Essays in International Trade and Firm Behaviour

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Statement

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

In accordance with the University of Sussex's regulations regarding Research Degrees, this thesis is presented as a series of journal papers. The paper presented in Chapter 2 is first authored by myself and co-authored by Michael Gasiorek and Burcu Fazlıoğlu and published as "Dalgıç, B., Fazlıoğlu, B. and Gasiorek, M. (2015). Costs of Trade and Self-selection into Exporting and Importing: The Case of Turkish Manufacturing Firms. Economics: The Open-Access, Open-Assessment E-Journal, 9 (2015-15): 1-28." The majority of the work on this paper was my own. Under the supervision of Dr. Michael Gasiorek, I identified the research question, developed the research design and formulated the data and methodology of the analyses for the investigation by myself. I was assisted in careful cleaning and preparing of the data by Burcu Fazlıoğlu and, I received detailed feedback, commentary and advice from Dr. Gasiorek (particularly about further incorporating the role of variable costs). I was responsible for the underlying analysis and regressions and for the writing of the paper, with commentary and suggestions from my co-authors.

Similarly, the paper presented in Chapter 3 is primarily my work while co-authored with my main supervisor Michael Gasiorek and also Burcu Fazlıoğlu. As with the first paper, I identified the research question, was responsible for preparing the data, and was responsible for the regressions as well as the drafting of the paper in consultation with Michael Gasiorek. Dr. Gasiorek provided further input into extending the research questions (for example how to explore the role of mark-ups), and how to explore these questions econometrically. Burcu Fazlıoğlu involved in interpretation of further results and finalization of the paper.

The paper presented in Chapter 4, with input from my supervisors who provided detailed commentary and suggestions, is completely my own work.

Başak Dalgıç

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First and foremost, I offer my sincerest gratitude to Michael Gasiorek for his invaluable guidance and exceptional supervision. Not only his immense knowledge has guided me during all phases of my study, but also his patience, kindness, encouragement and support made the accomplishment of this thesis possible. I am deeply indebted to him. It is no doubt that I have received invaluable inputs from him and working with him made a difference in my professional life as well as my personality.

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I owe special thanks to my family for their support throughout all the years of my academic life.

No wonder this thesis is dedicated to my daughter İlya for her unconditional love, joy and understanding shown to a busy mom.

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Abstract

The literature on international trade has witnessed a dramatic change over last two decades where the issues of firm-level heterogeneity has emerged as a core topic. The theoretical framework underpinning the way we understand firms' engagement in international trade has been essentially encouraged by the seminal studies of Melitz (2003) and Bernard et al. (2003) while, the micro econometrics was pioneered by Bernard et al. (1995), Aw and Hwang (1995) and Roberts and Tybout (1997). Motivated by this substantial and on-going literature, this thesis examines the behaviour of firms in international trade for Turkey.

Turkey is an emerging economy with a substantial reliance on the international markets both as a source and an outlet for its domestic economic activities. Over the last decade it has greatly increased its integration into the globalized world economy transforming itself into one of the major recipients of foreign direct investment. In this respect, this thesis adds to the literature with three separate self-contained empirical essays utilizing firm-level data from Turkish manufacturing and services industries. The first essay concentrates on self-selection into trade by exporting and importing firms, and on the presence of differential sunk costs between exporters and importers across different categories of exports and imports. The second essay explores the differentials in the post-entry effects of exporting to world markets with different income levels. Controlling for the quality of exports, the chapter examines the extent to which the post-entry effects on the productivity of firms are driven by changes in physical productivity, as opposed to quality/price mark-up effects. The third essay investigates the existence and extent of export spillovers that arise from buyer-supplier relations between domestic and foreign firms; within manufacturing industry and between manufacturing and services industries.

1 Introduction

The literature on international trade has witnessed a dramatic change over last two decades where the focus has switched from macro players of trade and where firm-level heterogeneity has emerged as a central topic. The macroeconomic literature at cross-country level has typically documented a positive relation between international trade and growth. Understanding the drivers of that growth, in particular at the micro-level is an ever more important issue for policy makers. The literature on heterogenous firms and trade has contributed significantly to that understanding. It has done so by addressing questions such as: What determines why a firm becomes an international trader? What determines the number of products traded and number of countries traded with? What determines the sophistication level of products traded and development level of countries traded with? How much transition is there related to product and country types and what drives these transitions?

The theoretical framework of firms' engagement in international trade has been largely motivated by the seminal studies of Melitz (2003) and Bernard et al. (2003) while, the micro-econometrics was pioneered by Aw and Hwang (1995), Bernard et al. (1995), and Roberts and Tybout (1997). The burgeoning literature has also been made possible and enriched by the increasing availability of firm level datasets. Bernard et al. (1995) and numerous succeeding studies have shown that typically a small fraction of firms, in any given country, constitute a large share of that country's international trade within narrow industry borders. Moreover, a substantial empirical literature has expressed that internationalized firms show better performance (productivity) to those firms serving only to the domestic markets. While such performance differentials are mainly attributed to substantial entry costs in export markets, the picture emerging from this literature suggests that the superior performance of internationalized firms arises via both self-selection effects and post-entry effects.

Regarding post-entry effects, exporting firms might get more efficient with exporting activity through learning, or as a result of economies of scale, or by contact with foreign clients, and also being exposed to more intense competition in foreign markets (Martins and Yang, 2009; Silva et al., 2012) On the other hand, the hypothesis of self-selection proposes that because of the presence of sunk costs, only the most productive firms self-

select into export markets. Specifically, Melitz (2003) builds his monopolistic competition model on the assumption that there exist extra costs for those firms serving in international markets. Only firms exceeding some threshold productivity level can therefore obtain positive profits in international markets. In a related vein, Bernard et al. (2003) further shows that self-selection into exporting occurs also via variable trade costs. Accordingly, these variable costs can also create self-selection of productive firms into foreign markets regardless of the presence of any sunk costs.

Motivated by this huge and still developing literature, this thesis investigates the behaviour of firms engaging in international trade in Turkey and adds to the literature with three separate self-contained empirical essays utilizing firm-level data from Turkish manufacturing and services sectors. Turkey is an emerging economy with a substantial reliance on the international markets both as a source and an outlet for its local economic activities. This study comprises an interesting quasi-natural experiment since the data utilized covers a period in which Turkey practiced a trade boom and underwent a structural change in terms of its production and trade patterns.

The process of integration of the Turkish economy into the world economy gained momentum following the positive stimulus from the Customs Union with the EU in the late 1990s and the EU's decision to start accession talks with Turkey in 2004 accompanied by abundant foreign capital inflows. Further, following a series of macroeconomic and structural reforms, the Turkish economy recovered relatively quickly from the negative shock of the economic crisis in 2001. This thesis analyses the period after 2002, over which Turkey experiences this recovery and an intense export boom. Particularly, Turkey's total volume of trade increased from $88 billion in 2002 to $389 in 2012 which is an increase of 342 percent over one decade's time whereas its exports increased from $36 billion to $153 billion i.e. by 325 percent. Over the same period, Turkey has experienced a structural change in terms of its production and trade patterns along with the sectoral and geographical diversification of its trade. Turkey's integration into global value chains has also enlarged significantly as well as transforming into one of the major recipients of foreign direct investments in its region.

In this context, *Chapter 2- Costs of Trade and Self-selection into Exporting and Importing: The Case of Turkish Manufacturing Firms*- The first essay of this thesis

concentrates on self-selection into trade by exporting and importing firms, and on the presence of differential variable and sunk costs between exporters and importers across different categories of imports. It particularly investigates the micro-dynamics of international trade focusing on firms operating in Turkish manufacturing industry over the period 2003-2010. Manufacturing industry played an essential role in defining Turkey's production and export performance over the period in question. While manufacturing industry constituted 23.5 percent of GDP and 13.5 percent of overall employment respectively, it produced 93.5 percent of the total export volume. One distinguishing feature of Turkish manufacturing industry is its dependence on imported intermediate goods. For instance, in 2010 the imported component of Turkish manufacturing industry was 40%. Over 2003-2010 period the growth of imports for manufacturing surpassed the growth rate of manufacturing itself.

There are four main contributions of this chapter to the literature on trade and firm heterogeneity. First, in considering the self-selection effects we control for the importing status of exporting firms and vice versa. This is commonly neglected in the literature. Such a comparison is crucial for firms operating in the Turkish manufacturing industry for whom a key characteristic is the dependence on imported intermediate goods. Secondly, in exploring the role of self-selection effects we take variable costs (in particular those associated with tariffs) into account, and assess the impact of these on the estimated sunk costs. Thirdly, and building on the literature suggesting a link between productivity and product complexity, we investigate the differentials between the sunk costs for importing/exporting of capital, intermediate and consumption goods. Finally, but equally importantly to the best of our knowledge our paper is the first attempt to inspect self-selection for Turkey, and contributes to the very limited literature on self-selection in importing for less developed countries.

Overall, we detect a self-selection effect for both importing and exporting Turkish firms with a more pronounced effect for importers. In contrast with much of the literature which fails to control for importing status of exporting firms and vice versa, when we consider trading status of firms, we uncover that effect of self-selection is still present, but greatly reduced. We show that the extent and nature of sunk costs varies between importing and exporting activities, with Turkish manufacturing importers facing higher sunk costs compared to exporters. In accounting for the variable costs associated with tariffs we

show that the sunk costs associated with importing and exporting decline, but with a lesser decrease for importers compared to exporters, hence widening the relative gap between these two. This identifies the importance of variable costs and the need for more research on this. We also show that the sunk costs are higher for capital goods, than intermediate and consumption goods for both of trading activities; and once again with higher sunk costs for importers in terms of each category.

Chapter 3- Does It matter Where You Export and Does Productivity Rise with Exporting? - The second essay of this thesis integrates and extends the existing empirical works on the relationship between exports and productivity. It adds fresh evidence to the existing literature by exploring the differentials in the post-entry effects of exporting to world markets with different income levels. We focus on three key issues. First, we examine whether measured productivity really rises with exporting which is the issue of self-selection versus learning-by-exporting. We do this by employing "Propensity Score Matching (PSM)" together with a "Difference-in-Differences (DiD)" methodology. Whereas the existing literature has relied on matching and then on estimating the average treatment effects between non-exporters and export starters, we also apply this method to export starters and always-exporters. This allows us to control for selection in a much more satisfactory manner than heretofore.

Secondly, we explore whether the post-entry effects on productivity are driven by changes in physical productivity, as opposed to quality/price mark-up effects. We do so in two ways. First, we control for quality by computing average unit values for firm level exports based on each firm's 12-digit export flows. In addition, we categorize each firm's exports by the type of product being exported - for example between differentiated and homogeneous goods and use such a categorization to explore whether the impact on productivity varies across categories. Thirdly, we identify the differentials in immediate and future productivity gains upon entry of firms into export markets with different income levels controlling for the composition of exports. For this we group countries using World Bank's classification according to gross national income per capita and distinguish between two mutually exclusive groups of markets: High-income (HI) countries and Medium-Low-income (MLI) countries. We then categorize firms on the basis of the destination of their exports.

Overall, we find clear evidence of learning-by-exporting and consistent with earlier work this is primarily with regard to exporters to high income countries. When we control for quality effects, the learning-by-exporting effects become larger for exporters to high income countries, but we find no evidence of an increase in physical productivity for exporters to medium and low-income destinations. We find a bigger impact on productivity for high-technology and skill-labour intensive products, as well as for differentiated products where we find no impact of exporting for primary/resource/unskilled labour-intensive products. This is consistent both with a learning-by-export hypothesis, but also with changes in mark-ups and/or quality. Once we control for quality however we still find a positive impact which suggests that physical productivity is positively associated with exporting. However, as for the MLI starters we only uncover some evidence of a positive impact on productivity with regard to differentiated products. Our results strongly suggest where you export matters.

Chapter 4- Export Spillovers from FDI- The third essay of the thesis is a separate yet related empirical study investigating whether and how inward foreign direct investments impact the export behaviour of firms operating in Turkish manufacturing industry over the period 2006-2014 where Turkey witnessed a remarkable inflow of foreign direct investments and a rapid rise in exports. In this chapter, we particularly investigate the existence and extent of export spillovers arising via from buyer-supplier relations between foreign and domestic firms; within manufacturing industry and between manufacturing and services industries. Our contribution to the existing literature is threefold. First, we utilize new alternative sectoral and firm level measures of foreign presence in terms of backward and forward linkages which has not been done before. Secondly, unlike previous studies on export spillovers, we consider buyer-supplier relations not only within manufacturing industry itself but also between manufacturing and services industries. Third, this is the first attempt to explore export spillovers for Turkey. Additionally, where the majority of the existing literature focuses on aggregate export propensity, we investigate export spillovers considering the extensive and intensive margins of exporting activity together and provide new interesting microeconomic insights.

The main findings from Chapter 4 confirm that there exist significant export spillovers from downstream foreign presence. The impact of foreign presence in downstream

manufacturing industries is stronger at the intensive margin, while the extensive margin is less affected. Thus, the results suggest that foreign presence in downstream industries increase the competitiveness of their upstream domestic suppliers. The increased competitiveness might be reflected in two conflicting effects on the unit values of exports by domestically owned firms. Interaction with firms in downstream sectors with foreign presence might cause exporting of products of higher quality or producing and exporting the same products at lower prices. Hence, we test whether existing spillovers are taking place through lowering prices or increasing quality of exports. Further, one could potentially argue that increased exports in developing economies are strongly correlated with increased use of imported inputs, namely import fragmentation. Thus, foreign presence might be creating export spillovers on domestic firms by increasing their imports of intermediate goods. Therefore, we broaden our investigation by testing whether foreign linkages enhance import fragmentation. Our results suggest that as domestic manufacturing firms supply to foreign firms in downstream manufacturing industries their reliance on imported inputs increases. Moreover, we reveal that downstream linkages accompanied by access to cheaper imports of intermediate goods.

The rest of the thesis is structured as follows. In the next section, Turkish data used throughout the chapters is described. Then, each of the subsequent sections offers a self-contained Chapter. Section 2 is dedicated to the essay Costs of Trade and Self-selection into Exporting and Importing: The Case of Turkish Manufacturing Firms; Section 3 covers the second essay of the thesis on Does It matter Where You Export and Does Productivity Rise with Exporting? and Section 4 presents the last essay of Export Spillovers from FDI. Section 5 concludes.

1.1 Turkish Data

The data utilized in this thesis are constructed on recent and comprehensive firm level datasets from various sources collected by the Turkish State Institute of Statistics (TURKSTAT). The datasets are available under a confidential agreement by which all the elaborations can only be conducted at the Microdata Research Centre of TURKSTAT under the respect of the law on the statistic secret and the personal data protection.

The first dataset exploited is *The Annual Industry and Service Statistics (AISS)*- it is a census for the firms with more than 19 employees whereas it is a representative survey for firms with less than 20 employees. In the dataset, firms are classified with respect to their main activity, whilst identified by NACE Rev 1.1 and Rev.2 standard codes for sectoral classification of Eurostat.[1] The database offers detailed info on a number of structural variables that are primarily seen on a firm's balance sheet such as value added, revenues, labour costs, intermediate inputs costs, tangible investment costs, intangible investment costs, information on geographical location and industry affiliation, the number of employees as well as the information on foreign ownership that classify firms between domestic, mixed ownership and purely foreign ownership status.

For the analysis undertaken in this thesis firm level productivity indicators were required. This was achieved by two different measures. One is total factor productivity (TFP) computed by utilizing Levinsohn and Petrin's (2003) semi-parametric methodology. The other is the standard labour productivity (LP), defined as value added per employee where value added is gross output net of intermediate inputs. Output is the sum of the revenues from the firm's annual sales of the final products, the revenues from the contract manufacturing and the value of stock of final products at the end of the year minus the value of stock of final products at the beginning of the year. It is deflated by using 4-digit producer price indices with the base year 2003.

Levinsohn and Petrin (2003) suggest semi-parametric production function estimators to overcome potential simultaneity and/or selection biases from the OLS estimation of production functions. In order to remove the relationship between variable inputs and productivity shocks, first Olley and Pakes (1996) alternate productivity shocks with firms' investment decision. Afterwards, Levinsohn and Petrin (2003) claim that in data sets which has a large number of zero observations for investment, investment cannot be monotonically increasing in productivity. In addition, ignoring such number of zero observations might generate efficiency losses. Hence, as material inputs are generally reported in positive numbers in firm-level data sets Levinsohn and Petrin (2003) suggest using material inputs as a proxy for productivity shocks. Since there is a large number of zero observations in the investment series of our data set the Levinsohn and Petrin's

[1] The economic activities covered are NACE sections C to K, and M to O.

(2003) approach was used to estimate the TFP measures used in this thesis. This methodology assumes that production technology is in the form of Cobb-Douglas. Namely, the logarithm of a firm's output is explained by the logarithm of the freely variable inputs – labour (l_{it}), material inputs (m_{it}), and energy input (e_{it}) and the logarithm of the state variable-capital (k_{it}).[2]

In Levinsohn and Petrin (2003), output of the firm is proxied by value added or gross revenue for TFP estimations. We prefer value added measured as gross output net of intermediate inputs. Because due to the lack of variation in the data, once output is used as the dependent variable, Levinsohn and Petrin (2003) is unable to identify the coefficients for labour, material inputs, energy and capital. Labour is the number of employees of the firm in a given year and is readily available in the dataset. Material inputs are calculated as the sum of the (i) value of purchases of intermediate inputs except for energy and (ii) the value of stock of material inputs at the beginning of the year, minus the value of stock of material inputs at the end of the year. Material inputs are deflated by the related three-digit input price deflator. The energy variable is measured as the sum of the values of fuel purchases and electricity used in production. Electricity used in production is computed as the sum of the value of electricity purchased and the value of electricity produced minus the value of electricity sold. Electricity and fuel are deflated by their own price deflators.

As capital stock series of firms are not readily available in the data, we calculate them by applying perpetual inventory methodology using the series of investment for machinery and equipment, building and structures, transportation equipment, and computers and programming, respectively.[3] Assuming that firms are on their balanced growth the initial

[2] In Levinsohn and Petrin (2003) the following production function is estimated: $y_{it} = \beta_0 + \beta_1 l_{it} + \beta_2 k_{it} + \beta_3 m_{it} + \beta_4 e_{it} + w_{it} + \varepsilon_{it}$ (1a), where the error term is disaggregated into productivity shocks known to the producer (w_{it}) and unobservable shocks (ε_{it}) and w_{it} follows a first order Markov process. Value added is calculated as follows: $v_{it} = y_{it} - \beta_3 m_{it} - \beta_4 e_{it}$. Since material inputs are assumed to be monotonically increasing in productivity, the inverse of the material input demand function (h_{it}) exists. Then, equation 1a could be redefined as $v_{it} = \beta_1 l_{it} + \Phi_{it}(k_{it}, m_{it}) + \varepsilon_{it}$ (1b), where $\Phi_{it}(k_{it}, m_{it}) = \beta_0 + \beta_k k_{it} + \mathrm{h}_{it}(k_{it}, m_{it})$ (1c). By substituting a higher order polynomial for capital stock and material inputs in the inverse demand function (h_{it}) and, estimating equation 1b a consistent estimate for the labour coefficient is obtained. This completes the first step of the Levinsohn and Petrin (2003). The second stage is to identify the coefficient of capital. Given the coefficient of labour, the coefficient of capital is obtained from the solution to the following optimization problem: $min \sum_t v_{it} - \widehat{\beta_l} l_{it} - \beta_k k_{it} - E[w_{it}|\widehat{w_{it-1}}])^2$.

