-0.094 (0.067)	-0.096 (0.067)	0.230 (0.383)	-0.085 (0.067)	-0.096 (0.067)	0.097 (0.966)
Backward	0.269*** (0.095)	0.269*** (0.095)	0.208 (0.575)	0.268*** (0.095)	0.277*** (0.095)	0.665 (1.172)	0.268*** (0.095)
Liquidity	-0.012 (0.020)	-0.012 (0.020)	-0.013 (0.020)	-0.012 (0.020)	-0.012 (0.020)	-0.012 (0.020)	-0.012 (0.020)
Capital	-0.010 (0.033)	-0.015 (0.033)	-0.010 (0.036)	-0.000 (0.036)	-0.008 (0.033)	-0.010 (0.033)	-0.010 (0.033)

Export-Intensity *(cont.)*	(1) Base Model	(2) Capital*Hor	(3) Capital*Back	(4) Capital*For	(5) Wage*Hor	(6) Wage*Back	(7) Wage*For
Capital squared	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Wage	-0.139	-0.138	-0.138	-0.140	-0.127	-0.126	-0.133
	(0.127)	(0.127)	(0.127)	(0.126)	(0.130)	(0.131)	(0.129)
Wage squared	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Capital*Hor		0.011					
		(0.015)					
Capital*Back			0.004				
			(0.040)				
Capital*For				-0.024			
				(0.028)			
Wage*Hor					-0.045		
					(0.041)		
Wage*Back						-0.035	
						(0.105)	
Wage*For							-0.017
							(0.085)
Constant	1.615**	1.680**	1.624**	1.486**	1.435*	1.474*	1.539*
	(0.702)	(0.705)	(0.725)	(0.712)	(0.746)	(0.814)	(0.805)

Rho	-0.643***	-0.644***	-0.644***	-0.643***	-0.641***	-0.644***	-0.643***
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
Sigma	-1.190***	-1.189***	-1.189***	-1.190***	-1.190***	-1.189***	-1.190***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Obs.	21634	21634	21634	21634	21634	21634	21634
Censored Obs.	14637	14637	14637	14637	14637	14637	14637

Table 6. Export Share, Regression Table.

Author's estimation.

Notes:

Standard errors in parentheses clustered around firm id; ***: significant at 1%; **: significant at 5%; *: significant at 10%. Geographical, year and sectorial dummies are present but omitted from the regression table. Hor: Horizontal spill-overs, Back: Backward linkages, For: Forward linkages.

In the export-propensity table, the coefficients displayed are referred to a probit model. Average marginal effects of the significant independent variables (standard error in parentheses) in (1) are: Age squared, 0.014 (0.006); Liquidity, –0.012 (0.005); Capital squared, 0.002 (0.001); Export lagged, 0.310 (0.002). In (2): Capital*Hor, –0.011 (0.006). In (3), Capital*Back, 0.026 (0.013). Other effects are omitted due to non-linear behaviour of the variable.

Regression (1) assesses the previously defined equation system for selection, and acts therefore as a base model; from regression (2) to (7), interaction terms between the two elements that relate to productivity, i.e. wage and capital, and the three spill-over proxies. Due to collinearity issues, it was not possible to run a single model with all the interaction terms at once, as it would been highly unstable; the models as they are displayed sometimes still are unluckily affected by the issue. However, rho is highly significant in all specifications, thus underlining the suitability of the model and the need of a sample selection. In the export-propensity regression, most of the proxies for spill-overs enters the model significantly. The exceptions are horizontal in (2) and backward linkages in (3), but for both the collinearity stemming from the interaction term appears as decisive in the result. Two interaction terms are indeed significant, both capital-related. One is the interaction between capital and horizontal spill-overs, negative and significant at the 10% level, therefore reducing the propensity to export. A plausible explanation for this might be that firms do not actually have the necessary capital to benefit from horizontal spill-overs, but the heterogeneity of the dataset does not allow to find an overall negative significance of horizontal spill-overs in any of the model specifications. The other one relates capital to backward linkages, with a positive sign, therefore increasing the probability that firms decide to engage in exports. Integrated with the previous significance, this might lead us to suppose that certain capital requirements are a necessary condition for the local subsidiary to enter GVCs, and for this reason these firms are endowed with the necessary capital to profit from externalities. Forward linkages and thus buying inputs from foreign companies does not seem to matter for local firms in the decision to export. Among control variables, age, size, capital and wage all seem to act in a quadratic, rather than a linear, way. Age squared appears always positive and significant at the 5% level, thus showing that older firms are more likely to decide to engage in exports than younger firms. This somehow contradicts the hypothesis that flexibility is a key driver of exports, as size squared never enters the regression significantly, however displaying a negative sign. The hypothesis is thus not fully clearly rejected, but neither endorsed by the results insofar. Capital squared also appears to positively affect the decision to export, thus showing that capital-intensive firms are more likely to engage in exports. The liquidity ratio displays a stable negative impact, significant at the 5% level. This is contrary to the expected sign, but should be interpreted