[3] Since the disaggregated investment deflator is not available, the different investment series of these capital goods are deflated by the aggregate investment deflator. The aggregate investment deflator used is provided by the Ministry of Development.

capital stock for any capital good of a firm is got by dividing the initial investment flow over the sum of growth rate of output and depreciation rate.[4] As for the firms reporting zero investment in the initial period it is presumed that they cannot be producing without capital. Therefore, their initial value of capital stock is computed where they report positive investment and iterated back to the starting year. Once capital stock series for building and structure, machinery and equipment, transportation equipment, computer and programming are calculated, the obtained series are aggregated to compute the total capital stock series of the firm.

The second main source of data utilized in this thesis is *The Annual Trade Statistics (ATS)* which includes foreign trade flows of individual firms that are sourced from customs declarations. The trade flows of goods are collected for the entire universe of exports and imports at 12-digit GTIP (Customs Tariff Statistics Position) classification, the first 8 digits of which correspond to CN classification (Combined Nomenclature of EU based on the 6-digit Harmonized System classification) whilst the last 4 digits are national. The information of the origin/destination countries and physical quantity of trade flows is also available for goods trade in ATS. Physical quantity of trade flows is measured by both kilograms and supplementary units. Unit values which are used in the subsequent chapters are calculated as the monetary values of export flows divided by their physical quantity. Supplementary units might be in pieces, litres, square metres or other units. If both measures are available, we construct unit values of export flows for each product-destination pair by dividing export value by supplementary units. Otherwise we rely on quantities exported measured in kilograms.[5]

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[4] Explicitly, where the initial year of the firm is denoted by zero; the initial capital stock is constructed as follows:
$K_1 = (1-\delta)K_0 + I_0$ (equation 1), $\frac{K_1}{K_0} = (1-\delta) + \frac{I_0}{K_0}$ (equation 2). Since firms are presumed at their balanced growth path, the growth rate of capital is equal to the growth rate of output (g). We use the average annual growth rate of a firm for the years that it appears in the sample. From equation 2 the initial capital stock can be calculated as follows: $K_0 = I_0/(g+\delta)$. Following Yılmaz and Özler (2005), depreciation rates of 5 %, 10 %, 20 % and 30 % are used for building and structure, machinery and equipment, transportation equipment, computer and programming respectively. Since these rates are pretty high with respect to the literature alternative rates of 2.5%, 5%, 10% and 15% are also employed as a robustness check, for building and structure, machinery and equipment, transportation equipment, computer and programming respectively. Afterwards, TFP is computed by using these alternative capital stock series and the coefficient estimations from Levinsohn and Petrin do not change qualitatively.

[5] We used supplementary units approximately for 27 percent of observations and kilograms for 73 percent. Note that we removed duplicate observations of firm-product-destinations, the observations where the description of the product was empty, entries with reported quantity of zero and, observations with destination markets reported as free trade zones.

Another source of data utilized in this thesis is *The Annual Industrial Products Statistics (AIPS)*. This provides information on the type and number of produced goods as wells as their value and volume of production. AIPS covers firms operating in manufacturing industry and having 20 or more persons employed. Production data is collected at 10-digit PRODTR level- a national product classification derived from 8 digit of Eurostat's PRODCOM classification. AIPS is used to derive firms' total intermediate goods production that we employ in calculating spillover variables in Chapter 4 as will be explained in detail.

The three datasets are matched utilizing a common firm identifier. In all subsequent chapters of the thesis the original sample sizes in the merged datasets were larger slightly yet merging the datasets was not straightforward and we applied an extensive screening and time-consuming data cleaning process that is principally inspired by Hall and Mairesse (1995). We removed abnormal observations (i.e. missing, zero or negative) for the main variables such as intermediate inputs, output, value added, labour cost etc. We excluded observations where the main variables and ratios (i.e. employee, sales, capital per employee, value added per employee) show excessive variation. Particularly, since we cannot follow mergers and acquisitions of firms from data, we drop the firms with employee growth rate above 300 percent and below -250. The limits were set different than that of Hall and Mariesse (1995), since we would lose too much observations by setting e.g. the lower limit to their suggested minimum limit of 90 percent. Similarly, we restricted observations to those with a growth or decline of sales smaller than 300 percent. The observations which are experiencing very close jumps and drops to those thresholds (e.g. 295 percent change in employment) are scrutinized one by one and evaluated together with their variation in their main ratios as capital per employee and value added per employee. We remove observations which had annual change for capital per employee, value added per employee outside of three times the inter-quartile range above or below the firm individual median (i.e. The 75 percent value minus the 25 percent value). Data is cleaned further for discernible keypunch errors. For example, the values are substituted by adjacent values whenever there comes a drop to zero (or missing) followed by a return to the value of previous year (e.g. 200,200,0,200), or a mistake in decimal value (6050,4550,60.5,45.5). We also lose some observations due to missing data in investment series over the entire analysis period and additionally exclude state-owned

firms. In all chapters we obtained unbalanced panels where we have information on exit, entry and missing values of some variables of the firms as well.

2 Costs of Trade and Self-selection into Exporting and Importing: The Case of Turkish Manufacturing Firms

2.1 Introduction

This paper examines the relationship between the self-selection mechanisms related with the trading activities of firms, and the related costs of trade. We focus on the differentials with regard to self-selection and trading costs between exporting and importing activities, and consider the role of both sunk and variable costs across firms by trading status. The paper uses an extensive data set on the trading activities of firms in Turkey and in so doing aims to expand the empirical evidence for developing / emerging countries on firms' heterogeneity in international trade.

The literature on international trade has witnessed a dramatic change over the past eighteen years where the attention has converted from the examination of macroeconomic agents to the micro players in trade, and where firm-level heterogeneity has emerged as a core topic. The micro-econometrics of firms' engagement in international trade was initiated by Aw and Hwang (1995), Bernard et al. (1995), and Roberts and Tybout (1997). The theoretical framework was principally inspired by Melitz's (2003) and Bernard et al.'s (2003) seminal works. Once datasets at firm-level became available, a substantial number of empirical studies has documented that internationalized firms show better performance with respect to the firms that sell to the domestic market only.[6] The majority of the literature focusses on exports, with much less attention paid to imports. In particular, there are relatively few studies on the importing activity and firm-performance nexus for developing countries.

The picture that emerges from this literature suggests that the superior performance of internationalized firms emerges via both the effects of self-selection and post-entry. Regarding the latter, exporting firms might get more efficient at exporting through learning, or as a result of economies of scale, or via contact with foreign clients, and being exposed to more intense competition in international markets.[7] The post-entry

[6] See Wagner (2007, 2012), Greenaway and Kneller (2007), Redding (2011) for surveys of the empirical works.
[7] For a detailed survey of studies on learning by exporting see Silva et al. (2012). Also see Martins and Yang (2009) for a detailed examination of 33 empirical works.

mechanisms of importing suggest the possibility of learning effects through the importing of capital and intermediate goods via knowledge spillovers, variety effects and quality effects.[8]

The self-selection hypothesis, which emerges from the theoretical literature, suggests that because of the existence of sunk costs and differing productivity levels within the same industry, only the most productive firms self-select into export markets. Specifically, Melitz (2003) builds his monopolistic competition model on the assumption that there exist extra costs for firms serving in international markets. Therefore, only firms that surpass some threshold productivity level can build positive profits in international markets. In a related vein, Bernard et al. (2003) shows that self-selection into exporting occurs also via variable trade costs. Accordingly, these variable costs can also create self-selection of productive firms into foreign markets regardless of the presence of any sunk costs. These sunk and/or variable costs are typically linked to knowledge of markets, transportation, marketing and advertising, and the setting-up of foreign distribution channels.

Similarly, the self-selection of firms with better superior productivity into import markets results from the existence of fixed and/or variable costs of importing, such that only firms above some threshold level of productivity can import. This enables firms with high productivity levels to offshore some of their production while low productivity firms bound themselves with sourcing from domestic markets. The nature of import costs is related to issues such as inspection of goods, the search costs for foreign suppliers, negotiation and contract formulation as well as learning and acquisition of customs procedures. Importers are also likely to face greater informational asymmetries associated with imperfect monitoring of the purchased goods quality and cost of transferring the embedded technology (Altomonte and Bekes, 2009).

While there exists substantial evidence promoting the hypothesis of self-selection into exporting (see among others Roberts and Tybout, 1997; Bernard and Jensen, 1999; Aw et al., 2000; Isgut, 2001; Delgado et al., 2002); there is much more limited evidence on

[8] For theoretical models see Grossman and Helpman (1991), Eaton and Kortum (2001), Acharya and Keller (2007) whereas for empirical evidence see, inter alia, Kasahara and Lapham (2008), Forlani (2010), Bas and Strauss-Kahn (2010).

self-selection into importing (Eriksson et al., 2009; Vogel and Wagner, 2010; Smeets and Warzynski, 2010; Altomonte and Bekes, 2010), with a small number of recent papers on the possible heterogeneity across importing and exporting activities (Kasahara and Lapham, 2008; Castellani et al., 2010; Ariu, 2016).

In this paper we utilize a recent dataset covering the entire population of Turkish manufacturing firms with more than 19 employees matched with firm-level international trade data over the period 2003-2010. Being an emerging economy for whom trade has been an important driver of growth, our case constitutes an interesting quasi-natural experiment since our data covers a period in which Turkey experienced a trade boom and underwent a structural alteration in terms of its trade patterns. The process of integration of the Turkish economy into the world gained momentum following the Customs Union with the EU in the late 1990s and the EU's decision to start accession talks with Turkey in 2004, accompanied by abundant foreign capital inflows. Following a series of macroeconomic and structural reforms, the Turkish economy recovered relatively quickly from the negative shock of the economic crisis in 2001. We analyse the period after 2002, over which Turkey experiences this recovery and a dramatic export boom. Over 2002-12, on average the share of Turkish manufacturing industry in GDP was 23.5 percent. With an average share of 90 percent in total exports, Turkey is second to only China which is among the BRIC countries in terms of the share of manufacturing in exports. Over 2002-12 Turkey's total trade volume increased by 342 percent with an increase of 325 percent in its exports. This competes to the average export performance of its peers in the same income group (such as China, Brazil, South Africa and Mexico) whose volume of exports grew by 212 percent.

There are four main contributions of this study to the existing literature on trade and firm heterogeneity. First, in considering the self-selection effects we control for the importing status of firms exporting and vice versa. This is commonly neglected in the literature. Such a comparison is crucial for firms operating in the Turkish manufacturing industry for whom a key characteristic is the dependence on imported intermediate goods. Secondly, in exploring the role of self-selection effects we take variable costs (in particular those associated with tariffs) into account, and assess the impact of these on the estimated sunk costs. Thirdly, and building on the literature suggesting a link between productivity and product complexity, we investigate the differentials between the sunk

costs for importing/exporting of capital, intermediate and consumption goods. Finally, but equally importantly to the best of our knowledge our paper is the first attempt to explore self- selection for Turkey, and contributes to the very limited literature on self-selection in importing for less developed countries (see Table 2 of Wagner 2012).[9]

Overall, and consistent with previous work, we show that firms that involve in both sides of trade perform superior than those engaged only in one side; and all types of internationalized firms outperform non-trading firms. The distinction between exporters and importers provides evidence as to the heterogeneity across firms, where only-importers (importers) perform superior to only-exporters (exporters). We reveal a self-selection for both exporting and importing firms with a stronger effect for importers. In contrast with much of the literature which fails to control for importing status of exporting firms and vice versa, when we consider trading status of firms, we find that the effect of self-selection is still present, but greatly reduced. The reduction is less for importers compared to exporters.

In accounting for sunk costs by past trade experience we show that the extent and nature of sunk costs diverges between exporting and importing activities, with Turkish manufacturing importers experiencing higher sunk costs compared to exporters. In accounting for the variable costs associated with tariffs we show that the sunk costs associated with importing and exporting decline, but with a less decrease for importers compared to exporters, hence widening the relative gap between these two. This identifies the importance of variable costs and the need for more research on this. We also show that the sunk costs are higher for capital goods, than intermediate and consumption goods for both of trading activities; and once again with higher sunk costs for importers in terms of each category.

The remainder of this paper is organized as follows. Section two introduces the data used in the empirical investigation and gives some descriptive evidence on trading status dynamics. Section three presents the empirical results. Section four concludes.

[9] Existing empirical analyses of Turkey on firm heterogeneity either focus on post-entry mechanisms (Yasar and Rejesus, 2005; Yaşar and Paul, 2008; Maggioni, 2012 and, Dalgıç et al., 2015) or investigate the role of importing, exporting and the joint involvement in both activities on the firm product scope and new product introduction (Lo Turco and Maggioni, 2015).

2.2 Data and Preliminary Evidence

This paper is based on two different data sources collected by TURKSTAT. They are the AISS and the ATS. The Annual Industry and Service Statistics is a census of firms with more than 19 employees, and a representative survey for firms with less than 20 employees. For this study, we pick the whole population of private Turkish manufacturing firms with 20 employees or more which constitutes a large portion of manufacturing industry. Such firms account for 87 percent of the value of production and 75 percent of employment in 2009 of Turkish manufacturing industry showing a similar pattern in the former and succeeding years. Also, in the existence of sunk costs while trading activity is mostly performed by large firms our sample selection does not produce biased results.

The database provides detailed info on a number of structural variables that are primarily seen on a firm's balance sheet such as, value added, revenues, intermediate inputs costs, tangible investment costs, intangible investment costs, information on geographical location and industry affiliation, the number of employees as well as the information on foreign ownership. As capital stock series of firms are not readily available in the data, we calculate them by applying perpetual inventory methodology utilizing the series of investment for machinery and equipment, building and structures, transportation equipment, and computers and programming. For firm-level productivity two different measures are employed. They are TFP which is computed by using Levinsohn and Petrin's (2003) semi-parametric methodology and, standard LP defined as value added per employee.

The Annual Trade Statistics includes foreign trade flows of individual firms that are sourced from customs declarations. The trade flows of goods are collected for the entire universe of exports and imports at 12-digit GTIP classification. The origin/destination countries and physical quantity of trade flows is also available for goods trade in ATS. To conduct our analyses, we merge the above two datasets. The resulting unbalanced panel covers longitudinal data of 38223 different firms over the period 2003-2010.[10] The original sample size in the merged dataset was slightly larger yet we applied a procedure

[10] See Appendix for Chapter 2 for the evolution of the sample over the analysis period.

of data cleaning that is principally inspired by Hall and Mairesse (1995).[11] The sample is mainly constituted by micro (62 percent) and small firms (17 percent) whereas the rest of them are medium-large (21 percent)[12].

To investigate the linkages between characteristics and the internationalization status of firms we primarily categorize the firms with respect to their trading status on a yearly basis. For each year, we define firms selling only to the domestic market as 'non-traders'; firms involved in exporting activities (including firms that only export and firms that not only export but also import) as 'exporters'; firms involved in importing activities (including firms that only import and firms that combine imports with export activities) as 'importers'; firms that do not import or export alone but which are simultaneously engaged in exporting and importing activities as 'two-way traders'. We also define 'only-exporters' and 'only-importers'.

In Table 2.1a, we provide descriptive evidence on our manufacturing industry panel, discriminating between firms due to their involvement in foreign markets. From the first column we can see that over 2003-2010, on average 63.3 percent of all firms are internationalized. Two-way traders, representing just over 39 percent of the sample, constitute the greatest share of internationalized firms, whereas firms that engage in only exporting (10.8 percent) or only importing (13.3 percent) are a minority. Exporting firms constitute 50 percent of the panel whereas importing firms' share is slightly higher at 52 percent.

Tables 2.1a and 2.1b report on how many firms changed their status over the period of analysis. According to Table 2.1a, the allocation of firms with respect to trading status stays fairly constant. For instance, the share of only-exporters stays in a range between 8.5-12 percent while the share of importers stays in a range between 12.1-14 percent. Column four of Table 2.1a displays that two-way traders are the group most likely to preserve their status. There is also quite a lot of churning in terms of entry and exit. The

[11] Since they include a small number of firms, we also excluded firms in NACE Rev. 1.1 sectors of 16, 23, 30, 37 which are manufacture of tobacco products, manufacture of coke, refined petroleum products and nuclear fuel, manufacture of office, accounting and computing machinery and, recycling respectively.
[12] Firms with the number of employees 20-50 are defined as micro, 51-100 are defined as small, 101-250 are defined as medium and, 250+ are defined as large.

share of entrants in 2010 with respect to 2003 is 94.5 percent. The share of entrants is highest in the only-exporters category, while the smallest share of entry was realized by only-importers. Firms that were active in 2003 but not in 2010 (i.e. exiting firms/deaths) are evident in all categories with a share of 51.8 percent in total. The group with the largest share of exits are non-trading firms. This is compatible with the empirical and theoretical view that non-traders are at the bottom end of the productivity distribution. Consistently, the smallest share of deaths is realized by firms engaging in both sides of the trading activities which are also shown to be at the top end of the productivity distribution. Additionally, the rate of exits is higher for only-exporting firms compared to only-importers (49.4 percent for only-exporters vs. 43.6 percent for the latter). This might be attributable to higher productivity thresholds for only-importers relative to those of only-exporters, and for which we provide evidence later in this paper.

Table 2.1a: Trade participation and employment rates by trade status

	Percentage of Firms					
	2003-2010	2003	2010	Same Status	Exit	Entry
Non-Traders	36.7	40.0	38.2	16.7	72.3	111.7
Only-Exporters	10.8	8.5	11.9	16.3	49.4	148.5
Only-Importers	13.3	13.9	12.1	18.2	43.6	75.4
Two-way Traders	39.2	37.5	37.6	53.2	33.6	70.8
Total				30.5	51.8	94.5

Notes: Columns 3,4 and 5 give percentage of firms according to 2003 values. The 3rd column gives percentage of firms that hadn't change their status in 2010. Columns 4 and 5 display exit and entry of firms according to 2003.

Table 2.1b: Transition of Firms Between Trading Categories (2003-2010)

	2003	Start Trading	Stop Trading	Switch	2010
Non-Traders	100	11.0	7.9		136.4
Only-Exporters	100	13.9	9.9	24.4	200.4
Only-Importers	100	9.3	9.2	29.0	123.3
Two-way Traders	100	5.1	2.8	10.4	143.3
Total	100				142.6

Notes: The table gives percentage of firms according to 2003 values. The first column shows the number of firms existing in each group in 2003. The next three columns report the switches of continuing firms in and out of each status. The movements between non-traders and the three types of traders are reported in column 2 and 3, while in column 4 we report those traders that switch trading status.

According to Table 2.1b, movements of firms between trading categories also shows significant variation. We observe that it is easier for only-importers to switch to two-way

trading with respect to only-exporters. Moreover, starting to trade as a two-way trader is a rare event for a non-trader whereas stopping to trade for a two-way trader is the least likely outcome.

Consistent with the existing literature our data corroborate that (i) trade is more concentrated than sales and employment; (ii) a high percentage of export volume is performed by a small number of firms which are substantially diversified in terms of destination countries and products (see Appendix for Chapter 2 for a detailed analysis of concentration of trade in Turkey).

2.3 Empirical Analysis

2.3.1 Do internationalized firms perform better?

In this part of the paper, starting with Table 2.2 we identify some stylized facts regarding the performance of internationalised firms. These are in line with the picture that emerged from the literature reviewed earlier. We show a clear ranking of firm types by performance from two-way traders to importers and then to exporters. In particular, we find that non-traders have less productivity, are less capital intensive, smaller in terms of number of employees and sales and, pay lower wages. Conversely, two-way traders are the most productive and capital intensive, have the largest numbers of employees, and pay the highest wages.

Next, we explore the productivity premia between non-traders and trading firms while controlling for other factors that could also impact on performance. For instance, it is well established that larger firms are averagely more productive with respect to smaller firms, or that foreign affiliated firms, on average, are more productive than the domestic firms. Similarly, two-way traders are typically found to be larger and have a higher-level of foreign participation than non-traders. To control for these factors in understanding the performance differentials between firms, and following Bernard and Jensen (1999) and several other studies, we uncover the relationship between firm-level characteristics and international trade status with the following regression:

$$y_{it} = \alpha + \beta_1 D_{it}^{two-way} + \beta_2 D_{it}^{only-imp} + \beta_3 D_{it}^{only-exp} + \delta Controls + \varepsilon_{it} \quad (2.1)$$

Where the subscript i indicates individual firms and t indexes year. The dependent variable y_{it} measures the logarithm either of firms' LP or TFP. Dummy variables for trading status are denoted by $D_{it}^{two-way}$, $D_{it}^{only-imp}$ and $D_{it}^{only-exp}$ respectively. We employ a set of control variables represented by the vector of $Controls$ comprising the logarithm of firm's employment, capital intensity and wage per employee as a proxy of skill intensity, as well as two-digit industry, year and region dummies.[13] We also include a foreign affiliation dummy where the foreign capital in equation (2.1) reveal the average trading premia in terms of productivity. The traders' premia can then be processed from the estimated coefficients as $100(exp(\beta)-1)$, showing the average percentage difference in productivity between a firm in one of the three respective groups of trading firms, and the non-trading firms, while accounting for the features of firms included in the vector of controls.

Table 2.2: Firm performance according to trade status (2003-2010)

	LP	TFP	Employee	Capint	Wage_L
Exporters	10.16	7.76	138.89	10.83	8.79
Importers	10.24	7.83	144.23	10.91	8.82
TW traders	10.29	7.87	164.06	10.96	8.86
Non-traders	9.49	7.17	48.93	9.97	8.51
Only-Exporters	9.67	7.35	47.00	10.34	8.53
Only-Importers	10.07	7.69	85.18	10.79	8.68

The results obtained from the pooled OLS regressions and FE regressions are reported in Table 2.3. For each of these, in the first column we provide the results from standard OLS regression; in the second column, and in order to deal with unobserved aspects of firm-level heterogeneity, we incorporate firm specific time invariant fixed effects; and in the final column we give the results for a dynamic FE model where we include the lagged dependent variable as an explanatory. Supporting the descriptive evidence above, the trade premia in terms of productivity are of considerable magnitude and statistically significant. Specifically, internationalized firms have superior productivity levels than non-trading firms even after controlling for size, capital and skill intensity, region, sector

[13] The region dummies identify 12 Turkish regions, identified with respect to the classification of NUTS2.

and time effects. The magnitude of the trade premia coefficient falls considerably in the FE specifications referring to the role of unobserved heterogeneity and the significance of firm specific factors. For instance, in terms of TFP in the OLS specification two-way traders are estimated to be 51 percent more productive with respect to non-internationalized firms, while in the FE model this premium reduces to 14 percent.

In both the OLS and FE specifications, two-way traders have the biggest premia followed by firms that only import, whereas firms that only export have the lowest estimated premia. Note that the hierarchy suggesting that two-way traders perform best followed by only-importers, and then only-exporters and lastly non-traders remains after the addition of time invariant fixed effects into the equation (1).[14] This performance ordering of firms is in line with other empirical work using this workhorse model (Muuls and Pisu, 2009; Serti and Tomasi, 2009; Altomonte and Bekes, 2009; Silva et al.,2012; Castellani et al., 2010) with the exception of McCann (2009) and Vogel and Wagner (2010).[15] The fact that importers are more productive than exporters can be attributed two different but not mutually exclusive explanations. The first is to do with self-selection effects and associated sunk/fixed costs; and the second is to do with the possible impact of importing on productivity. Indeed, regarding the latter Dalgıç et al. (2015) show that importing has a bigger impact on productivity compared to exporting in Turkish manufacturing industry.

Regarding the former, advocates of self-selection propose that only more productive firms will be able to import due to the presence of fixed costs of importing. That the evidence from both the descriptive statistics and regressions suggest higher performance premia for only-importers (importers) than only-exporters (ex- porters), reinforces the idea of a stronger self-selection mechanism associated with importing at work with respect to exporting. In turn this may be driven by higher fixed costs associated with importing, in comparison to exporting. In the next section, we therefore turn to analysing the existence of self-selection mechanisms with a special focus on the question of whether

[14] In order to compare the coefficients within each regression, we have performed the Wald test of the difference between the coefficients on only-export and only-import dummies. The F-statistics are highly significant rejecting the hypothesis that the two coefficients are equal.
[15] McCann (2009) working with data for Irish firms, and Vogel and Wagner (2010) on data for East and West Germany find that only exporting firms out-perform only importing firms.

a stronger mechanism is at work for importing activities in comparison to exporting in Turkish manufacturing industry.

Table 2.3: Trade premia regressions (2003-2010)

	LP			*TFP*		
	Pooled Regression	FE	Dynamic FE	Pooled Regression	FE	Dynamic FE
Two-way trader dummy	0.591***	0.131***	0.117***	0.401***	0.131***	0.116***
	(0.00621)	(0.00973)	(0.0106)	(0.00641)	(0.00977)	(0.0106)
Only-export dummy	0.144***	0.0716***	0.0607***	0.0801***	0.0725***	0.0606***
	(0.00739)	(0.00972)	(0.0106)	(0.00764)	(0.00977)	(0.0106)
Only-import dummy	0.429***	0.0799***	0.0787***	0.323***	0.0775***	0.0730***
	(0.00744)	(0.00948)	(0.0102)	(0.00764)	(0.00952)	(0.0102)
Observations	111619	111619	85422	111619	111619	85422
R-squared	0.393	0.063	0.070	0.812	0.059	0.054

Notes: Reported in the table are the estimated regression coefficients and the robust standard errors (in parentheses) from estimations of the dependent variables as labour productivity (LP) and total factor productivity (TFP) at time *t* respectively. Asterisks indicate levels of significance (***: p < 1 %; **: p<5 %; *: p<10 %). All regressions contain region, industry, year and foreign affiliation dummies as well as logarithm of firms' number of employees, wages per employee and capital intensity as controls. Dynamic FE regressions include lagged dependent variables. All dependent variables are in natural logarithms.

Note that, so far, the analysis should be largely seen as providing correlations/associations between firm performance and international trade engagement as opposed to unequivocally showing causality. The existing literature frequently fails to employ dynamic specifications in order to address issues of endogeneity.[16] Hence, in order to shed light on possible endogeneity associated with the FE regressions, we test a dynamic specification, and this also serves as a robustness check. We estimate a series of fixed effects regressions where we incorporate the lagged dependent variable as an additional regressor. Including the lagged dependent variable may produce inconsistent and biased parameter estimates because of its correlation with the individual specific effects. While in such cases, GMM estimators are generally used (Bond, 2002; Blundell and Bond, 1998), in large samples as ours the standard results for the dynamic model indicate that the OLS estimator is upward biased, whereas the within-group estimator is biased downward (Bond, 2002; Bernard and Jensen, 2004). Note that we do not utilize any dynamic panel data estimation techniques here and the results from the dynamic FE model only highlight patterns or correlations in the data. We report on the FE estimates with lagged dependent variables for equation (1) in Table 2.3. The results from the dynamic specifications are consistent with our preceding finding demonstrating the

[16] Silva et al. (2013) is the only study that employs such a dynamic specification in this context.

positive correlation between firm productivity and trade engagement as well as the clear pattern of performance ordering among the types of internationalization status. Further, the significant coefficients on the lagged dependent variables in these regressions approves that a firm's performance history impacts its current position.

2.3.2 Self-selection & sunk costs: Exporting vs. importing

Evidence from Tables 2.1a and 2.1b demonstrated a substantial number of firms switching their internationalization status. This variation in our data signals the importance of identifying the self-selection mechanisms at work. In addition, in Table 2.1a we observe a more persistent behaviour for importing firms with respect to exporters and, in Table 2.1b we observe that a higher percentage of importers switch to two-way trading than is the case for exporters. This may suggest higher sunk costs for importing with respect to exporting in Turkey.[17] We therefore proceed by shedding light on whether firms self-select into trade and whether this effect is stronger for importing and finally consider the driving forces behind this.

We start with addressing the question whether being a trader is associated with firms' ex-ante superior performance. If more productive firms become traders then, several years before entry, we should anticipate to catch significant differentials in productivity between future trade starters and future non-starters. In order to do so, we designate an only-export-starter as a firm which had never traded in the previous two years (*t-2 & t-1*) and starts to exporting-only in year *t*. In this way, we can compare firms which did not trade in years *t-2 & t-1* and begin to export in year *t* with firms that did not trade at all. Only-import-starters and two-way-starters are defined similarly. We thus have six cohorts each corresponding to a year between 2005 and 2010. To explore the pre-entry differentials of productivity between trade-starters and non-traders, we estimate the following equation with the usual controls:

$$y_{it-\rho} = \beta_0 + \alpha_i + \beta_1 D_i^{Starter} + \delta Controls_{t-\rho} + \varepsilon_{it}, with\ 1 \leq \rho \leq 2 \qquad (2.2)$$

Where $D_i^{Starter}$ is a dummy taking value one if the firm is a starter and zero if the firm is always a non-trader. The results are documented in Table 2.4, where we consider the

[17] One should also note that since we have a short period over 2003-2010 this finding may also reflect changes in competitiveness though exchange rate is rather stable over the period.

premia with regard to both labour productivity and total factor productivity. The coefficients show the average percentage performance differential at *t-2* between starters at *t* and firms with no international trade activity over the whole period. Overall, and in parallel with previous works we reveal a self-selection effect for both importing and exporting firms. Specifically, the results confirm that internationalized firms have ex-ante higher productivity levels than non-traders. The productivity premia are highest for two-way starters, and this applies both to labour productivity and total factor productivity.

Note also that, the pre-entry levels of the productivity differentials are larger for only-import starters than those of only-export starters. For instance, two years before entering the import market, import starters are 31.9 percent more productive in terms of TFP, and 26.6 percent in terms of LP than always non-traders, while the corresponding figures for export starters are 28.3 percent and 20.4 percent. The differentials are even greater when looking at one year before entry (36.8 percent and 36.9 percent for importers with respect to TFP and labour productivity, and 29.1 percent and 21.1 percent for exporters). This suggests that importing-only firms exhibit ex-ante performance advantages with respect to those that export-only, in turn indicating a stronger self-selection for importing than exporting.[18]

Failing to control for the importing status of exporting firms and vice versa may lead to overstating the role of self-selection in exporting and importing respectively. Thus, we further investigate the productivity premia of future two-way traders compared to future only-exporters and future only-importers. In this way, we account for importers that start to export by comparing firms that imported but not exported in years *t-2* and *t-1* and start to export in *t* with firms that always imported but not exported at all. Similarly, we investigate the productivity premia of exporters that start to import. This can be seen in the last four columns of Table 2.4 where, analogously to before, the coefficients show the average percentage productivity difference at *t-2*, between only-exporters that start to

[18] To provide an alternative approach, instead of estimating equation 2.2 and comparing the coefficients on only-export and only-import starters, we estimate a version of equation 2.2 for exporters and importers using the Seemingly Unrelated Regressions methodology. We test for the equivalence of the coefficients on export/import dummies, and the results indicate that they are statistically different. See Appendix for Chapter 2 for details.

import at *t* (only-importers that start to export at *t*) and only-exporters (only-importers) that do not start to import at all.

Table 2.4: Ex-ante performance differentials of trade starters

						LP				
	(t-2)	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*
Non-trader that starts to export in t (dummy)	0.186***	0.191***								
	(0.0259)	(0.0253)								
Non-trader that starts to import in t (dummy)			0.236***	0.314***						
			(0.0447)	(0.0430)						
Non-trader that start to two-way trade					0.364***	0.415***				
					(0.0270)	(0.0255)				
Importer that starts to export in t (dummy)							0.071**	0.106***		
							(0.0295)	(0.0315)		
Exporter that starts to import in t (dummy)									0.221***	0.281***
									(0.0299)	(0.0292)
Observations	10070	12664	10263	12866	9551	12157	2549	2854	1784	2119
R-squared	0.241	0.251	0.253	0.268	0.246	0.257	0.243	0.265	0.207	0.258
						TFP				
	(t-2)	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*	*(t-2)*	*(t-1)*
Non-trader that starts to export in t (dummy)	0.249***	0.255***								
	(0.0591)	(0.0597)								
Non-trader that starts to import in t (dummy)			0.277***	0.313***						
			(0.0461)	(0.0457)						
Non-trader that start to two-way trade					0.325***	0.444***				
					(0.0964)	(0.0906)				
Importer that starts to export in t (dummy)							0.065**	0.104***		
							(0.0319)	(0.0235)		
Exporter that starts to import in t (dummy)									0.197***	0.251**
									(0.0706)	(0.0689)
Observations	10070	12664	10263	12866	9551	12157	2549	2854	1784	2119
R-squared	0.125	0.116	0.130	0.117	0.129	0.118	0.138	0.145	0.181	0.187

Notes: Reported in the table are the estimated regression coefficients and the robust standard errors (in parentheses) from estimations of the dependent variables as LP and TFP at time *t-2* and *t-1* respectively. Asterisks indicate significance levels (***: p < 1 %; **: p<5 %; *:p<10 %). All regressions contain region, sector, year and foreign affiliation dummies as well as lagged values of capital intensity, wages-per-employee and logarithm of firms' number of employees as controls. All dependent variables are in natural logarithms.

We find that when considering the importing status of export starters, the performance premium of export starters is still present but greatly reduced. The premium is 6.7 percent with respect to TFP and 7.4 percent with regard to labour productivity. Similarly, the productivity premium of import starters goes down, but by considerably, and is 21.8 percent with respect to TFP, and 24.7 percent with regard to labour productivity.

Hence, considering the importing (exporting) status of exporters (importers) respectively serves to accentuate the higher productivity premia associated with importing in contrast to exporting firms. In addition, these findings indicate that the initial pre-entry premia reported in Table 2.4 may overstate the extent to which export and import starters have higher initial productivity levels. We therefore conclude that for Turkish manufacturing firms the self-selection effect is evident in both exporting and importing activities but is stronger with respect to importing. A limited number of studies controls for the importing status of exporting firms or vice versa in investigating self-selection effect associated with entering into foreign markets. Following a similar analysis and using Hungarian data, Altomonte and Bekes (2009) also show that ex-ante productivity of importing is larger than that of exporting.

A stronger self-selection effect at work for import starters compared to export starters might suggest higher sunk costs of importing. Accordingly, we shed some light on the differentials between the sunk costs of importing and exporting. In order to do so, we estimate three dynamic models for firms that only-import, only-export and for firms that involved in both activities. Following Roberts and Tybout (1997), Bernard and Jensen (2004) and Muuls and Pisu (2009), we interpret the lagged dependent variable's coefficient as a measure of the importance of sunk costs. The rationale behind our interpretation is that sunk costs generate hysteresis in export (import) market participation thus we account for sunk costs by means of earlier experience of trade. We estimate the following random effects panel probit regression where we include lagged TFP, wage per labour and number of employees as firm-level performance controls:

$$P(y_{it} = 1, x_{it}, y_{it-1}, u_i) = f(\alpha + \rho y_{it-1} + \beta' x_{it} + u_i) \quad (2.3)$$

Subscript i and index t denotes the individual firms and years, respectively. The dichotomous variable y_{it} denotes if the firm is a trader or not in one of three subsequent

forms (exporting-only, importing-only or being a two-way trader); x consists of our firm level performance controls including the mean of these controls as well as year, industry, and region dummies; u_i captures the firm level unobservables where f denotes the cumulative normal distribution and where u_i can be expressed as:[19]

$$u_i = \beta_0 + \beta_1 y_{10} + \beta_2 \overline{x_i} + \epsilon_i \quad (2.4)$$

The findings from the random effects dynamic probit model are presented in Panel A of Table 2.5. As is standard within the present literature, we corroborate that the more productive the firms are, the more likely they are to self-select into trade. Looking at the coefficients on the lagged dependent variables, we find that Turkish firms face sunk costs of getting into international markets and the nature of these sunk costs differs between exporting and importing.[20] Specifically, we see that the coefficient associated with the lagged import status is higher than exporter coefficient. This suggests that the sunk costs of importing-only are greater than the sunk costs of exporting-only for Turkish manufacturing firms.

Data from the World Bank Doing Business Surveys suggests that there are indeed higher costs of importing for Turkey. Importing a standard container of goods requires larger number of documents, takes more time and costs higher for an importing firm than with respect to those of exporting for Turkish Firms. Over 2005-2012, the period in which the data is available, one can see that cost of importing in all dimensions is higher that of exporting for Turkey.[21]

[19] In order to cope with the initial condition bias in models of dynamic limited dependent variables and the potential correlation between the controls and unobserved heterogeneity, we utilize Wooldridge's (2005) methodology which models firm specific effects u_i as a function of the initial condition and other independent variables. Accordingly, the model becomes a random effects probit model.

[20] The initial trade status coefficients are large in magnitude and statistically significant correcting for the bias introduced by the 'initial condition' problem.

[21] The data suggests that exporting a standard container of goods requires 7 documents, takes 13 days and costs $990. Importing the same container of goods requires 8 documents, takes 14 days and costs $1063 in 2010.

Table 2.5: Dynamic panel probit regressions

	Panel A (without tariffs)			*Panel B (with tariffs)*		
	Only-exporter	Only-importer	Two-way trader	Only-exporter	Only-importer	Two-way trader
Only-exporter (t-1)	0.921***			0.878***		
	(0.0269)			(0.0260)		
Only-importer (t-1)		0.959***			0.949***	
		(0.0225)			(0.0223)	
Two-way trader (t-1)			1.072***			1.055***
			(0.0217)			(0.0211)
Employee(t-1)	0.0889**	0.0925**	0.112**	0.0855**	0.0997**	0.115***
	(0.0371)	(0.0475)	(0.0451)	(0.0442)	(0.0464)	(0.044)
TFP(t-1)	0.0215***	0.0348***	0.0416***	0.0268***	0.0335***	0.0483***
	(0.0067)	(0.0048)	(0.0138)	(0.005)	(0.0043)	(0.0134)
Wage_L(t-1)	0.0100	0.0203**	0.0603*	0.0109	0.0174***	0.0604**
	(0.0449)	(0.0083)	(0.0364)	(0.0424)	(0.0057)	(0.0354)
Observations	85412	85412	85412	85412	85412	85412

Notes: The table reports dynamic panel probit regressions. *(t − 1)* indicates that the variable is lagged. Reported in the table are the estimated regression coefficients and the robust standard errors (in parentheses) from estimations of the dependent variables as binary outcome variables of being an only exporter, only importer and two-way trader respectively. Asterisks denote significance levels (***: p < 1 %; **: p<5 %; *: p<10 %). All regressions contain means of the continuous explanatory variables and initial values of the dependent variables as well as region, industry, year and foreign affiliation dummies as controls.