as a sign that too much liquidity dampens investments, and therefore also the decision to export. The high significance of the lagged decision to export proves it is a key-variable in the decision to start exporting and how it suits in avoiding identification issues.

The previous variables appear to have a highly different impact on the export-intensity dimension. Backward linkages appear as the only spill-over proxy that leads firms to export more. Its significance appear relatively stable, at the 1% level, excepting regressions (3) and (6), where the interaction term deeply limits the interpretation of the coefficient. Its magnitude is quite important. A change in backward linkages from 0 to 1, i.e. a sector that fully decides to serve its products as inputs to MNEs, causes export share to increase by roughly 27%. No other spill-over proxy enters any specification significantly, and not even interactions between terms. The heterogeneity of the considered sample, again, might be paramount in this scarce significance. For what concerns control variables, age squared appears to have a negative impact on export share at the 10% level of significance, thus reversing its sign from the export dummy equation. This swift change, together with the positive and highly significant impact from size squared might lead to state that flexibility keeps on playing a substantial role. The underlying result of this joint analysis on age would point at a situation where the longer the firm has been active on the market, the more likely it will export, possibly due to a saturated local demand; but older firms are also likely to export less, because they might have lost the flexibility required to compete on international markets. Size appears as insignificant in the export-propensity equation, to gain a significance only in export-intensity. The variable follows the paradigm we observe for developed countries, i.e. bigger firms are able to produce more output and as such to export more. It appears therefore that the hypothesis of flexibility is only partly true in the Estonian market, where both younger and bigger firms are able to export more. A sound institution-building during the transition period, as confirmed by many indexes (e.g., EBRD, Economic Freedom, World Bank), can be considered as a rationale for this result, which would then contradict the results on flexibility by Sinani and Meyer (2004). Wage squared, capital squared, and liquidity never enter any model specification significantly. The rationale previously used to assess the insignificance of horizontal spill-overs might partly be used here, and as such the heterogeneity of the considered dataset needs to be acknowledged.

For this reason, it is considered as necessary to assess this issue by analysing differences employing different sub-datasets.

3.5. Checking for Heterogeneity

The sub-datasets have been divided according to a time first and to a sectorial dimension then. Below, models from (1) to (4) assess a time-specific difference in behaviour, using 2004 as the splitting year as it is the one in which Estonia entered the European Union. Specifications from (5) to (8) analyse differences between low- and high-tech industries. The distinction between the two is consistent with Anwar and Nguyen (2011): sectors from 15 to 23 included, with the addition of sector 36, are low-tech; the others are considered as medium- and high-tech. Last, models (9) and (10) include also foreign-owned firms, adding a dummy for ownership as a control.

	(1) E-P	(2) E-I	(3) E-P	(4) E-I	(5) E-P	(6) E-I	(7) E-P	(8) E-I	(9) E-P	(10) E-I
	1999-2003		2004-2009		Low-tech		High-tech		FO	
Age	-0.400*	0.020	-0.483**	0.198**	-0.674***	0.182***	-0.128	-0.105	-0.557***	0.093*
	(0.241)	(0.082)	(0.228)	(0.094)	(0.177)	(0.067)	(0.241)	(0.095)	(0.136)	(0.050)
Age sq.	0.073	-0.011	0.081	-0.053**	0.131***	-0.055***	0.010	0.024	0.110***	-0.033**
	(0.070)	(0.025)	(0.056)	(0.024)	(0.048)	(0.019)	(0.063)	(0.026)	(0.036)	(0.014)
Size	0.234***	-0.096***	0.314***	-0.026	0.317***	-0.074***	0.232***	-0.049	0.261***	-0.032*
	(0.058)	(0.024)	(0.055)	(0.028)	(0.055)	(0.025)	(0.062)	(0.036)	(0.039)	(0.019)
Size sq.	-0.013	0.021***	-0.007	0.008	-0.017	0.017***	0.000	0.011	-0.009	0.009***
	(0.013)	(0.004)	(0.011)	(0.005)	(0.012)	(0.005)	(0.013)	(0.007)	(0.008)	(0.003)
Horizontal	-0.057	-0.037	-0.015	0.073	-0.472	0.061	0.054	-0.019	0.022	0.017
	(0.307)	(0.067)	(0.297)	(0.085)	(0.307)	(0.078)	(0.307)	(0.100)	(0.177)	(0.048)
Forward	0.264	-0.064	0.072	-0.050	-0.498	0.139	0.247	-0.178**	0.123	-0.084
	(0.493)	(0.133)	(0.358)	(0.079)	(0.390)	(0.116)	(0.290)	(0.086)	(0.217)	(0.068)
Backward	0.820	-0.021	-1.761***	0.388**	-0.624	0.224	-0.598	0.268	-0.215	0.189**
	(0.714)	(0.163)	(0.670)	(0.170)	(0.534)	(0.147)	(0.655)	(0.230)	(0.256)	(0.086)
Liquidity	-0.089*	-0.010	-0.083	-0.024	-0.084*	-0.031	-0.069	0.027	-0.055	0.000
	(0.047)	(0.024)	(0.051)	(0.028)	(0.043)	(0.024)	(0.064)	(0.036)	(0.034)	(0.018)
Capital	-0.080	-0.061	-0.294***	0.052	-0.257***	0.006	-0.221**	-0.044	-0.212***	0.003
	(0.104)	(0.042)	(0.078)	(0.041)	(0.079)	(0.044)	(0.095)	(0.048)	(0.058)	(0.030)

Capital sq.	0.008*	0.001	0.015***	-0.003	0.015***	-0.001	0.012***	0.001	0.012***	-0.001
	(0.004)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.004)	(0.002)	(0.002)	(0.001)
Wage	0.314	0.168	0.001	-0.323**	-0.339	-0.010	0.114	-0.318**	-0.116	0.060
	(0.448)	(0.175)	(0.240)	(0.148)	(0.304)	(0.220)	(0.251)	(0.135)	(0.181)	(0.124)
Wage sq.	-0.006	-0.008	0.009	0.014**	0.025*	-0.000	0.003	0.014**	0.014*	-0.004
	(0.021)	(0.008)	(0.011)	(0.007)	(0.014)	(0.010)	(0.011)	(0.006)	(0.008)	(0.006)
Export lagged	2.003***		2.103***		2.086***		2.004***		2.079***	
	(0.047)		(0.044)		(0.042)		(0.056)		(0.033)	
FO									0.363***	0.177***
									(0.050)	(0.018)
Constant	-3.977*	0.376	-1.077	1.906**	0.656	0.762	-2.788*	2.798***	-1.248	0.440
	(2.390)	(0.948)	(1.634)	(0.851)	(1.790)	(1.187)	(1.625)	(0.756)	(1.132)	(0.696)
Rho	-0.717***		-0.588***		-0.713***		-0.558***		-0.628***	
	(0.056)		(0.040)		(0.051)		(0.046)		(0.035)	
Sigma	-1.187***		-1.203***		-1.167***		-1.243***		-1.176***	
	(0.018)		(0.017)		(0.016)		(0.027)		(0.012)	
Obs.	8062		13572		13858		7776		24086	
Censored	4424		10213		9478		5159		15232	

Table 7. Export Share, Heterogeneity Checks.

Author's estimation.

Notes: Standard errors clustered around firms in parentheses; ***: significant at 1%; **: significant at 5%; *: significant at 10%. Geographical, year and sectorial dummies are omitted from the regression table. E-P: Export-Propensity. E-I: Export Intensity. FO: Foreign-Owned.