Such data is not available neither at the product or bilateral levels hence making it impossible to include such information as a variable in our regressions. However, another key variable cost are the tariffs faced by the firms both with regard to importing and in export markets. It is also possible that self-selection mechanisms may be linked to variable costs of trade. As in Bernard et al. (2003) and Melitz and Ottaviano (2008) higher variable costs of trading also mean only higher productivity firms will have the ability to enter into trade markets. That is, they propose altered selection mechanisms grounded on variable costs of trade instead of sunk costs of trading. In their model setting, market size and variable costs determine the toughness of competition and hence the strength of the self-selection effect. In order to control for the variable costs of trading we re-run the dynamic probit regressions in Panel B of Table 2.5 including import and export tariffs as additional controls. In calculating the firm level tariffs, we use import and export tariffs at HS6 digit product category from WITS-Trains database. We then calculate firm level tariffs by weighting each product-country level (e.g. export line) tariff rate with the share

of that product line in the total exports of the firm. In this way, we get an average tariff rate which is specific to each firm. It should be acknowledged that the import and export tariffs can only be observed if the firm is importing or exporting so that the probit estimations in Table 2.5 are prone to selection problems.

The results in Panel B of Table 2.5 reinforces our previous finding that there is a stronger effect of self-selection for importers than exporters, and with the strongest effect for two-way traders. We see that when we control for tariffs, the coefficients representing the sunk costs for exporting and importing shrink to 0.878 and 0.949 from 0.921 and 0.959, respectively; and that the biggest reduction takes place with regard to exporters. This suggests that the tariff-related variable cost element is a more important component of the forces driving self-selection effect for exporters than with respect to importers. However, in addition, now the sunk costs of importing-only become relatively higher than previously in comparison to the sunk costs of exporting-only. Hence failing to consider the variable costs of trade may underestimate the sunk cost differences between importers and exporters.

Next, and given the previous finding that importing is associated with higher sunk costs we try and shed more light on the sunk costs that firms might face while selecting into trade markets. Altomonte and Bekes (2010) argue that importers face uncertainty in their trading relationships (e.g. with regard to the quality of the product). This uncertainty is likely to be higher the more complex is the good being traded; therefore, the fixed costs of trading are likely to be higher for more complex goods. They show that importers are more productive than exporters and associate this with higher import complexity. One way of looking at the dissimilar kinds of goods and at the complexity of goods is to classify them according to their final use. Therefore, we utilize United Nations' Classification by Broad Economic Categories (BEC) and define products traded in three broad categories as: consumption goods, intermediate goods and capital goods.

Table 2.6: Dynamic probit regressions w.r.to BEC classification

	WITH TARIFFS					
	Capital Exporter Only	Intermediate Exporter Only	Consump. Exporter Only	Capital Importer Only	Intermediate Importer Only	Consump. Importer Only
Capital Exporter Only (t-1)	0.919***					
	(0.0387)					
Intermediate Exporter Only (t-1)		0.914***				
		(0.0248)				
Consumption Exporter Only (t-1)			0.820***			
			(0.0396)			
Capital Importer Only (t-1)				0.974***		
				(0.0387)		
Intermediate Importer Only (t-1)					0.923***	
					(0.0277)	
Consumption Importer Only (t-1)						0.831***
						(0.0737)
Observations	82869	83105	83278	82696	83278	83278

Notes: The table reports dynamic panel probit regressions. *(t − 1)* indicates that the variable is lagged. Reported in the table are the estimated regression coefficients and the robust standard errors (in parentheses) from estimations of the dependent variables as binary outcome variables of being an only exporter, only importer and two-way trader respectively. Asterisks denote significance levels (***: p < 1 %; **: p<5 %; *: p<10 %). All regressions contain means of the continuous explanatory variables and initial values of the dependent variables as well as region, industry, year and foreign affiliation dummies as controls.

The descriptive evidence for Turkey reveals that the share of capital goods imports in total imports is greater compared to capital goods exports in total export. Thus, Turkish imports seem to be more complex than exports. We distinguish between three types of firms: capital goods importers/exporters; intermediate goods importers/exporters and consumption goods importers/exporters. An only-importer (only-exporter) firm is defined to be capital goods importer (exporter) if the share of capital goods imports (exports) in its total value of imports (exports) is equal to or greater than 0.5. We define the other categories similarly.

Table 2.6 presents the random effects dynamic probit regressions run with these categories of firms in question. Given the importance of including the variable cost element associated with tariffs, all these regressions include the import and export tariffs faced by each firm. We show that the sunk costs are higher for capital goods, than

intermediate goods, followed by consumption goods, and this applies to both importers and exporters.[22] The coefficient of the lagged dependent variable associated with sunk costs of importing-only are 0.974, 0.923 and 0.831 for capital, intermediate and consumption goods importers respectively. While, the coefficients associated with the sunk costs of exporting-only are 0.919, 0.914 and 0.821 for capital, intermediate and consumption goods importers respectively. Note, first, that in each case these coefficients are higher for importers with respect to those for exporters. Second, that the differential is the largest with regard to capital goods. Once again, these results reinforce our previous finding that sunk costs, to the extent that they drive self-selection, are more important in the case of importing than exporting in Turkey. As the sunk costs of capital goods are higher, this also lends support to the notion that this arises because of the higher complexity associated with such imports (as in Altomonte and Bekes, 2010).

2.4 Concluding Remarks

This paper exploits a recent and inclusive dataset for manufacturing firms in Turkey from 2003 to 2010 to provide the first comprehensive analysis of firm heterogeneity connecting firms' performance to international trade. More importantly, we investigate self-selection into foreign markets systematically for Turkey, with a particular concentrate on the differential between exporting and importing with regard to the self-selection effect, and the role of variable and sunk costs in importing and exporting.

Overall, in line with the picture emerging from the existing literature we show a clear ranking of firm types by performance from two-way traders to importers-only and then to exporters-only. The evidence suggests higher performance premia for only-importers (importers) than only-exporters (exporters), which in turn implies a stronger self-selection mechanism associated with importing with respect to exporting. Indeed, we confirm the self-selection effect for both exporting and importing firms with a more pronounced effect for importers in Turkey.

In so doing so we show that: (i) being a trader is associated with firms' ex-ante superior performance; (ii) the pre-entry levels of firm' s productivity are larger for only-importers

[22] The F-statistics are highly significant suggesting the significance of the differences in parameters in each regression in Table 2.6.

than those of only-exporters; (iii) the self-selection effect is still existent but is somewhat declined with less reduction for importers compared to exporters after controlling for the importing status of exporting firms and vice versa; (iv) the nature of sunk costs differs between exporting and importing where importers face higher sunk costs.

We also show that the self-selection mechanism is associated with both variable and sunk costs. In particular, if we take the tariff related variable costs of trade into account, we reveal that the relative sunk costs for importing are even larger than for exporting. We further show that the sunk costs are highest for capital goods, then intermediate and consumption goods for both of trading activities, with higher sunk costs for importers in terms of each category. These results suggest the importance of further research exploring the determinants of both sunk and variable costs in trade, and the differential costs which are likely to be present between importers and exporters.

3 Does It Matter Where You Export and Does Productivity Rise with Exporting?[23]

3.1 Introduction

There exists a wide literature on the link between exporting and productivity, where much of the discussion is concerned with the issue of self-selection versus learning by exporting. The empirical literature largely draws on the theoretical work of (Melitz, 2003) on heterogeneous firms. A core feature of these models is that exporting involves higher fixed/sunk costs and possibly also higher variable costs. Consequently, only more productive firms will be able to export, hence the self-selection hypothesis. It is also possible however, that exporting activity can lead to productivity growth, which is the learning-by-exporting hypothesis. Early work on this (Clerides et al. 1998; Bernard and Jensen, 1999) found that the superior productivity is driven by self-selection as opposed to learning-by-exporting. More recent evidence is mixed. This derives in part from the use of different datasets for different kinds of countries and different time-periods, and in part from different methodologies employed.

There are several mechanisms through which learning by exporting may occur. These include: greater competition in trade markets inducing firms become more competitive (Damijan and Kostevc, 2006); interaction with foreign buyers who may offer technical assistance or demand higher quality (Blalock and Gertler, 2004); an improved understanding of foreign markets (Eaton et al., 2011); economies of scope or scale arising from access to a larger market or changes in the product mix; investment in product or process innovation (Damijan et.al. 2011), and quality upgrading (Verhoogen, 2008).

There are four closely related strands to this literature. First, there is work focusing on the country and product extensive margins of firm-level exports, which considers what might drive changes in these margins, and what the consequent impact may be on aggregate productivity (e.g. Bernard et al., 2011; Eckel and Neary, 2010; Nocke and Yeaple, 2006; Allanson and Montagna, 2005). Secondly, there is a body of work focusing on the connections between investment/innovation and exporting (for example Aw et.al., 2011;

[23] This paper is published as a working paper as Dalgıç, B., Fazlıoğlu, B. and Gasiorek, M. (2015) "Does it matter where you export and does real productivity really rise with exporting?" MPRA Paper 69956, University Library of Munich, Germany. https://mpra.ub.uni-muenchen.de/69956/.

Eckel et.al., 2015). Thirdly, there is a literature on exports and product quality (e.g. Verhoogen, 2008), and closely allied to this on exports and price-cost mark-ups (De Loecker, 2011; De Loecker and Warzynski, 2012). The first of these strands raises questions concerning the relationship between learning-by-exporting and country/product extensive margins. Given that productivity estimates employed are almost universally revenue-based estimates, the second and third strands, raise questions as to whether observed changes in productivity are driven by adjustments in mark-ups and/or quality. The fourth strand which has had comparatively little attention in the literature (see Wagner, 2012) is on the extent to which the different channels via which exporting activity might affect productivity depends upon the destination market of exports.

This paper integrates and extends the existing empirical literature on the relation between productivity and exports. To this end, we exploit an extremely rich and comprehensive firm level data set of Turkish manufacturing industry firms over the years 2003-2011, a period which Turkey has experienced an export boom as well as undergoing a structural transformation process along with sectoral and geographical diversification. We focus on three key issues.

First, we examine whether measured productivity really rises with exporting this is the issue of learning-by-exporting versus self-selection. We do this by employing propensity score matching (PSM) together with a difference-in-differences (DiD) methodology. Whereas the existing literature has relied on matching and then on estimating the average treatment effects between non-exporters and export starters, we also apply this method to export starters and always-exporters. This allows us to control for selection in a much more satisfactory manner than heretofore.

Secondly, we explore whether the post-entry effects on productivity are driven by changes in productivity, as opposed to quality/price mark-up effects. We do so in two way. The richness of our data set allows us to compute average unit values for firm level exports based on each firm's 12-digit export flows. We use these unit values to control for quality in the propensity score matching. In addition, our data set allows us to categorize each firm's exports by the type of product being exported- for example between differentiated and homogeneous goods. We use such categorization to explore whether the impact on productivity varies across categories.

Thirdly we identify the differentials in immediate and future productivity gains upon entry of firms into export markets with different income levels controlling for the composition of exports. For this we first group countries using World Bank's classification according to gross national income per capita and distinguish between two mutually exclusive groups of markets: High-income (HI) countries and Medium-Low-income (MLI) countries. We then categorize firms on the basis of the destination of their exports. Once again, this is made possible by the richness of the data which gives us the destination for each 10-digit product produced by each firm.

To summarize our results: First, we find clear evidence of learning-by-exporting and consistent with earlier work this is primarily with regard to exporters to high income countries. When we control for quality effects, the learning-by-exporting effects become larger for exporters to high income countries, but we find no evidence of an increase in productivity for exporters to medium and low-income destinations. We find a bigger impact on productivity for high-technology and skill-labour intensive products, as well as for differentiated products where we find no impact of exporting for primary/resource/unskilled labour-intensive products. This is consistent both with a learning-by-export hypothesis, but also with changes in mark-ups and/or quality. Once we control for quality however we still find a positive impact which suggests that productivity is positively associated with exporting. However, as for MLI starters we only find some evidence of a positive impact on productivity with regard to differentiated products. Our results strongly suggest where you export matters. Finally, we find a larger positive impact on productivity associated either with exporting to more countries, or with exporting more products. This suggests there may be economics of scope either in the product or country dimension.

The rest of this paper is systematized as follows. Section 3.2 gives a brief overview of the literature. Section 3.3 discusses data and preliminary descriptive evidence. Section 3.4 provides the results of the empirical exploration. Section 3.5 concludes.

3.2 Related Literature

The heterogenous firms in international trade literature largely builds on the works of Melitz (2003) and Bernard et al. (2003). Due to sunk costs and differential levels of productivity inside the same industry borders only firms which are the most productive

self-select into export markets. One alternative but not mutually exclusive reasoning regarding the better performance of exporting firms is that firms get more efficient following they start exporting via learning or economies of scale effects (Clerides et al., 1998).[24]

Evidence on self-selection versus learning-by-exporting (LBE) is mixed. Several authors uncover little or no evidence of LBE. This includes, for example, Clerides et al (1998) using data on Mexico, Columbia and Morocco; Arnold and Hussinger (2005) with regard to German firms; and Greenaway et al. (2005) for Swedish firms. Damijan and Kostevc (2006) with regard to Slovenian firms, and Eliasson et al (2012) using data on small and medium sized Swedish firms find an initial one-period impact on observed productivity but that the productivity gap then remains constant. A possible explanation for this is a short-run increase in capacity utilization with no longer run impacts on productivity.

Alvarez and Lopez (2005) used the term "conscious self-selection" to describe firms choosing to invest in order to increase productivity in preparation for exporting. Costantini and Melitz (2007) show analytically how trade liberalization can increase the rate of return on R&D or investment in new technology leading to future endogenous productivity gains (see also Atkeson and Burstein, 2010). In a dynamic model Burstein and Melitz (2011) show how innovation and the decision to export endogenously interact, as a result amplifying the productivity differences between exporters and non-exporters. In these papers size of export markets impacts the firm choice to export or invest in new technology.

Alvarez and Lopez find strong evidence supporting the notion of self-selection as a conscious process. Bustos (2011) studying with Argentinian firms reveals how exporting enables firms to make investment in novel technologies giving rise to superior productivity. Aw et al. (2011) based on Taiwanese data show how investments in R&D and technology adoption are correlated with exporting and therefore productivity. In related work Damijan and Kostevc (2006) find evidence that exporting activity positively impacts on innovation; and Iacovone and Javorcik (2008) show that Mexican firms improve quality (unit values) prior to exporting to the United States in response to

[24] See Wagner (2007); Greenaway and Kneller (2007) and Silva et.al (2012) for relevant surveys.

NAFTA. Eckel et al (2015) integrate the literature on multi-product firms with the literature on endogenous investment and show that firms may choose to compete in export markets either with respect to cost, or with respect to quality and that this depends on the nature of the markets they are exporting to and the nature of the products they produce. They test the model on Mexican data and show that firms producing differentiate products tend to compete on quality, while those producing non-differentiated goods compete more on price.

De Loecker (2010) debates that prevailing studies tend to bias against rejecting the LBE hypothesis. This is because firms often decide to export and invest to export simultaneously, and hence that exporting experience matters in shaping a firm's productivity in the future. Building his work on Slovenian data, he shows considerable productivity improvement related with export entrance (i.e. up to 7.35%). Similarly, Van Biesebroeck (2005) reveals that exporting firms in sub-Saharan African economies experience higher productivity and further rise their productivity once they enter into the export markets, where the key driver for the productivity differences is economies of scale through access to larger markets. Similarly, positive LBE effects have been found by Par and Nan (2004) on Swedish firms, Serti and Tomasi (2008) for Italian firms, Cirera et al. (2015) for Brazilian firms, and Manjon et al. (2013) for Spanish firms.

There is also a related literature on the diversification of firms' activities with respect to country and product extensive margins (see Mayer and Ottoviano, 2007). Lawless (2009) adapts the Melitz model to allow for differential fixed costs across markets, and then tests the model on Irish data and finds that more productive firms export to more countries. Trade is typically found to be concentrated within a few firms characterized with a large degree of diversification in terms of products and geography (see Bernard et al. (2007) for the US, Muuls and Pisu (2009) for Belgium, Eaton et al. (2004) for France, and Castellani et al. (2010) for Italy). A diversification premium is found by Andersson et al. (2008) and Castellani et al. (2010) who find a positive correlation between firm performance and geographical and product diversification.

Along with the number of foreign markets served there has been some work on the characteristics of these markets. This includes models covering asymmetric foreign markets and asymmetric sunk costs of entry. Helpman et al. (2007) and Chaney (2008) build on Melitz (2003) model and find that self-selection depends on the market that the

firm operates in. Firms with inferior productivity sell countries with lower productivity thresholds (less developed markets) while firms with higher productivity sell countries with higher thresholds of productivity (more developed markets). The empirical evidence indicates that exporters to economies which are more developed demonstrate ex-ante better performance compared to those firms which export to less developed markets (see Pisu (2008) on Belgian firms; Serti and Tomasi (2009) and, Conti et al. (2010) with respect to Italian firms; Silva et al. (2012) for Portuguese firms).

There is however comparatively little evidence on LBE by destination. Conceptually this could occur as a result of greater competition in markets of developed countries (Damijan and Kostevc, 2006); greater interaction with firms/suppliers operating close to the technology frontier (Blalock and Gertler, 2004; Albornoz and Ercolani, 2007), and with improved techniques of quality control; greater opportunities to benefit from economies of scope or scale arising from access to a larger market or from changes in the product mix; or from an improved understanding of foreign markets (Eaton et al., 2011).

With regard to evidence on LBE by destination, De Loecker (2007) reports greater productivity gains for firms in Slovenia exporting to regions with higher income. Similarly, Damijan et al. (2004) reports evidence on Slovenian exporters that learning effects can arise only for the firms exporting to more advanced markets. Wilhelmsson and Kozlov (2007) find significant productivity gains upon entry for Russian manufacturing firms entering into OECD export markets. Using Belgian manufacturing data, Pisu (2008) cannot find evidence of LBE effects, regardless of the features of destination markets. Pisu suggests post-entry effects might also differ due to certain development paths of origin countries, in addition to the features of destination economies. Recent studies, including Damijan et al. (2010), Ito and Lechevalier (2010), and Ito (2012) identify the conditions under which LBE is at work and find that characteristics of export destinations matter as well as pre-exporting R&D intensity and firm size. Fernandes (2007) finds strong evidence of LBE for young Columbian firms, and in sectors that export a greater proportion of their exports to countries with higher income levels. Trofimenko (2008) conceptually develops on Clerides' (1998) model via letting for greater costs of entry into more developed foreign markets and supposing that learning outcomes differ by development level of the destination country. Building his

work on Columbian data, Trofimenko (2008) reveals that the effect of exporting on productivity is larger when exporting is to richer markets.

3.3 Data and Preliminary Evidence

In this paper, we exploit a recent panel of firms merging two different data sets collected by TURKSTAT. The Annual Industry and Service Statistics (AISS) provides comprehensive information about a number of structural variables mainly observed on firms' balance sheet and it is a census of firms with more than 19 employees. In the dataset, firms are classified according to their main sector of activity, as identified by Eurostat's NACE Rev.1.1 standard codes for sectoral classification. The Foreign Trade Statistics consists of the exports and imports at 12-digit GTIP classification as well as origin/destination country information. For this study, we choose the entire population of private Turkish manufacturing firms with 20 employees or more.[25] After a cleaning procedure mainly inspired by Hall and Mairesse (1995)[26], our unbalanced panel covers longitudinal data of 18,286 firms on average over the period 2003-2011.