Models from (1) to (4) divide the dataset into two groups according to the time-span considered. (1) and (2) cover years from 1999 to 2003, whereas (3) and (4) from 2004 to 2009. Specifications (1) and (3) assess export-propensity and as such, again act as selection equations. We can see again how no spill-overs proxies are significant but backward linkages. They enter significantly only in the second time-span, with converse effects: in (3) backward linkages display a highly significant negative value, thus discouraging firms to engage in exports; in (4) the positive impact is however significant and higher than the one offered by the base model in Table 6 (38% rather than 27%). The control variables again seem to impact export share in a quadratic way rather than linearly. Furthermore, age squared enters significantly only (4), thus in the second time-span considered, with a negative significant value. The overall results might therefore hint at a situation where younger firms, thus the ones established after a while that capitalism was established in the country, were able to reach higher levels of exports; at the same time, suppliers to foreign firms needed to decide to export before integrating with the EU to achieve higher levels of production into exports. The partial significance of size squared, entering significantly only in (2) with a positive value, might again lead to infer how the market started to reward flexibility more and more after 2004. In regards to flexibility then, the Estonian market seems to resemble still more closely, at least partly, developing countries. The result also fits with the findings by Sinani and Meyer (2004), as it covers years after their analysis. Liquidity was significantly exerting a negative impact on the decision to export before 2004, perhaps also due to improvements in access to finance along time. Capital squared appears as significant in both selection equations, increasing the probability to start exporting, whereas wage squared exerts a positive impact on export share only after 2004. It appears that only a closer integration with the EU linked more effectively higher wages to higher levels of export share.

Results from (5) to (8) operate a similar distinction on a sectorial dimension; the first two consider low-tech industries, and the other ones medium and high technological-intensive sectors. Specification (8) offers few significant values. One is wage squared, consistent with the idea that sectors requiring more knowledge from workers are benefiting from it in their export performance. The other is a significant negative value for forward linkages. The result is somehow puzzling, as usually they are at best found as insignificant. A partial justification might be offered by interacting this result with the

relevance of backward linkages from the base model in Table 6. Local firms might then benefit more from forward linkages within themselves, i.e. receiving outputs from other local firms that are benefiting from backward linkages, mediating the effect of foreign presence in the host economy (Amendolagine et al., 2012). This interpretation looks however far-fetched, as backward linkages do not enter significantly in (8), thus signalling no significant impact in the sector.

No spill-over proxies enter significantly in (6). However, low-tech industries offer further proof of the relevance of flexibility for the export performance of Estonian firms. (6) confirms the trend of age squared negative and significant, and size squared positive and significant. The two selection equations, (5) and (7), offer a similar result in the decision to export: capital squared is positive and significant in both. (7) displays no further significant value, thus it seems that high-tech industries export behaviour is perhaps driven by different variables that the ones employed here. On the contrary, (5) presents more room for interpretation; wage squared is significant at the 10% level. This, together with the significance of capital squared, can be seen as a signal of the relevance of overall higher productivity in order to achieve higher levels of exports. Liquidity confirms the negative impact witnessed both in Table 6 and in specification (1) here, and therefore we might infer its significance in export-propensity is somehow limited to low-tech firms. Age squared has a positive impact as well, confirming that older firms are more likely to start exporting.

Table 6 ends with (9) and (10), which express the same base model in Table 5, specification (1) adding foreign-owned firms and a foreign ownership dummy variable among the controls. Foreign-ownership is highly significant in both export-propensity and -intensity, as one could have already inferred from Table 3. The other results further confirm what was already stated for Table 6: the relevance of flexibility is evident from the significance of age and size in their quadratic forms, but quite surprisingly the magnitude of backward linkages diminishes to a net increase of 19% in export share. This might suggest that foreign-owned firms in Estonia are mostly endowed with a specific mandate from their headquarters.

3.6. The Impact on Export Value

Consistent with Duran and Ryan (2014), it seems important to assess the impact of FDI spill-overs on what they call export-quantity. This means that the dependent variable considered is no more a ratio, as it was until now, but simply the natural logarithm of deflated export value. This seems particularly pivotal here for two reasons. First, we are able to integrate more observations into the dataset, as we can use also values that were excluded in the export-intensity equation due to an unrealistic ratio of export share. Second, we can assess whether the export value of the firm is affected by FDI, thus excluding the overall firm productivity or sells, and evaluate differences between the impact on exports and on exports as related to overall production. In the following pages, Table 8 offers the results from the same model specifications defined in Table 6.

Export-Propensity	(1) Base Model	(2) Capital*Hor	(3) Capital*Back	(4) Capital*For	(5) Wage*Hor	(6) Wage*Back	(7) Wage*For
Age	-0.542*** (0.140)	-0.540*** (0.140)	-0.538*** (0.141)	-0.541*** (0.141)	-0.542*** (0.141)	-0.539*** (0.141)	-0.542*** (0.140)
Age squared	0.099*** (0.037)	0.099*** (0.037)	0.098*** (0.037)	0.099*** (0.037)	0.099*** (0.037)	0.098*** (0.037)	0.099*** (0.037)
Size	0.258*** (0.039)	0.258*** (0.039)	0.259*** (0.039)	0.259*** (0.039)	0.258*** (0.039)	0.255*** (0.039)	0.259*** (0.039)
Size squared	-0.008 (0.008)	-0.008 (0.008)	-0.008 (0.008)	-0.008 (0.008)	-0.008 (0.008)	-0.007 (0.008)	-0.008 (0.008)
Horizontal	-0.000 (0.183)	0.707 (0.528)	0.000 (0.182)	-0.000 (0.183)	0.129 (1.231)	-0.010 (0.183)	-0.002 (0.183)
Forward	0.053 (0.212)	0.038 (0.212)	0.065 (0.213)	0.005 (0.936)	0.055 (0.213)	0.057 (0.212)	-1.151 (2.239)
Backward	-0.141 (0.262)	-0.121 (0.264)	-2.162* (1.173)	-0.141 (0.263)	-0.132 (0.266)	-2.003 (2.639)	-0.132 (0.263)
Liquidity	-0.060* (0.032)	-0.059* (0.032)	-0.061* (0.032)	-0.060* (0.032)	-0.060* (0.032)	-0.060* (0.032)	-0.060* (0.032)
Capital	-0.203*** (0.059)	-0.178*** (0.063)	-0.251*** (0.065)	-0.205*** (0.065)	-0.203*** (0.059)	-0.199*** (0.059)	-0.203*** (0.059)

Export-Propensity *(cont.)*	(1) Base Model	(2) Capital*Hor	(3) Capital*Back	(4) Capital*For	(5) Wage*Hor	(6) Wage*Back	(7) Wage*For
Capital squared	0.012***	0.011***	0.011***	0.012***	0.012***	0.011***	0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Wage	-0.117	-0.125	-0.115	-0.116	-0.114	-0.186	-0.159
	(0.183)	(0.182)	(0.184)	(0.183)	(0.188)	(0.206)	(0.188)
Wage squared	0.014	0.014*	0.014	0.014	0.014*	0.014*	0.013
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Export lagged	2.106***	2.105***	2.105***	2.105***	2.106***	2.105***	2.105***
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
Capital*Hor		-0.055					
		(0.039)					
Capital*Back			0.153*				
			(0.087)				
Capital*For				0.002			
				(0.073)			
Wage*Hor					-0.012		
					(0.110)		
Wage*Back						0.166	
						(0.236)	
Wage*For							0.107
							(0.200)
Constant	-1.131	-1.393	-0.441	-1.105	-1.173	-0.421	-0.624
	(1.129)	(1.181)	(1.170)	(1.150)	(1.263)	(1.507)	(1.320)