Our empirical investigation is based on estimates of firm level productivity, based on total factor productivity (TFP) estimates calculated by utilizing Levinsohn and Petrin's (2003) semi-parametric approach. We do so at the 2-digit sectoral level where TFP is measured as the residual of labour and capital over value added under a Cobb-Douglas technology, employing the firms' usage of intermediate inputs as a proxy variable for unobserved productivity shocks. Before proceeding with the empirical analysis, we first group traders according to their destination market. We utilize the World Bank's classification of countries according to gross national income-per-capita, and distinguish between two mutually exclusive groups of countries High-income countries (HI) and Medium-Low-income countries (MLI).[27] We define a firm selling all of its exports to HI regions as an only-HI-exporter, a firm directing all of its total export value to MLI countries as an only-

[25] Firms with 20 and more than 20 employees constitute a large portion of manufacturing industry in Turkey. For instance, it accounts for 87 percent of production value and 75 percent of employment in 2009 with a similar pattern for other years.

[26] Since they include a small number of firms, we also excluded firms in NACE Rev. 1.1 sectors of 16, 23, 30, 37 which are manufacture of tobacco products, manufacture of coke, refined petroleum products and nuclear fuel, manufacture of office, accounting and computing machinery and, recycling respectively.

[27] Medium-Low-income countries correspond to non-high-income countries, defined by the World Bank as countries with 2007 per-capita gross national incomes lower than $11,456 computed in U.S. dollars using the Atlas conversion factor.

MLI-exporter and firms exporting both to the HI and MLI countries as both high and medium-low income exporters. In Table 3.1, we present the distribution of exporters in each group as well as total number of exporters in each year. We see that throughout the period between 2003 and 2011, 50-55% of firms trade with more than one group of countries and that the share of firms exporting only to MLI countries rises from 15.7% of firms to 26.2%, with a corresponding decline in the relative importance of firms exporting only to HI countries. This transition is driven by the decline of the EU and EFTA countries as export destinations and the development of new markets in the Middle East and North Africa (MENA) as well as in Europe and Central Asia.

Table 3.1: Distribution of firms w.r.to export Orientation

	$Exporter^{Only\_HI}$	$Exporter^{Only\_MLI}$	$Exporter^{Both}$	$Exporter^{Only\_HI}$	$Exporter^{Only\_MLI}$	$Exporter^{Both}$	# Exporters
2003	2124	1041	3466	32,03%	15,70%	52,27%	6631
2004	2349	1262	4057	30,75%	16,52%	53,12%	7638
2005	2568	1783	4804	28,05%	19,48%	52,47%	9155
2006	2415	1955	5109	25,48%	20,62%	53,90%	9479
2007	2155	1893	5023	23,76%	20,87%	55,37%	9071
2008	1952	1925	5083	21,79%	21,48%	56,73%	8960
2009	1770	1820	4691	21,37%	21,98%	56,65%	8281
2010	1988	2596	5675	19,38%	25,30%	55,32%	10259
2011	1953	2710	5663	18,91%	26,24%	54,84%	10326

Motivated by the stylized facts in the literature that exporters to more developed markets display better performance with respect to exporters to less developed countries, Table 3.2 provides some descriptive comparisons where we compare TFP, labour productivity LP, capital intensity (CAPINT), wage per employee (WAGE L), total manufacturing sales (SALES) and number of employees (EMP). The table gives the means of these variables for firms exporting to destination markets according to destination country income levels. Our findings suggest that firms exporting to both kind of regions outperform others. That is both HI and MLI exporters are the most productive, most capital intensive and biggest in terms of sales and number of employees and, pay the highest wages. One can also see that only-HI-exporter show superior performance with respect to only-MLI-exporters.

Table 3.2: Firm performance according to export orientation

	TFP	LP	CAPINT	EMP	WAGE_L
$Exporter^{Only\_HI}$	7.830	10.078	10.672	101.070	8.702
$Exporter^{Only\_MLI}$	7.480	9.961	10.421	75.271	8.642
$Exporter^{Both}$	7.918	10.316	10.943	183.083	8.811

We also present the results of 'standard' premia regressions. These follow the often used methodology in the literature (e.g. Pisu, 2008; Serti and Tomasi, 2009) where we estimate a dynamic panel model with fixed effects and using dummies for export market participation.

The dependent variable measures the TFP (in logarithms) where subscript *i* denotes individual firms and *t* indexes year. Dummies for the export market orientation are denoted by $Exporter_{it}^{Only-HI}$; $Exporter_{it}^{Only-MLI}$ and $Exporter_{it}^{Both}$, respectively, dummy variables for a only-HI-exporters, only- MLI-exporters and both HI and MLI exporters. The beta coefficients in front of the export orientation dummies represents the average trading premia for firms that export to different markets, with respect to the baseline category of non-exporters. We employ a series of controls comprising the logarithm of the number of employees in each firm, a foreign ownership dummy, an import status dummy specifying if a firm is an importer or not, two-digit industry, year and region dummies. We also incorporate firm-specific time-invariant fixed effects.

$$TFP_{it} = \beta_0 + \alpha_i + TFP_{it-1} + \beta_1 Exporter_{it}^{Only-HI} + \beta_2 Exporter_{it}^{Only-MLI} + \beta_3 Exporter_{it}^{Both} + \delta Controls + \varepsilon_{it} \quad (3.1)$$

The results obtained from the specification of fixed effects panel are shown in Table 3.3, where we report only on the export destination dummies. We find that firms exporting only to HI countries perform better than firms exporting only to MLI countries whereas non-exporters perform the worst. Firms exporting to both HI and MLI countries have the highest premia and this may reflect the fact that firm performance is increasing with firms' geographical scope. Note such a specification provides a correlation between firm productivity and exporters' status but does not satisfactorily deal with the issue of self-selection and the post-entry effects by exporting. It is to this that we now turn.

Table 3.3: Exporter premia by destination

VARIABLES	TFP
onlyhi_exporter	0.0432***
	(0.00958)
onlymli_exporter	0.0355***
	(0.00859)
both_himli_exporter	0.0717***
	(0.00920)
Observations	100955
R-squared	0.025

Notes: Reported in the table are robust standard errors (in parentheses). Asterisks indicate significance levels (*** p<0.01; ** p<0.05; * p<0.1).

3.4 Empirical Analysis

3.4.1 Post-entry differentials: Baseline specification

In this part of the study, we aim to identify whether there are productivity gains associated with exporting and whether there is heterogeneity in those gains arising from exporting to different destination markets. To overcome the problems of self-selection bias in the standard regression equation as above, we use matching techniques by applying propensity score matching (PSM) and then look at the average treatment effects between our treatment and control groups. In addition, we use a difference-in-differences (DiD) approach which further removes the effects of common shocks and provide clear estimates of the treatment effect on the change in productivity differentials.

Our aim is to estimate the productivity gains associated with export entry separately for HI and MLI countries. In a baseline specification, to estimate the productivity gains associated with export entry separately for HI and MLI countries we establish two treatment models. Our treatment group entails firms that do not export at time $t-1$, start exporting only to the HI countries (MLI countries) at time t and continue exporting only to the HI countries (MLI countries) at least until time $t+1$. Accordingly, we have seven cohorts each corresponding to a year between 2004 and 2010.

Note that here we constrain our treated sample to firms that start exporting to only HI or only MLI countries. Although these firms constitute a smaller portion of the sample, this

restriction is necessary to accurately recognise the differentials in productivity gains. In the third and fourth models, the treatment group contains firms which were exporting only to the MLI countries (HI countries) at time $t-1$ and start to export to HI countries (MLI countries) at time t and continue to export both types of markets at least until time $t+1$. Our control group comprises of the firms that continue exporting only to the MLI countries (HI countries) over the analysis period. We compute the average treatment effects on the treated (ATT) as follows:

$$ATT = E(Y_{it}(1) - Y_{it}(0)|D_i = 1) = E(Y_{it}(1)|D_i = 1) - E(Y_{it}(0)|D_i = 1) \quad (3.2)$$

Equation (3.2) illustrates the difference between the productivity level after the firm, which is formerly non-exporter ($D_i = 1$), starts exporting only to the HI countries (MLI countries) $(Y_{it}(1)|D_i = 1)$ and the potential productivity it would have if it would have never exported to HI countries (MLI countries) $(Y_{it}(0)|D_i = 1)$. The potential outcomes of both models are unknown. Nonetheless, we can compute the outcome for control groups, which can be described as $E(Y_{it}(0)|D_i = 0)$. However, as is well known, there can be selection bias in the calculation of the ATT. The bias is defined as:[28]

$$B(ATT) = E(Y_{it}(0)|D_i = 1) - E(Y_{it}(0)|D_i = 0) \quad (3.3)$$

To overcome the potential selection bias, we employ PSM jointly with DiD.[29] Pioneered by Wagner (2002) in this context, the PSM methodology has been subsequently used by others (Arnold and Hussinger (2005) on German firms; Greenaway et al (2005) on Swedish firms; Damijan and Kostevc (2006) on Slovenian data; Manjon et al (2013) on Spanish data). But as detailed below, in this paper we use improved control and treatment groups, as well as controlling for quality. The DiD method removes the impact of common shocks and provides clearer estimates of the treatment effects on the productivity differentials. We define the PSM-DID estimator as follows, where the resultant ATT provides the differential between average treatment effects of treated and non-treated groups in which time-invariant unobservables are uninvolved:

[28] Dehajia and Wahba (2002) propose that comparing a treatment group with a non-experimental control group could produce biased results due to problems of self-selection or some form of systematic judgment by the researcher in selecting treatment units.

[29] See Blundel and Costa Dias (2000) for a discussion of the use of matching techniques with DiD in order to improve the quality of non-experimental evaluations.

$$\Delta^{PSM-DID} ATT = E(Y_{it}(1) - Y_{it}(0)|D_i = 1) - E(Y_{it}(1) - Y_{it}(0)|D_i = 0) \quad (3.4)$$

To find the control units to be matched with the treated units we first estimate probit models from which we retrieve the propensity scores. Note that the Thus, we have seven cohorts each corresponding to a year between 2004 and 2010.

This probit specification *(in equation 3.4)* is estimated pooling these seven cohorts. Accordingly, in the first two treatment models, we keep the firms in the control group that are always non-exporters *for all the years they are in the sample,* whereas we keep the firms in the treatment group (that do not export at time t-1, start exporting only to the HI countries/MLI countries at time t and continue exporting only to the HI countries/MLI countries at least until time t+1) *only for the year they start exporting*. In the third and fourth treatment models, we keep the firms in the control group (that continue exporting only to the MLI countries/HI countries over the analysis period) *for all the years they are in the sample,* while we keep the firms in the treatment group (that were exporting only to the MLI countries/HI countries at time t-1 and start to export to HI countries/MLI countries at time t and continue to export both types of markets at least until time t+1) *only for the year they start exporting to HI countries/MLI countries*. Note that we employ the pooled sample since by this way, we are able to use the information contained in the largest possible sample for specifying the export-starting decision.

The dependent variable in the probit specifications is the probability to start to export HI countries (MLI countries) at time t and the vector of covariates contains TFP, wage per employee, number of employees and capital intensity in logarithms and, foreign ownership as well as year, sector, region and import status dummies. All of the independent variables are lagged one year. We incorporate covariates in their lagged values since current values of such variables could also be impacted by the exporting behaviour of the firms. Making use of the propensity scores resulting from the probit estimates, we apply kernel matching.[30] For the quality of the matching we test if the

[30] There are alternative matching methods that could be used, such as nearest neighbourhood matching, stratification matching and radius. No particular method is unambiguously preferred (Becker and Ichino, 2002). Asymptotically all estimators should give similar results, since in large samples they all boil down to comparing only exact matches (Smith, 2000). However, the performance of different matching estimators might change in smaller samples depending on the data structure (Zhao, 2004). For instance, where there are a lot of comparable untreated individuals employing more than only nearest neighbour (either by kernel matching or oversampling) may be advised for increased precision in the estimates, as this exploits as much of the information as possible from the control groups (Caliendo and Kopeinig, 2008). Hence in our context, owing to the smaller number of observations in our treatment groups, we utilize

means of covariates are significantly different in the matched and unmatched samples. The results (see Appendix, Table 3.A1) imply that the procedure of matching eliminates the inequality for means of covariates and significant differences vanish in the matched sample.

The resulting average treatment effects (ATTs) in Panel A of Table 3.4 provides us with a productivity comparison between export starters and never-exporters some years before and after entry. The first column of the table gives the ATTs for non- exporters who start to export only to HI, and the second column for non-exporters who begin to export only to MLI; and the subsequent two columns then give those that were exporting to HI (MLI) and then also start exporting to MLI (HI). The top panel of the table gives the ATTs prior to exporting; the middle panel gives the ATTs once firms start to export; and the bottom panel gives the results for the difference-in-difference estimations.

From Table 3.4, Panel A we see that prior to exporting there is an increase in the productivity differential between non-exporters and export starters. This suggests that before starting to export, export starters are becoming increasingly more productive than non-exporters signalling some preparation for exporting i.e. self-selection. This impact is stronger for non-exporter firms that start to export to HI countries (HI-starters) in comparison to firms that start to export to MLI destinations (MLI-starters). For example, the difference in productivity levels between export-starters and non-exporters in period $t-2$ is considerably higher with regard to HI exporters (42 percentage points) as opposed to MLI exporters (13 percentage points).

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kernel matching methodology.

Table 3.4: Average treatment effects from PSM-DiD

	Non-Exporter Firms Start to Export Only to HI	Non-Exporter Firms Start to Export Only to MLI	Only MLI Exporter Start to Export to HI	Only HI Exporter Start to Export to MLI
PANEL A:				
TFPt-3	0.231***	0.122***		
	(0.071)	(0.041)		
TFPt-2	0.423***	0.137***		
	(0.042)	(0.042)		
TFPt-1	0.493***	0.149***		
	(0.043)	(0.042)		
PANEL B:				
TFPt	0.533***	0.158***	0.365***	0.192**
	(0.046)	(0.047)	(0.119)	(0.094)
TFPt+1	0.550***	0.195***		
	(0.045)	(0.05)		
TFPt+2	0.606***	0.204***		
	(0.061)	(0.062)		
PANEL C:				
TFPt+1-TFPt-1	0.041*	0.034*	0.229*	0.133*
	(0.023)	(0.018)	(0.134)	(0.076)
TFPt+2-TFPt-1	0.054**	0.035**		
	(0.027)	(0.018)		
TFPt+3-TFPt-1	0.054*	0.039**		
	(0.029)	(0.017)		

Notes: Reported are standard errors (in parentheses). Asterisks indicate significance levels (*** p<0.01; ** p<0.05; * p<0.1).

In Panels B and C, we identify the impact of starting to export only to the HI countries (MLI countries) on the productivity of formerly non-exporting firms. Hence the first column gives the ATTs and the DiD coefficient for firms that were previously non-exporters and now export only to high income countries. What is clear from the table is that the productivity of export starters is greater than those that remain non-exporters, and that exporting to HI or MLI countries improves the productivity of the previously non-exporter firms. This can be seen from the increase in the PSM coefficients over time, and from the DiD coefficient. When the unobserved time-invariant effects are eliminated with the DiD methodology, the increase in productivity between $t-1$ and $t+1$ for exporters to HI is 4.1% and for MLI it is 3.4%. Note also that the difference in productivity between export-starters and non-exporters in period t is considerably higher with regard to HI exporters (53 percentage points) as opposed to MLI exporters (16 percentage points).

In the third and fourth columns of the table, we give the results where the treatment group covers firms that were exporting only to the MLI countries (HI countries) at time $t-1$ and start to export to HI countries (MLI countries) at time t and endure exporting both types of markets at time $t+1$. Our control group consists of the firms that continue to export only to the MLI countries (HI countries) over the analysis period. Thus, we present the differential impact of starting to export to HI (MLI) countries on the productivity of firms who were formerly exporting only to the MLI (HI) countries. In this way we control for the previous exporting status of firms and see whether productivity gains still differ between HI and MLI markets. Once again, we observe positive and significant productivity gains from starting to export to HI (MLI) and as before the gain in productivity is greater for firms that start to export HI destination countries in comparison to those that start to export MLI destinations. The increase in productivity from the PSM-DiD estimates suggests that switching from being an MLI exporter to also being an HI exporter increases productivity by nearly 23 percent, and conversely switching from being an HI exporter to also being an MLI exporter increases productivity by just over 13 percent.[31]

Note that an alternative interpretation for Table 3.4 is that revenue TFP increased because the demand elasticity in the high-income country dictated a higher price for a good that was previously sold at a relatively low lira price in a middle-income country. That is, if the firm is charging different prices in different destinations because of different demand elasticities, then revenue productivity will change when the set of markets changes purely because of a composition shift in pricing. Further, the increase in the TFP effect over time could be driven purely by selection bias. Accordingly, the results from the preceding table and discussion that identifies the positive effect of exporting on productivity might be potentially problematic in two dimensions. First, and as discussed above our productivity estimates are revenue-based measures and it is possible that the observed change in

[31] We also conducted sensitivity analysis on our definition of being a HI (MLI) exporter firm, we redefine an HI (MLI) exporter as a firm selling more than 50 percent of its exports to HI (MLI) countries. We alternatively define two different cut-offs of 75 percent and 90 percent. By doing so, we aim to see the impact of starting to export to HI (MLI) countries with a share of more than 50/75/90 percent while being a non-exporter formerly. Results from the new sets of specifications corroborate our previous findings. First of all, post entry productivity gains of starting to export to HI countries are always greater than that of MLI countries. Further, the more countries are HI (i.e. the larger the share of HI-countries within a firm's total exports/ the larger the cut-offs) as opposed to MLI, the bigger are the coefficients (i.e. treatment effects). Consistently, as the share of exports to MLI countries within a firm rises, ATTs decrease. (See Table 3.A2 in Appendix)

productivity does not reflect changes in productivity, but instead is a result of changes in quality or mark-ups. Second, although our procedure suggests that the matching removes the inequality for means of covariates and significant differences disappear in the matched sample, it is still possible that in some other unobserved dimension the export starters are different to the non-exporters and that selection issues remain.

We deal with each of these in the following manner. Our rich trade data set gives us the exports of each firm up to the 12-digit level. For each exporting firm we therefore calculate the weighted average unit-value based on the value of exports.[32] Note that, adding prices of exported products as controls for quality might be criticized for two main reasons. First of all, one may argue that in order to measure quality, one needs to cross the information about sales and prices (two firms with the same price but one sells more). This is not relevant for our case as we use a weighted average unit-value for each firm where the weights are defined as the share of each 12-digit export flow in firm's total export value. Next, the observed price might only refer to exports and not to the entire production of a firm, while revenue TFP is based on the latter. Due this effect our proxy for price might be far from a perfect measure of quality yet it still hints on the relationship. Thus, including the weighted average unit-values as a control for export quality we re-run the PSM matching routine where our treatment group is as before- non-exporting firms that start to only export to HI(MLI); but this time our control group are those firms that always only export to HI(MLI) throughout our sample period. This procedure, therefore neatly handles both the issue of quality (and to a large extent therefore mark ups as these are typically highly correlated with quality) and the issue of selection, as we are now comparing export starters with always exporters. To our knowledge applying the PSM by comparing export starters with always exporters has not been previously done, neither has the literature controlled for quality in this way.