Export Value	(1) Base Model	(2) Capital*Hor	(3) Capital*Back	(4) Capital*For	(5) Wage*Hor	(6) Wage*Back	(7) Wage*For
Age	0.771*** (0.289)	0.778*** (0.290)	0.764*** (0.290)	0.758*** (0.289)	0.774*** (0.290)	0.766*** (0.289)	0.767*** (0.289)
Age squared	-0.275*** (0.078)	-0.277*** (0.078)	-0.273*** (0.078)	-0.271*** (0.078)	-0.276*** (0.078)	-0.273*** (0.078)	-0.274*** (0.078)
Size	0.087 (0.102)	0.085 (0.103)	0.085 (0.102)	0.085 (0.102)	0.089 (0.103)	0.091 (0.102)	0.086 (0.102)
Size squared	0.107*** (0.019)	0.108*** (0.019)	0.107*** (0.019)	0.107*** (0.019)	0.107*** (0.019)	0.106*** (0.019)	0.107*** (0.019)
Horizontal	0.008 (0.283)	1.081 (1.196)	0.006 (0.283)	-0.031 (0.282)	3.894 (2.766)	0.052 (0.282)	0.006 (0.283)
Forward	-0.260 (0.369)	-0.262 (0.368)	-0.281 (0.369)	2.272 (1.798)	-0.177 (0.363)	-0.281 (0.368)	3.368 (4.592)
Backward	0.832* (0.456)	0.845* (0.457)	3.228 (2.523)	0.799* (0.458)	0.890* (0.461)	10.150* (5.598)	0.805* (0.460)
Liquidity	-0.145* (0.083)	-0.145* (0.083)	-0.142* (0.083)	-0.139* (0.084)	-0.146* (0.083)	-0.139* (0.084)	-0.143* (0.084)
Capital	-0.337** (0.157)	-0.301* (0.156)	-0.283* (0.168)	-0.255 (0.173)	-0.329** (0.156)	-0.351** (0.157)	-0.336** (0.157)

Export Value *(cont.)*	(1) Base Model	(2) Capital*Hor	(3) Capital*Back	(4) Capital*For	(5) Wage*Hor	(6) Wage*Back	(7) Wage*For
Capital squared	0.016***	0.016***	0.017***	0.016***	0.016***	0.017***	0.016***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Wage	-2.415***	-2.422***	-2.414***	-2.416***	-2.277***	-2.185***	-2.256***
	(0.551)	(0.553)	(0.552)	(0.547)	(0.603)	(0.547)	(0.546)
Wage squared	0.129***	0.129***	0.129***	0.129***	0.129***	0.132***	0.128***
	(0.026)	(0.026)	(0.026)	(0.026)	(0.027)	(0.026)	(0.025)
Capital*Hor		-0.078					
		(0.085)					
Capital*Back			-0.172				
			(0.175)				
Capital*For				-0.187			
				(0.126)			
Wage*Hor					-0.349		
					(0.247)		
Wage*Back						-0.828*	
						(0.502)	
Wage*For							-0.322
							(0.406)
Constant	25.803***	25.374***	24.980***	24.696***	24.182***	22.855***	24.103***
	(3.028)	(3.122)	(3.150)	(3.057)	(3.613)	(3.312)	(3.438)

Rho	-0.802***	-0.799***	-0.804***	-0.803***	-0.798***	-0.804***	-0.803***
	(0.040)	(0.041)	(0.041)	(0.040)	(0.041)	(0.040)	(0.040)
Sigma	0.570***	0.570***	0.571***	0.570***	0.569***	0.571***	0.570***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Obs.	22837	22837	22837	22837	22837	22837	22837
Censored Obs.	14725	14725	14725	14725	14725	14725	14725

Table 8. Export Value, Regression Table.

Author's estimation.

Notes: Standard errors in parentheses clustered around firm; ***: significant at 1%; **: significant at 5%; *: significant at 10%. Geographical, year and sectorial dummies are present but omitted from the regression table. Hor: Horizontal spill-overs, Back: Backward linkages, For: Forward linkages.

The export-propensity equation is here included as it uses more observations (around a thousand) than the previous one, for cross-checking. There are overall three minor changes in the significance of control variables, and one in interaction terms, thus confirming the results outlined in table 6. None concerns their sign, and thus effect or behaviour. Age squared is now significant at the 1% rather than at the 5%, whereas liquidity is significant at the 10% rather than at the 5%. While insignificant in the selection equation for export-intensity, wage squared now becomes significant at the 10% level in (2), (5) and (6), with a positive sign, and it is very close to significance in other specifications. According to this model then, human capital is at least close to being a significant driver in export-decision. The result does not need to be overestimated however, as capital squared still proves more significant. Among the interaction terms, the capital and horizontal spill-overs term becomes insignificant, whereas the significance of capital multiplied by backward linkages remains at the 10% level. This can be regarded again as proof of the stronger importance of backward linkages, as opposed to other spill-overs, in the export performance of Estonian firms, as further embodied in the export value specification. Backward linkages enter significantly at the 10% level all specification except (3), which is however one of the two that assesses interaction terms. The behaviour of variables, again, does not seem to differ much from table 6. Among control variables, both capital and wage squared enter with a high significance, possibly reflecting that increase in export which is due to a numerical increase in overall output. Indeed, in export-intensity the two variables were not significant. Liquidity enters negative and significant, and a similar interpretation can be offered: an increase in the value of exports somehow reflects an increase in productivity, whereas export-intensity is assessing the relative foreign market allocation of Estonian firms. Therefore, liquidity directly affects production only. Age squared is more significant using export value rather than export share, keeping the same sign, and thus displaying a similar behaviour. The peculiar way in which flexibility gains importance in the Estonian economy therefore is confirmed by these results. The interaction of wage and backward linkages is here significant at the 10% level, with a negative sign. This hints at a possible lack of absorptive capacity in interacting with foreign technology, but further analysis is deemed as fundamental to further investigate this result.

4. CONCLUSION

The present thesis was aimed at capturing FDI spill-overs in domestic Estonian manufacturing firms and analysing their impact on the two aspects of the decision to start exporting, and subsequently the export-intensity, i.e. the share of exported products related to the overall sales, of such firms. The results suggested a positive role of backward linkages in export-intensity, thus highlighting a possible relevance of the standards MNE require from subsidiaries for Estonian development. Other spill-overs appear as insignificant, except for a negative and significant value of forward linkages in technologically intensive sectors for export-intensity. The result is somehow puzzling, but might be linked to the overall significance of backward linkages. Horizontal spill-overs enter only one unstable specification significantly, despite attempts at disclosing heterogeneity. The present thesis therefore clearly hints at an insignificant impact of intra-industry spill-overs. It is still not possible to fully deny their presence, as this might be linked to the limitations of the datasets (e.g., sectorial dimension, time-span, and so on). The positive relevance of inter-industry spill-overs is consistent with Kneller and Pisu (2007) and Girma et al. (2007), whereas the insignificance of horizontal spill-overs is in contrast with many papers in the field (Aitken et al., 1997; Anwar and Nguyen, 2011; Du and Girma, 2007).

The result from the control variables points at an Estonian market that somehow still resembles more a developing market. Firm size leads larger firms to exporting more, but age has a negative impact. This is linked to the profile of innovative firms in developing countries, where the two are negative, and it is inferred that a mix of these characteristics is due on one hand to the legacy of the Estonian economic transition, and on the other to a successful institution building. The latter allows bigger firms to be able to produce (and perhaps innovate) more, therefore showing an effective path to developed

status. The results witness a successful evolutionary path contrasting with the earlier findings by Sinani and Meyer (2004).

The limitations of the present study are many, mostly linked to the absence of a proxy for R&D expenditures, which is a highly relevant variable in discerning FDI-related spill-overs. Another limitation is that the Heckman ML method does not fully account for endogeneity, which might somehow bias result. Other relatively minor limitations are represented by the sectorial dimensions of the analysis, which limits itself to manufacturing industries at the NACE 2-digit level; by the issue of multicollinearity that somehow affects results, particularly when focusing on interaction terms; and, due to the scope of the present thesis, the model does not capture any potential spill-overs between local firms. In a more dynamic setting, it would definitely be interesting to assess them as well, perhaps particularly for what concerns technologically-intensive industries.

Further research should focus on other relevant datasets, such as Amadeus, to further include R&D investment as a variable in the model; on the relevance of product quality in export spill-overs (Hausmann et al., 2007; Giroud et al., 2012); and trying to assess if including observations from later years the situation changed and in what ways, as the time dimension of the dataset might be pivotal in determining if and how certain dynamics of the Estonian market, especially for what pertains to the number of exporting firms, have changed. Other models focusing on the post-2008 Eurozone crisis, which can assess then an exporting performance and market redistribution whose progress is still ongoing in the dataset used here, might manage to avoid the need for sample selection. This should in turn lead to capturing the real influencing variables in the export-intensity dimension, which seems to have acquired a much relevant role along the years for the Estonian market. Last, further research on spill-overs and innovation should focus on the role of local companies, i.e. assess ways in which Estonian, and not only foreign, firms are influencing each other in technological advancement.

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