The results for this are given in Table 3.5, where the first three columns give the PSM results and the last three columns the DiD results. If, ceteris paribus, exporting leads to higher productivity then, over time, for exporting firm's productivity should rise. Therefore, if we compare the productivity of firms previously exporting with the productivity of export starters we would expect the ATT to be negative- which is what

[32] Note we only have this information for firms that export and we do not have this for the non-exporters.

we find. The PSM results in the first three columns are negative, declining over time, but only statistically significant for exporters to HI for the first two periods. This indicates that firms exporting to HI destinations see the productivity gap between themselves and the always exporters diminish over time. In turn this is confirmed by the DiD results, which suggest a productivity increase for the HI export starters of 11.1%. Note that this suggests that once we control for quality, the effect of exporting on productivity is larger than in the preceding table. The DiD results further suggest that productivity improvement takes place mainly in the first year although we do find on-going productivity gains as much as three years after from export entry. Finally, what is interesting from this table is that once we control for quality/mark-ups and for the possible remaining selection problems associated with our first set of control groups, there is no evidence of an increase in productivity for exporters to MLI destinations. In other words, with respect to MLI exports the observed productivity increase seen previously in Table 3.4 might arise from either a quality or mark-up effect.

Table 3.5: Average treatment effects from PSM-DiD with an alternative control group

	PSM			DID		
	TFPt	TFPt+1	TFPt+2	TFPt+1-TFPt-1	TFPt+2-TFPt-1	TFPt+3-TFPt-1
Non-Exporter Firms Start to Export Only to HI	-0.178**	-0.141*	-0.063	0.111*	0.122*	0.128*
	(0.086)	(0.080)	(0.224)	(0.067)	(0.069)	(0.069)
Number of Starters	1044	1044	1044	1044	1044	1044
Number of Obs. in Control Group	1565	1565	1565	1565	1565	1565
Non-Exporter Firms Start to Export Only to MLI	-0.065	-0.047	-0.036	0.072	0.072	0.083
	(0.173)	(0.189)	(0.211)	(0.089)	(0.098)	(0.133)
Number of Starters	1104	1104	1104	1104	1104	1104
Number of Obs. in Control Group	1632	1632	1632	1632	1632	1632

Notes: Reported are standard errors (in parentheses). Asterisks indicate significance levels (*** p<0.01; ** p<0.05; * p<0.1).

3.4.2 Post-entry differentials by factor intensity and product sophistication

Post-entry productivity differentials between exporting to HI and MLI markets may emerge due to the fact that HI countries have a greater demand for more sophisticated products which in turn may be associated with more learning effects. Thus, we proceed by further exploring whether the post-entry effects on productivity are driven by changes in productivity and whether the differentials between exporting to different markets still remain. To do so we utilize the product level information in our data set and categorize

firms' exports by the type of the product being exported. We perform PSM-DiD estimations over sub- samples where we classify firms according to their export composition in terms of their export products.

One way of looking at the different types of goods with different sophistication levels is to classify them according to Hinloopen and Marrewijk (2008) classification. Hinloopen and Marrewijk (HM, 2008) decompose trade into six categories: primary products; natural resource intensive products, unskilled labour-intensive products; technology intensive products; human capital-intensive products; and other. Using the HM classification, we distinguish between three types of exporters: primary/resource/unskilled labour-intensive (P/R/U) goods exporters, technology intensive goods exporters, and skilled-labour (human capital) intensive goods exporters. To define a firm's export sophistication level in terms of HM classification, we rank export products of different types based on their share within a firm's total exports value. A firm is defined to be "skilled-labour intensive goods exporter" if the skilled-labour intensive goods exports has the largest share in a firm's total value of exports. We define the other categories similarly. As an alternative to HM classification in defining firms' export composition, we adopt the Rauch (1999) classification where differentiated products signify the products of the sector with higher degree of quality differentiation.

Here, we employ the PSM matching procedure over the sub-samples constructed upon HM and Rauch classifications where our treatment group is as before- non-exporting firms that start to only export to HI(MLI) and our control group consists of those firms that always only export to HI(MLI) throughout our sample period. For instance, for the technology intensive goods exporters sub-sample our treatment group comprises of non-exporting firms that start to export technology intensive goods[33] only to HI(MLI) countries whereas the control group are those firms that always export technology intensive goods only to HI(MLI) throughout our sample period.

In Panel A and B of Table 3.6 we present the ATT estimates for the HM and Rauch classifications respectively. Once again, we find a negative ATT for period *t*, which

[33] Note again that, we define a firm to be a technology-intensive-good-exporter if technology intensive goods have the largest share in that firms' export basket. Thus, a given firm does not have to export only technology intensive goods.

corroborates the results found earlier. Secondly, we find that starting to export to HI countries is found to improve the productivity of non-exporter firms even after controlling for the composition of exports as well as the quality proxied by unit values for high-tech/skill-intensive products. For instance, for HI export starters, ATTs from the DiD estimates for the period $t + 3$ suggest a productivity increase for the technology intensive good exporters of 13.2%, for skill-intensive goods exporters of 12.2%, while the coefficient is not significant for the unskilled labour-intensive/primary/resource intensive exporters. Given that we are controlling for quality/price mark-up effects, these results suggest strongly that the productivity gains we find are associated either with some form of technology/managerial spillovers from interactions with foreign buyers, or from economies of scale. We also reveal that the productivity gains appear to be primarily in the first year of exporting, with only a very modest subsequent increase in productivity for technology intensive goods. Finally, it is also worth noting that there are no statistically significant productivity gains for MLI-starters.

Table 3.6: Average treatment effects from PSM-DiD w.r.to composition of exports

	PSM	DID				
	TFPt	TFPt+1	TFPt+2	TFPt+1-TFPt-1	TFPt+2-TFPt-1	TFPt+3-TFPt-1
PANEL A: HM CLASSIFICATION						
Primary/Resource/Unskilled-labour Intensive						
Non-Exporter Firms Start to Export Only to HI	-0.177	-0.131	-0.133	0.104	0.102	0.096
	(0.126)	(0.080)	(0.081)	(0.097)	(0.091)	(0.099)
Non-Exporter Firms Start to Export Only to MLI	-0.063	-0.039	-0.023	0.002	0.009	0.190
	(0.299)	(0.339)	(0.387)	(0.197)	(0.236)	(0.341)
Technology Intensive						
Non-Exporter Firms Start to Export Only to HI	-0.201***	-0.171**	-0.061**	0.123*	0.129*	0.132*
	(0.062)	(0.065)	(0.023)	(0.067)	(0.066)	(0.069)
Non-Exporter Firms Start to Export Only to MLI	-0.077*	-0.071	-0.068	0.091	0.096	0.098
	(0.046)	(0.080)	(0.101)	(0.102)	(0.108)	(0.094)
Human-Capital Intensive						
Non-Exporter Firms Start to Export Only to HI	-0.189**	-0.143*	-0.063	0.121**	0.124**	0.122**
	(0.088)	(0.080)	(0.204)	(0.059)	(0.055)	(0.061)
Non-Exporter Firms Start to Export Only to MLI	-0.067	-0.057	-0.056	0.077	0.064	0.091
	(0.114)	(0.164)	(0.167)	(0.099)	(0.098)	(0.128)
PANEL B: RAUCH CLASSIFICATION						
Differentiated						
Non-Exporter Firms Start to Export Only to HI	-0.194**	-0.166**	-0.084*	0.118**	0.120*	0.121***
	(0.089)	(0.080)	(0.044)	(0.050)	(0.068)	(0.032)
Non-Exporter Firms Start to Export Only to MLI	-0.064	-0.031	-0.039	0.094	0.092*	0.103*
	(0.188)	(0.235)	(0.288)	(0.087)	(0.053)	(0.054)
Non-differentiated						
Non-Exporter Firms Start to Export Only to HI	-0.104**	-0.107**	-0.053	0.081*	0.089*	0.091*
	(0.041)	(0.046)	(0.056)	(0.047)	(0.054)	(0.053)
Non-Exporter Firms Start to Export Only to MLI	-0.027	-0.026	-0.047	0.96	0.117	0.049
	(0.251)	(0.274)	(0.368)	(0.151)	(0.203)	(0.229)

In Panel B with the ATTs over sub-samples by Rauch classification, one can observe that there are again significant productivity gains for HI-starters. However, differentiated products have greater productivity impact with respect to non-differentiated goods. For instance, the increase in productivity from the PSM-DiD estimates suggests that switching from being a non-exporter to being an HI exporter of differentiated goods increases productivity by over 12%, and switching from being a non-exporter to being an HI exporter of mainly non- differentiated goods increases productivity by just over 9%. What we find is that when looking at MLI starters we only observe significant productivity growth for the technology-intensive products, and where the effect is slightly lower than that for the HI starters. There is no evidence for the MLI export starters of a positive productivity impact for any of the Rauch classification categories. Overall therefore, the findings from Table 3.6 indicate that there exist differential effects of

exporting across HI and MLI countries even for the same types of products suggesting that where a firm export does matter for productivity growth.

3.4.3 Post-entry differentials by extensive margins

So far, we have shown that the productivity effect is at work primarily for HI exporters while controlling for quality/mark-up effects and sophistication of the exporting. Now, we aim to investigate whether there may be economies of scope at work leading to ex-post productivity improvements across different markets. Hence, here we examine whether there are any changes in productivity associated either with exporting to more countries, or with exporting more products, as well as investigating how these changes differ across markets.

Once again utilizing the detailed information on export flows inherent in our data set we categorize firms according to their product and country extensive margins (NPE/NCE). We define the cut-off for the number of products / countries as one and distinguish between sub-samples for each margin as follows: firms that export only one product, firms that export more than one product; and firms that export to only one country, firms that export to more than one country. By employing these cut-offs, in particular with regard to the number of products we can check whether the productivity effects outlined earlier derive from changes in the product mix. We employ our matching routine for each sub-sample where our treatment group is non-exporting firms that start to only export to HI(MLI) and our control group consists of those firms that always only export to HI(MLI) throughout our sample period. E.g., for exporters of only one product, our treatment group comprises of non-exporting firms that start to export to HI(MLI) countries with only 1 product while the control group are those firms that always export to HI(MLI) only with one product throughout our sample period.

Table 3.7: Average treatment effects from PSM-DiD w.r.to extensive margins

	PSM			DID	DID	DID
	TFPt	TFPt+1	TFPt+2	TFPt+1-TFPt-1	TFPt+2-TFPt-1	TFPt+3-TFPt-1
PANEL A: Number of Products Exported (NPE)						
NPE: 1						
Non-Exporter Firms Start to Export Only to HI	-0.165*	-0.135*	-0.061	0.083	0.091	0.093
	(0.093)	(0.072)	(0.178)	(0.103)	(0.072)	(0.075)
Non-Exporter Firms Start to Export Only to MLI	-0.041	-0.032	-0.031	0.050	0.061	0.066
	(0.234)	(0.238)	(0.308)	(0.234)	(0.195)	(0.209)
NPE: 1+						
Non-Exporter Firms Start to Export Only to HI	-0.159**	-0.095**	-0.066	0.116*	0.121*	0.131*
	(0.072)	(0.044)	(0.157)	(0.067)	(0.068)	(0.074)
Non-Exporter Firms Start to Export Only to MLI	-0.096	-0.076	-0.047	0.064	0.076	0.093
	(0.227)	(0.258)	(0.283)	(0.151)	(0.194)	(0.227)
PANEL B: Number of Products Exported (NCE)						
NCE: 1						
Non-Exporter Firms Start to Export Only to HI	-0.168*	-0.127*	-0.082	0.115	0.119*	0.125*
	(0.091)	(0.068)	(0.165)	(0.097)	(0.069)	(0.073)
Non-Exporter Firms Start to Export Only to MLI	-0.045	-0.039	-0.036	0.071	0.074	0.079
	(0.262)	(0.258)	(0.365)	(0.118)	(0.092)	(0.065)
NCE: 1+						
Non-Exporter Firms Start to Export Only to HI	-0.197**	-0.197*	-0.091*	0.117*	0.125*	0.128*
	(0.089)	(0.108)	(0.053)	(0.070)	(0.069)	(0.071)
Non-Exporter Firms Start to Export Only to MLI	-0.055	-0.057	-0.056	0.077	0.062	0.074
	(0.202)	(0.224)	(0.296)	(0.112)	(0.142)	(0.197)

The resulting ATTs in Table 3.7 first show that differentials in productivity gains across different type of markets is again apparent with statistically insignificant ATTs for MLI countries. When we examine the number of products, looking at the DID results we find no increase in productivity gains for firms that export only one product- either to HI or MLI destinations. In contrast we find that exporters to HI do experience productivity gains when they export more than one product. This suggests either the presence of economies of scope and/or productivity gains arising from changes in the product mix. This could be, for example, that firms choose to specialise in certain more successful goods over time. If this was the case we would expect to find an increase in productivity over time, and not just in period *t*. Whilst there is a modest increase in subsequent periods the principle gain in productivity appears to be in the first period. This suggests that it is more likely that there are gains associated with economies of scope, as opposed to

changes in the product mix. We also find a positive impact on productivity associated with exporting to more countries- once again this maybe because of economies of scope associated with multiple destinations- especially if those destinations may have similar characteristics and possibly standards, such as exporting to EU markets.

3.5 Concluding Remarks

Exploiting a rich firm level data set for the Turkish manufacturing firms over 2003- 2011, this paper integrates and extends the existing empirical literature on the linkage between exports and productivity and sheds light on differentials in post-entry effects arose by involvement in export markets with different income levels. We employ PSM methodology together with a DiD methodology. PSM allows us to control for the self-selection whereas DiD estimates further removes effects of common shocks to the productivity. We build upon the existing literature that relied on matching between non-exporters and export starters, but we redefine the control groups as always-exporters. In so doing we are able to incorporate information on export quality proxied by average weighted unit values into our analysis. Therefore, we explore whether the post-entry effects on productivity are driven by changes in productivity, as opposed to quality/price mark-up effects. Redefining such control groups also improves the quality of the matching procedure since it is still possible that in some other unobserved dimension the export starters are different to the non-exporters and that selection issues may remain. Secondly, we distinguish between several sub-samples of firms using classifications on types of products exported and, use this categorization to control firms' export composition. Finally, we categorize firms upon their product and country extensive margins to investigate whether the differentials between productivity gains across different types of markets is impacted by firms' export margins.

The core results of the analyses indicate that exporting can lead to positive productivity gains, particularly so for exports to high income (HI) countries as opposed to middle low income (MLI) countries. Once we control for quality effects and for the possible remaining selection problems associated with the control group definitions, learning-by-exporting effects are larger for HI countries. Further, there is little evidence of an increase in productivity for exporting to MLI destinations. For HI destinations we find bigger impact on productivity for high-technology, skill-labour intensive products as well as differentiated products. Although this could be consistent both with changes in mark-ups

and/or quality, given that we have controlled for quality through the use of unit values, these results suggest that the increase is more likely to be driven by learning by exporting. In terms of MLI starters we also find some impact on productivity with regard to technology-intensive products. Overall, these findings indicate that there exist differential effects of exporting across HI and MLI countries even for the same types of products suggesting that where a firm export does matter. In terms of HI-starters the positive impact of exporting gets larger the greater the number of products exported, and countries exported to, indicating economies of scope.

4 Export Spillovers from FDI

4.1 Introduction

Foreign direct investments (FDI) impacts host countries' economic performance both directly and indirectly by adding to their savings of capital, enlarging their capacity of production, bringing about diffusion of technology and improving management skills. The indirect impacts of FDI that are often referred as 'spillover effects' result from various foundations comprising the linkages created between foreign owned and domestic firms and, boosted competition within the domestic market. A more recent literature offers that the interaction of domestically owned firms with foreign affiliated firms could impact on the decision of export and export performance of domestic firms namely, generate export spillovers.[34] Relative to the extensive literature studying the effect of spillovers generated by FDI on productivity (i.e. productivity spillovers)[35], there has been little effort spent on export spillovers. This is notwithstanding with the fact that foreign presence may obviously impact the export decision and export behaviour of firms via vertical and horizontal linkages (Rodriguez-Clare, 1996; Aitken et al., 1997). The empirical works on the impacts of FDI on the exporting activities of domestic firms is even more sparse regarding developing countries.

Studies on export spillovers diverge in some key aspects, key among are how export spillovers are defined, and/or disaggregation level of data. While their results are somewhat mixed, the literature suggests that foreign presence may impact on export markets involvement and the export behaviour of firms in host countries through three channels: (i) through increased competition within industries (ii) by creating foreign market related information externalities leading to knowledge acquisition about export markets (iii) by creating technological knowledge externalities (Aitken et al., 1997; Rodriguez-Clare, 1996; Greenaway et al., 2004).[36] In turn, the way export spillovers are generated may differ subject to whether there exist horizontal linkages or vertical linkages between domestic and foreign owned firms. Through horizontal linkages, domestically

[34] Greenaway and Kneller, 2004; Görg and Greenaway, 2004; Ruane and Sutherland, 2004; Wagner, 2007; Kneller and Pisu, 2007; Bajgar and Javorcik, 2013.
[35] See among others Blomström (1986); Harrison and Aitken (1999); Blomström and Kokko (2001); Mucchielli and Jabbour (2004); Javorcik (2004); Keller and Yeaple (2009); Blalock and Gertler (2008); Mervelede and Schoors (2005); Javorcik and Spatareanu (2011).
[36] See Wagner (2012) for detailed discussions on productivity-export behaviour nexus which pioneers the new-new trade theory about firm heterogeneity.

owned firms may benefit from foreign affiliated firms which are operating within their own industry of domestic firms. Foreign presence could generate export spillovers through vertical linkages i.e. buyer-supplier relations where the channels may through foreign owned firms supplying to downstream industries (i.e. forward linkages), foreign firms outsourcing from upstream industries (i.e. backward linkages). Each of these may create a positive effect on export behaviour of firms.

Against this background, this chapter mainly focuses on the presence and extent of export spillovers that rise from foreign presence, through horizontal and/or vertical linkages between foreign firms and domestic firms in Turkey. Specifically, we investigate whether and how inward FDI influences the export behaviour of firms in Turkish manufacturing industry over the period 2006-2014. We use a comprehensive firm level panel over the period 2006-2014. We build our horizontal and vertical (backward and forward) linkage variables using Turkish 2012 input-output matrix and our firm-level panel dataset. Our empirical strategy follows the existing literature on export spillovers and is mainly built on the assumption that domestically owned firms are more likely to supply foreign affiliated firms when foreign owned firms constitute a greater portion of output in their downstream sectors, i.e., the sectors to which they supply inputs. Similarly, we rely on the assumption that domestically owned firms are more likely to buy inputs from foreign affiliated firms if foreign owned firms account for a greater share of the domestically sold output in the upstream industries. We further search whether the extent of foreign presence within the same industry impact on firms' exporting behaviour. As we are interested in the export behaviour of firms, while our dataset contains firms that both do and do not export we employ a Heckman two-step procedure in order to treat the selection bias issue rising from firms' export decisions.

Our contribution to the existing literature is threefold.

1. First, we utilize new alternative sectoral and firm level measures of foreign presence with regard to forward and backward linkages which has not been done before.
2. Secondly, unlike previous studies on export spillovers, we consider buyer-supplier relations not only within manufacturing industry itself but also between manufacturing and services industries.
3. Third, for Turkey, this is the first attempt to examine export spillovers. Concentrating on a developing country case is essential since the potential for gaining from export

spillovers for developing countries could be higher than that for developed countries. The Turkish case is also interesting since over the period in question Turkey experienced a notable inflow of foreign direct investments and a rapid rise in exports.[37]

Additionally, where the majority of the existing literature focuses on aggregate export propensity, we investigate export spillovers considering both the extensive and intensive margins of exporting activity and provide new interesting microeconomic insights.

Each of these contributions is discussed in more detail below.

First, rather than relying on the standard indicators from the literature on export spillovers, we contribute to the literature by proxying the extent of foreign presence via alternative sectoral and firm level spillover variables. We do with respect to both the backward and forward linkages. In an early study of this literature, Blomstrom and Kokko (1998) call export spillovers as market access spillovers and define them as gains accruing to domestic firms in host economies through export tasks of foreign owned firms since they propagate info about foreign trade markets that could be useful to domestic firms. In accordance with this definition and foreign market related information externalities, we define alternative sectoral level spillover variables for vertical linkages. By this means, we are specifically interested in assessing the importance of export operations of the sectors with foreign presence and whether domestic firms have higher probability to benefit from vertical linkages if the downstream/upstream sectors with foreign presence engage in exporting activities more intensively. Hence, we test whether export-oriented industries tend to be a more prominent source of export spillovers.

[37] Indeed, Turkey has integrated into the globalized world, as well as changing into one of the major recipients of foreign direct investment in its region. In reference to the 2015 World Investment Report of UNCTAD (United Nations Conference of Trade and Development), Turkey was ranked 12th among the developing countries and 1st within the West-Asia Region. After 1980's, a time of liberalization policies and foreign capital entries, Turkey was not able to benefit from the upward trend of foreign capital flows that were canalizing to other middle-income countries within the same income level as much as it could in 1990's. "Reform Program for the Improvement of Investment Environment" which was adopted in 2001 in Turkey, aimed at removing administrative barriers and paving the way for foreign investments but foreign capital towards Turkey maintained its low course because of the economic crisis during the same year. In the following period, Turkey was into a very intense integration process with globalized world and became the leading country for foreign investments in the region. While Turkey ranked 38 in FDI attraction list of 2004, in 2007 it ranked 17. Though FDI inflows to Turkey decreased after 2008 in parallel to the general trend in the World, the related figures in 2010, 2011, 2012, 2013 and 2014 were respectively 9, 16, 13.6, 12.9 and 12.8 billion dollars (Ministry of Economy of the Republic of Turkey, 2015).

One strand of literature suggests that spillovers from foreign owned firms in the host countries vary depending upon the features of domestic firms and industries, such as human capital, financial market development and technological sophistication (Kneller and Pisu, 2007; Anwar and Nguyen, 2011). However, additionally, export spillovers derived from foreign presence will also vary considerably across firms depending on their underlying production characteristic. The association between foreign presence in downstream (upstream) sectors and exporting behaviour of the firms in upstream (downstream) industries is likely to vary according to the intensity of their intermediate goods production (intermediate goods usage). Part of the contribution of this chapter is therefore to define an alternative firm level spillover variable which captures the vertical linkages while controlling for firm heterogeneity in terms of firms' intensity of intermediate goods production and their input usage. Put differently, if spillovers do arise from the foreign presence in upstream or downstream industries via buyer/supplier relations, ignoring the importance of intermediate goods in firms' production process might result in underestimating these effects. In defining the alternative firm level spillover variables we test for the importance of firms' share of outputs produced as inputs and their input usage within the context of forward and backward linkages, respectively.

Second, a recent and more limited literature also documents strong positive effects from increased openness in services industries on manufacturing industries promoting the competitiveness of domestically owned manufacturers.[38] This literature points out that letting foreign entrance into services sectors may be an important channel towards enhanced performance of downstream manufacturing sectors which source inputs from those services sectors. Entry of successful foreign firms into services sectors may cause services sectors to provide more qualified and reliable services which, in turn, is likely to impact on export performance of outsourcing manufacturers. Furthermore, this might give rise to availability of new services as well as a wider accessibility of those services like coverage of internet in rural areas or business consulting services to small firms

[38] Ariu et al. (2019) denote liberalisation of trade in services is important to boost future trade since, compared to the manufacturing sectors, where tariff and non-tariff barriers to trade have decreased significantly over the past four decades, services suppliers are still highly protected. Francois and Woerz (2008) examines the role of services as inputs in manufactured exports with a panel of 30 OECD countries and finds significant and strong positive effects from increased trade and FDI flows in services industries on skill and technology intensive manufacturing industries like machinery, motor vehicles, chemicals and electric equipment. Relied upon firm data from the Czech Republic Arnold et al. (2007), shows a positive relation between services sector liberalization and the performance of domestically owned firms in downstream manufacturing industries.

which were previously limited to certain user groups. In association with the regarding stream of research, unlike the existing studies on export spillovers, we go further by considering buyer-supplier relations not only within manufacturing industry itself but also between manufacturing and services industries.

We add to the literature specifically by relating the export behaviour of producers in (downstream/upstream) manufacturing sectors to the extent of foreign presence in both (upstream/downstream) services and manufacturing industries. Thus, we differentiate between the spillover effects coming from manufacturing sectors and those coming from services sectors. Moreover, considering that recently the sectoral decomposition of FDI in Turkey shifted from manufacturing towards services, differentiating between spillover effects arising from manufacturing and services sectors is relevant. While manufacturing industry had the highest share in FDI from 1980 till 2001 by 61 percent, its share decreased in the following period and as a result it fell behind services industry in Turkey. Over the period 2002-2014, 24 percent of FDI flows to Turkey headed towards manufacturing industry, while 58 percent for services industry excluding electricity, gas and construction.[39]

The main findings of the study confirm that there exists significant export spillovers stemming from downstream foreign presence and the impact of foreign presence in downstream manufacturing sectors is concentrated at the intensive margin, whilst the extensive margin is less impacted. Thus, the results suggest that foreign presence in downstream sectors increase the export competitiveness of domestic suppliers in upstream industries. The increased competitiveness may be reflected in two conflicting effects on export unit values by domestically owned firms. Interaction with firms in downstream sectors with foreign presence might give rise to exporting higher quality products or producing and exporting the same products at lower prices. Hence, we test whether existing spillovers are taking place through lowering prices or increasing quality

[39] This observation is easy to justify considering the fact that Turkey witnessed the same shift in sectoral structure of FDI with the world after 1980's. It is clear that especially in developed countries there was an obvious shift from industry to services sectors worldwide. As for Turkey, transition from manufacturing to services in sectorial distribution of foreign direct investments might be deemed as a result of developments in services sector as well as the fact that services and trade sectors became more profitable than industry in this inflationary environment. A significant amount of foreign direct investment shifted to activities of financial intermediaries and services of transportation, communication and storage after 2005. There was also an obvious increase in electricity, gas, water, and real estate renting and works activities sectors in the very same period.

of exports. Further, one could potentially argue that increased exports in developing economies are strongly correlated with increased use of imported inputs, namely import fragmentation. Thus, foreign presence might be creating export spillovers on domestic firms by increasing their imports of intermediate goods. Therefore, we broaden our investigation by testing whether foreign linkages enhance import fragmentation. Our results suggest that as domestic manufacturing firms supply to foreign firms in downstream manufacturing industries their reliance on imported inputs increases. Moreover, we reveal that downstream linkages provide access to cheaper imports of intermediate goods.

This study is arranged as follows. Next section briefly reviews the existing literature. Section three introduces the data and provides some descriptive evidence. Section four presents the methodology and results of our empirical research. Section five concludes.

4.2 Background Framework

Within the literature of international trade, it has been postulated that foreign direct investment can impact on host countries' trade performance via bringing along improved technological knowledge, management skills as well as providing information about foreign markets (Kneller and Pisu, 2007; Fu, 2011). Explicitly referred as export spillovers from FDI, there exists a number of empirical and theoretical studies exploring the effect of foreign presence on export performance of host country firms (Görg and Greenaway, 2004; Wagner, 2007; Kneller and Pisu, 2007; Sun, 2009; Bajgar and Javorcik, 2016).[40] According to this literature, through the sectoral linkages between foreign owned and domestic firms, foreign presence in the same, downstream or upstream industries could influence the export decision and exporting performance of domestically owned firms in host countries essentially through increased competition within industries, creating foreign market related information externalities leading to knowledge acquisition about export markets and creating technological knowledge externalities (Aitken et al., 1997; Rodriguez-Clare, 1996; Greenaway et al., 2004).

[40] An earlier literature focuses mainly on the productivity gains from linkages between foreign and domestic firms i.e. productivity spillovers (Blomström, 1986; Harrison and Aitken, 1999; Blomström and Kokko, 2001; Liu and Wang, 2003; Javorcik, 2004; Görg and Hijzen, 2004; Mervelede and Schoors, 2005; Javorcik and Spatareanu, 2008; Blalock and Gertler, 2008; Keller and Yeaple, 2009). In this literature, vertical linkages are shown to be playing more critical role than horizontal linkages for productivity gains, while backward linkages are found be more effective than forward linkages as well (Havranek and Irsova, 2011).

Apart from the industrial linkages, one strand of the literature highlights export-stimulating spillovers from agglomeration of firms within same regions i.e. export spillovers concerning geographical proximity (Koenig, 2009; Poncet and Mayneris, 2013). Aitken et al. (1997) analyse the exporting performance of firms in Mexico and show that domestic firms' decision to export is positively related with the existence of foreign owned firms within the same region. Kneller and Pisu (2007) also confirm that in UK foreign firms located in the same region affect the export performance of domestic firms positively. On the one hand, rather than foreign owned firms, Koenig (2009) examine the export spillovers brought about by the proximity to other exporter firms and finds that the cluster of local French exporters positively impacts on the export entry decision to a country. Referring to the regional proximity of exporter firms Krautheim (2012) reveals that information spillovers amongst firms that export to the same destination moderates the fixed cost of exporting. In terms of intensive margins; Rauch and Watson (2003) confirm that once a trade relationship is established, uncertainties may arise for the importer on the capacity of the exporter firm to successfully meet greater orders. Hence, a cluster of exporters could enhance the buyers' information on the quality of the exporter firms which in turn will support larger export volumes at firm level.[41]

This study relates to the existing works on export spillovers stemming from the industrial linkages between domestically owned and foreign firms. Within the context of industrial linkages (i.e. horizontal and buyer/supplier relations), there are mainly three channels affecting the export market participation and export performance of domestically owned firms stemming from foreign firms, namely creating export spillovers (Görg and Greenaway, 2004). The first channel export spillovers occur by foreign presence is about the competitive pressure that foreign firms create. Entry of foreign firms brings about competition that accordingly puts pressure on domestic firms to perform better. From this point of view the competitive environment due to foreign presence supports domestic firms' export market participation and performance as well (Görg and Greenaway, 2004; Narjoko, 2009). Nevertheless, foreign owned firms can lead to adverse spillover effects if competitive pressure exerted by foreign presence constrains domestic firms'

[41] There emerges an alternative literature which focus on the role of export spillovers on the survival of newly established export flows (Görg et al. 2008; Cadot et al., 2011; Albornoz et al., 2012; Fernandes and Tang, 2014).

profitability by reduced market shares and limited access to skilled labour force (Aitken and Harrison, 1999; Hu et al., 2005; Blalock and Gertler, 2008; Krautheim, 2008).

The second channel is about gathering information about foreign markets (e.g. taste and preference of consumers, regulations and competitive pressure in foreign markets, etc.) and thereby reducing export-related sunk costs. Foreign firms in host countries which already form a part of a multinational enterprise, possess better knowledge experience about foreign markets since they access to information on foreign markets more easily via their parent firms (Aitken et al., 1997; Greenaway et al., 2004). In the pre-entry stages of exporting this knowledge accumulation about foreign markets has a vital role in reducing the sunk costs of exporting such as establishment of distribution networks, research about consumers' tastes, competitors, market structure and regulations in foreign markets. Because of their accumulated knowledge stock and reduced uncertainty such costs are lower for foreign owned firms facilitating the post-entry benefits of exporting as well.[42]

The third channel emphasizes the role of improved technology brought by foreign owned firms. Domestic firms benefit from the technological knowledge externalities raised by foreign owned firms (Fosfuri et al., 2001; Greenaway et al., 2004; Kneller and Pisu, 2007). First, technological knowledge externalities might yield to reverse engineering and thereby upgrading local technology. Next, access to inputs by foreign firms including more advanced technological knowledge might lead to improvements in production efficiency of domestically owned firms. Lastly, foreign owned firms that are endowed with more advanced technological know-how might force their domestic suppliers to overtake the international standards regarding level of technology used in production process. As a result, technological knowledge externalities due to foreign presence upgrade the technology used by domestic firms and result in export spillovers with consequential benefits for the production efficiency of firms.

The way export spillovers are created changes subject to whether the linkages between foreign and domestic firms are horizontal or vertical. In general, horizontal linkages yield

[42] The first study on this topic is Aitken et al. (1997) highlighting the critical role of information externalities generated by foreign firms on domestic firms' export decision within an industry. Utilizing plant-level data from manufacturing industry of Mexico, they uncover that firms are more prone to exporting when there exists a more concentration of export activity by foreign firms within the same sector.

to export spillovers mainly through increased competition within industries. Particularly, within the same industry borders foreign presence exerts a competitive pressure on domestic firms. While such competitive pressure may incentivize domestic firms to perform better it might also restrain export activity of domestic firms by damaging their profitability via reduced market proportions and constrained access to skilled labour force (Aitken and Harrison, 1999; Hu et al., 2005; Blalock and Gertler, 2008). Besides, foreign firms in the same sector may generate information externalities. The extent of export spillovers depends on dominance of these opposing effects. Empirical evidence about the effect of horizontal linkages on export behaviour is mixed. Whereas some works present evidence on horizontal linkages' positive impact namely, export spillovers stemming from horizontal linkages (see among others Kokko et al., 2001; Kneller and Pisu, 2007; Alvarez and Lopez, 2008), some others find negative or zero effect (see among others Aitken and Harrison, 1999; Djankov and Hoekman, 2000; Greenaway et al., 2004). The latter generally points out that horizontal spillovers might be irrelevant or even negative when the ones happening through vertical linkages between domestic firms and foreign firms are taken in consideration.

In terms of vertical linkages foreign market related information and/or technological knowledge externalities are more pronounced. First, interacting with foreign firms in upstream sectors (i.e. backward linkages) can influence export performance of domestic firms in downstream sectors positively via technological knowledge externalities through outsourcing intermediate inputs which comprise of more advanced technological knowledge. Put differently, access to improved, new or fewer costly inputs that are produced by foreign firms leads to improvements in production efficiency and thus increases the export competitiveness of domestically owned firms. That is supplying from foreign firms in upstream industries can positively impact domestic firms' decision to start exporting and export behaviour in downstream sectors i.e. creates export spillovers. Secondly, interacting with foreign firms in upstream sectors could also generate export spillovers through foreign market related information externalities reducing export related costs of domestic firms in downstream sectors.

Next, interacting with foreign firms in downstream sectors (i.e. forward linkages) could positively influence domestic firms' export performance via technological externalities. The foreign owned firms in downstream industries require their domestic suppliers in

upstream sectors to catch up with international standards with regards to variety, quality, managerial know-how and, technology level used in production stages etc. Thus, foreign firms, which are already engaged with such standards, can push their domestic suppliers to increase their competitiveness in export markets by improving their production efficiency and thus reducing their marginal costs. That is supplying to foreign owned firms in downstream sectors can positively influence domestic firms' decision to export and export behaviour in upstream sectors i.e. creates export spillovers. Furthermore, interacting with foreign firms in downstream sectors could also generate such spillover effects through foreign market related information externalities, which reduce export related costs of domestic firms in upstream sectors.

Evidence on vertical linkages is mixed. As some of the studies show evidence on the positive effect of vertical linkages in terms of decision to export (see among others, Kokko et al., 2001; Greenaway et al., 2004) some of them reports negative or zero impact (see among others, Ruane and Sutherland, 2004; Kneller and Pisu; 2007). Similarly, with reference to export intensity whereas some studies show positive impact of vertical linkages (see among others Barrios et al., 2003; Karpaty and Kneller, 2011; Sun, 2009) some other studies find negative or zero impact (see among others, Greenaway et al., 2004; Ruane and Sutherland, 2004). For instance, Kneller and Pisu (2007) focus on information externalities and provide evidence on the relation concerning foreign presence and export participation of domestically owned firms. Domestic firms' decision to export is shown to be impacted by FDI only via backward linkages while forward linkages have no effect on their export participation. With regards to export propensity, a strongly positive spillover effect is founded from foreign owned firms in downstream industries.

Bajgar and Javorcik (2013) critiques the literature cited above which investigates the nexus of FDI and exports for firms at intensive margins and without evaluating export quality due to boundaries in their data. Bajgar and Javorcik (2013) add to the literature thru examining the existence of vertical and horizontal spillovers from multinational firms on various margins and quality of exports for domestic firms in Romania. Their findings uncover foreign firms operating in downstream industries is positively linked with the likelihood of exporting, the number of products and the number of destinations exported namely extensive margins, while foreign presence in same sector has negative

effects. In more recent work, Bajgar and Javorcik (2016) study the linkage between foreign direct investment and export quality by using disaggregated data at firm-product-destination level for Romanian manufacturing industry. Their results reveal that the quality of exports is affected positively via forward and backwards linkages, while the effect of the former is more pronounced. Bajgar and Javorcik (2016) conclude that vertical spillovers lead to quality upgrading for Romanian exports.

4.3 Data and Empirical Strategy

4.3.1 Data and descriptive evidence

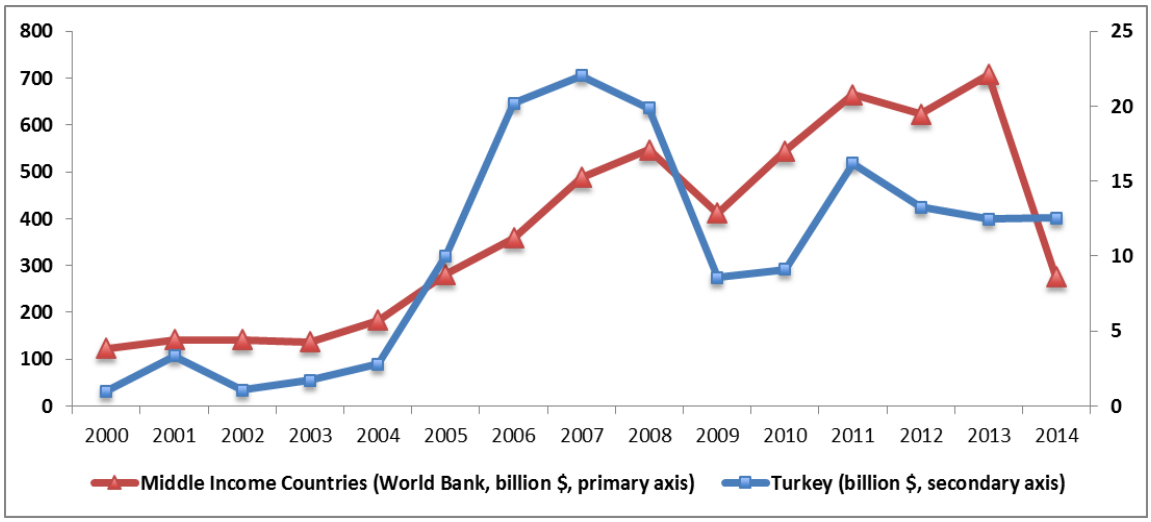
In this study, we try to address export spillovers exploiting detailed data on exports of Turkish manufacturing firms over 2006-2014 period. As a developing country, Turkey in this period, is an interesting case since it has witnessed a remarkable inflow of foreign direct investments and a rapid rise in exports along with a robust growth of 4 percent annually on average. Between 2002-2012, the remarkable performance of growth of 5 percent along with important structural reforms incorporated Turkey into the globalized world and transformed it into one of the major recipients of foreign direct investment flows in its region.[43] FDI flows to Turkey trended upward especially from 2005 and reached to $22 billion in 2007 with the highest level ever recorded. Over this period, the increase in FDI inflows into Turkey was significantly higher than that of countries in the same income group. However, as was the case for other emerging countries Turkey was stroke by the global financial crisis in 2008 and, influenced by the globally declining capital flows running it into a fluctuating course of foreign investment inflows after 2009 (See Figure 4.1). In 2008 FDI flows shrank to $19.9 and then to $8.6 billion in 2009 with a sharp decrease. The related figures in 2010, 2011, 2012, 2013 and 2014 were respectively 9, 16, 13.6, 12.9 and 12.8 billion dollars. Tracing FDI inflows as the percentage of its GDP demonstrates that there is an increase from 0.5 percent in 2002 to 1.5 percent in 2014. While the highest share with 3.7 percent is recorded in 2007 it has a

[43] After the 2001 financial crisis, the successful implementation of IMF structural adjustment program provided macroeconomic stability and improved the investment climate in Turkey which is reinforced by global liquidity conditions. Moreover in 2003, a new Act of Law (No.4875) was introduced guaranteeing non-discriminatory rights to foreign and domestic investors. It removed administrative barriers of screening and pre-approval procedures for FDI as well as providing foreigners with the right to acquire real estate.

declining and fluctuating course particularly after this period due to the global economic crisis.

As for the sector-wise distribution of inward FDI, Turkey shows a similar trend as the sectoral decomposition of FDI in the world and, suggests a substantial shift from manufacturing sectors towards services industry. From 1980 till 2001, while manufacturing industry had the highest share in FDI by 61 percent, this share decreased in the following period and fell behind services industry in Turkey. During our analysis period of 2006-2014, 22 percent of total FDI inflows to Turkey headed towards manufacturing industry, while 73 percent for services. Within the service industries, while financial intermediaries are ranked as the highest FDI attracting sector accounting for 37.2 percent of total inward FDI, services of electricity, gas, water is ranked 2nd with 13.2 percent. and services of information and communication is ranked 3rd with 9.2 percent. One should note that even the share of inward FDI towards the manufacturing industry decreased over 2006-2014 period, this shift does not extenuate the fact that the FDI flows into the manufacturing industries has increased in overall value. Within the manufacturing industries, food products, beverages and tobacco were the largest recipient of FDI with 8.4 billion, this is followed by chemical products and pharmaceuticals and, computer, electronic and optical products with 5.3 and 3.6 billion dollars, respectively.

Figure 4.1: FDI flows into Turkey and Middle-Income countries (2000-2014)



Over and above the substantial FDI inflows to manufacturing and services sectors, manufacturing has always played comparatively large role in the Turkish export

performance. From the late 90s to the present day the share of manufacturing industry in total export value of Turkey has been sustained at over 90 percent. The share of manufacturing in Turkish exports is 93 percent on yearly average during the studied period 2006-2014. Besides, manufacturing constituted 24 percent of overall GDP in Turkey and it generated 15 percent of the total employment in the same period. Moreover, while it has an average growth rate of 5 percent on annual basis manufacturing industry in Turkey has a large potential for improvement of its export performance.

To sum up, Turkey is a developing country with a strong manufacturing focus in terms of exports. In the period under study, it has received large FDI inflows towards both manufacturing and services sectors. Thus, we explore the link between these two phenomena and attempt to understand to what extent foreign presence give rise to export spillovers for firms in Turkish manufacturing industry via its horizontal and vertical linkages through both manufacturing and services sectors. We employ a recent and comprehensive firm level data for Turkey over the period 2006–2014. Our dataset mainly based on two different data sources collected by TURKSTAT. They are The Annual Industry and Service Statistics (AISS) and Annual Trade Statistics (ATS).

In the AISS dataset, firms are classified with respect to their main activity, whilst identified by NACE Rev.2 standard codes for sectoral classification of Eurostat. The database provides detailed info on a number of structural variables as well as the information on foreign ownership that classify firms between domestic, mixed ownership and purely foreign ownership status. As for Turkey, FDI is often in the form of partnership with domestically owned firms and only a low number of firms are 100 percent foreign-owned. Hence, we split all firms into two groups as domestic and foreign owned firms and, define firms as foreign affiliated where the share of foreign ownership is positive. To carry out our investigation we chose the entire population of private Turkish firms with more than 19 employees.[44,45]

[44] Firms with more than 19 employees constitutes a large portion of manufacturing industry. For example, in 2009, they account for 87 percent of total production value and 75 percent of total employment. In the previous and following years, it displays a similar pattern.

[45] Particularly, we removed abnormal observations (i.e. zero or negative) for the main variables such as intermediate inputs, output, labour cost etc.; and excluded observations where the main variables and ratios (e.g. employee, capital per employee, value added per employee) shows extraordinary drops and jumps over a year.

We match AISS data with ATS data- second main data source we use including firm-level trade flows. The foreign trade flows of goods are gathered for the entire universe of exports and imports at 12-digit GTIP classification. The info for the origin/destination markets and physical quantity for trade flows is additionally available for goods trade in ATS dataset. Physical quantity is measured in both supplementary units and kilograms. Unit values are the monetary values of export flows divided by their physical quantity. Supplementary units might be in pieces, litres, square metres or other units. If both measures are available, we composed unit values for export flows of each product-destination pair by dividing export value by supplementary units. Otherwise we rely on quantities exported measured in kilograms.[46]

Another source of data we utilize is The Annual Industrial Products Statistics (AIPS) providing info on the type and number of goods produced as wells as their value and volume of production. AIPS covers firms operating in manufacturing industry and having 20 or more persons employed. Production data is gathered at 10-digit PRODTR level, which is a national product classification derived from 8 digit of Eurostat's PRODCOM classification. We use AIPS to derive firms' total intermediate goods production that we employ in calculating spillover variables as will be clarified in detail in the next section.

Table 4.1: Share of output due to foreign owned firms

Year	All Industries	Manufacturing	Services
2006	19.68	28.81	14.85
2007	18.61	23.38	16.09
2008	19.62	23.62	17.51
2009	22.29	25.05	20.83
2010	20.10	23.31	18.41
2011	19.83	24.12	19.51
2012	19.01	22.93	17.42
2013	17.78	20.54	16.28
2014	17.56	20.46	15.98

[46] We used supplementary units approximately for 27 percent of observations and kilograms for 73 percent. Note that we removed duplicate observations of firm-product-destinations, the observations where the description of the product was empty, entries with reported quantity of zero and, observations with destination markets reported as free trade zones.

Table 4.1 presents the share of foreign owned firms' output in 52 industries 19 of which are manufacturing and 33 of which are services over the analysis period. In line with the aggregate data, the average share of foreign firms' output has an increasing trend over 2007-2009 period and it declines afterwards. During our sample period, even though a considerable part of FDI entered into the services sector, in production terms, foreign owned firms always constitute larger shares of their own sectors within manufacturing industry than do those within services industry. In brief manufacturing sectors have larger shares of foreign ownership than services sectors.

Looking at the output shares due to foreign owned firms at the individual sector level, as shown in Figure 4.A1 in the Appendix, one can see that foreign output shares are characterized by significant variation across industries. The largest shares are observed for motor vehicles with 74.7 percent, pharmaceutical products with 49.06 percent, computer, electronic and optical products with 43.09 percent and chemicals and chemical products with 40 percent in manufacturing and for telecommunications services with 64.3 percent, rental and leasing services with 38.8, postal and courier services with 38.6 percent in services. For the relevant shares in all sectors see Table 4.A1 in Appendix.

Table 4.2: Outcome variables

Variable	Description
Total Export Value	Logarithm of firm's total value of exports in dollars
Export Intensity	Logarithm of firm's total value of exports over total sales
Number of Products	Logarithm of number of HS6 products exported by the firm
Number of Countries	Logarithm of number of destinations exported by the firm
Exports per Product	Logarithms of firm's value of exports in dollars per HS6 product
Exports per Destination	Logarithms of firm's value of exports in dollars per destination
Exports per Product and Destination	Logarithms of firm's value of exports in dollars per product-destination pair
Weighted Unit Value of Exports	Firm level unit value where weights are defined as the share of each product-destination pair in total export value of the firm
Firm-product Level Unit value of Exports	Logarithms of unit values of export flows for each firm-product pair where products are defined at HS-6 level.
Firm-product-destination Level Unit value of Exports	Logarithms of unit values of export flows for each firm-product-destination pair where products are defined at HS-12 level.

Our analysis on export spillovers consider not only the intensive but also the extensive margins of exports. Accordingly, we assess export performance of firms by various outcome variables of exporting performance whose definitions are presented in Table 4.2. Table 4.3 presents the evolution of various intensive and extensive margin measures of exports over the analysis period as well as the total number of firms and number of firms that are exporting. For the relevant statistics of each manufacturing sector see Table 4.A2 in Appendix.

Table 4.3: Evolution of outcome variables (Averages per firm)

Year	*Total Export Value*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*	*Unit Value of Exports*
2006	26.585	0.192	8.676	6.488	4.121	2.749	3.896	144.814
2007	37.805	0.192	9.120	6.845	5.001	3.374	4.611	183.530
2008	47.748	0.202	9.486	7.246	6.444	4.019	5.954	263.841
2009	36.642	0.217	9.477	7.671	4.734	3.418	4.388	246.413
2010	38.469	0.204	9.371	7.352	5.189	3.587	4.758	256.012
2011	40.670	0.204	9.375	7.474	6.178	3.919	5.616	242.164
2012	41.851	0.206	9.288	7.504	5.535	3.772	5.049	279.539
2013	39.956	0.203	9.320	7.643	5.299	3.818	4.874	229.643
2014	39.063	0.206	9.204	7.719	5.189	3.653	4.811	223.464

Note: Export values in 100,000 dollars.

4.3.2 Spillover variables

4.3.2.1 Standard linkage variables

Our fundamental aim is to investigate whether and how foreign presence in upstream and downstream sectors influences the export performance of firms operating in manufacturing industry through backward and forward linkages. We build our horizontal and vertical linkage variables exploiting our firm panel and Turkish input-output table for 2012 equipped by TURKSTAT. As regards to the input-output table, TURKSTAT use Turkish Liras at current prices as units and CPA 2008 (Classification of Products by Economic Activities of European Commission) product classification where it is compatible with NACE Rev. 2 industrial classification. Up to 4-digit definitions CPA corresponds to NACE and thus, an unambiguous concordance between them does not

exist. In AISS data the main activity of each firm is defined in 4-digit NACE industries but we aggregate into and rely on 2-digit industrial classification to match firm data with the input-output table.

We relate the exporting behaviour of producers in (downstream/upstream) manufacturing sectors to the extent of foreign presence not only in (upstream/downstream) manufacturing and but also in (upstream/downstream) services industries. Accordingly, we match firm level data with the input-output table focusing not only on the manufacturing sectors but also on services sectors. Each manufacturing industry has backward and forward linkages with one or several 2-digit NACE industries including 69 sectors with foreign presence. However, some of 2-digit NACE codes correspond to a single 2-digit code in the input-output table as some industries are gathered into a single sector. For example, while "manufacture of food products (10)", "manufacture of beverages (11)" and "manufacture of tobacco products (12)" are classified as separate industries in section C of CPA 2008 and NACE Rev. 2 classification; in the input output matrix, they are represented in a single column/row that is referred as "food, beverages and tobacco products" (10-11-12). Therefore, the number of industries in input-output table is smaller than the number of 2-digit NACE industries. As a result, we are left with 52 different industries[47] with foreign presence in total, where our linkage variables are calculated for 19 manufacturing and 33 services sectors.[48] It is crucial to state that while our sample of estimation is restricted to firms operating only in the manufacturing sectors; our linkage variables are derived in terms of both manufacturing and services.

By employing data on firm-level revenues, we measure the extent of foreign presence in each of the 52 industries, as the percentage of foreign firms' output in total output of any industry. Where, as explained earlier, a foreign firm is defined as a firm which has some positive level of foreign ownership. This horizontal linkage variable is based on Aitken and Harrison (1999) and characterizes the foreign presence within an industry where firms operate in (own industry). Let J_{jt} indicate the set of all firms operating in Turkey in industry J in year *t*, the Horizontal spillover variable for industry *J* at time *t* is computed as

[47] See Table 4.A1 in appendix for the list of the industries and the corresponding aggregations.
[48] Since their data is not provided in AISS, we exclude the sectors of Public administration and defense services, Financial services and Insurance Services from our analysis.

$$FDI\_Own_{Jt} = \frac{\sum_{j \epsilon J_{jt}} fdi\_dummy_{jt} * Y_{jt}}{\sum_{j \epsilon J_{jt}} Y_{jt}} \quad (4.1)$$

where j denotes each firm in sector *J*, fdi_dummy_{jt} takes value 1 if the firm has foreign share and Y_{jt} is the total real output of the firm *j*. An increase in this horizontal linkage measure implies that the output of the foreign affiliated firms in a given sector is growing faster than that of the domestic firms within the same sector.

We calculate our vertical linkage variables following Kneller and Pisu (2007) and using the Turkish input-output table including buyer-supplier relations where all spillover variables refer to the firms' main activity sector. Vertical spillover effects can be classified into two categories: vertical forward ($FDI\_Forward_{Jt}$) and vertical backward ($FDI\_Backward_{Jt}$). To recognise vertical spillovers from foreign firms in downstream/upstream industries, we hypothesize that a domestic firm has more likelihood to supply to/outsource from foreign firms and thus gain from vertical linkages if foreign firms comprise a larger proportion of output in the downstream/upstream industries. Relying on this assumption, the forward linkage variable $FDI\_Forward_{Jt}$; measures the degree of spillovers for a manufacturing industry *J* supplying inputs to other manufacturing and services industries is computed as follows:

$$FDI\_Forward_{Jt} = \sum_{\forall K \neq J} \gamma_{KJ} * FDI\_Own_{Kt} \quad (4.2)$$

Note that as *J* and *K* indicate upstream and downstream sectors respectively, the spillover effect stems from the downstream manufacturing and services sectors which means that for forward spillovers we take the foreign presence in downstream industries into account. In this setup, γ_{KJ} are weights derived from the input-output table and defined as the shares of the total output of the manufacturing industry *J* supplied as inputs to each downstream industry K.[49] As the denominator in calculating γ_{KJ} is the total output of the upstream industry, the weights sum to less than 1. Namely, the upstream industries which supply a greater proportion of their output as inputs rather than selling it for final consumption are weighted higher. Thereby, this forward linkage measure gets higher the larger is the proportion of foreign firms' output in industry *K* (i.e. manufacturing or services) and, the

[49] γ_{KJ} acts for the extent of interconnectedness between the upstream and downstream industries. And we disregard output supplied to other firms in own industry i.e. the diagonal entries of the input-output matrix in generating the forward linkage variable. Note that input-output coefficients do not vary by time.

greater is the portion of output supplied as inputs to industry *K* in total output produced by the manufacturing industry *J*.

Similarly, the backward linkage variable $FDI\_Backward_{Jt}$ measures the degree of spillovers for any manufacturing industry *J* which outsource inputs from other manufacturing and services industries, is computed as follows:

$$FDI\_Backward_{Jt} = \sum_{\forall K \neq J} \phi_{KJ} * FDI\_Own_{Kt} \quad (4.3)$$

In this case, we reflect the foreign presence in upstream sectors and, as J and K are downstream industries and upstream industries respectively, the spillover effect stems from the upstream manufacturing and services industries. ϕ_{KJ} are weights defined as the share of inputs purchased by the manufacturing industry *J* from industry *K* (i.e. manufacturing or services) in total inputs sourced by *J*.[50] Accordingly, this backward linkage variable gets larger the higher is the proportion of foreign firms' output in industry *K* and, the greater is the share of inputs from industry *K* in total inputs used by industry *J*.

Table 4.4: Mean values of vertical linkage variables over years

Year	Manufacturing_FDI Forward	Service_FDI Forward	Manufacturing_FDI Backward	Service_FDI Backward
2006	7.303	4.935	6.185	2.686
2007	7.263	5.189	4.919	2.836
2008	7.491	6.146	5.047	3.540
2009	7.634	6.955	5.228	3.750
2010	7.229	6.169	4.676	3.476
2011	7.461	5.916	4.814	3.183
2012	7.315	5.526	4.254	3.073
2013	6.839	5.581	5.054	2.999
2014	6.919	5.593	4.879	2.908

[50] We disregard output outsourced from other firms within own industry i.e. the diagonal entries of the input-output matrix in generating the backward linkage variable.

Table 4.4 offers the evolution of the vertical linkage variables from manufacturing and services industries over the analysis period. Note that for the manufacturing linkage variables we are concerned with the foreign presence in downstream/upstream manufacturing industries and for services linkage variables we consider foreign presence in downstream/upstream services sectors at 2-digit industry level. Both for forward and backward linkages manufacturing measures tends to be larger than services measures. They show a similar trend over the years in question which can generally be defined upward between 2006-2009 and downward afterwards. All the vertical linkage variables have a peak in 2009 consistent with the horizontal measure. As illustrated in Figures 4.A3 in the Appendix all the vertical linkage variables are characterized by substantial variation across manufacturing sectors. As for the forward linkages associated with manufacturing sectors, chemical products industry has the highest values; while printing and recording industry takes the highest value of the forward measures associated with services sectors. In terms of the backward linkages, the measure linked to manufacturing sectors is highest for rubber and plastic products industry while pharmaceutical products have the largest value in terms of backward linkage measure from services sectors. Further, looking at the evolution of linkage variables within each sector we observe significant variation over the period in question (see Figures 4.A1-4.A5 in Appendix).

4.3.2.2 Alternative linkage variables

To this end, by means of the standard spillover variables defined above, we explore export spillovers raised by foreign presence in manufacturing and services industries combining firm level data with industry level information. In addition to these standard indicators existing in the literature on export spillovers, we define alternative vertical linkage variables. Similar to the standard ones, the first set of the alternative variables are computed at 2-digit industry level. With these linkage measures we take into account the export tasks of firms operating in downstream/upstream industries. We proxy the intensity of the exporting tasks within those industries by their share of exports in total output hypothesizing that the downstream/upstream industries with more intensive exporting activity may propagate knowledge about foreign markets and could be useful to firms operating in upstream/downstream industries. We presume that domestic firms are more likely to benefit from vertical linkages if the downstream/upstream sectors with foreign presence engage in exporting more intensively. That is, export-oriented industries

are more likely to be the source of export spillovers than local market-oriented ones. Relying on this assumption, our alternative forward linkage variable considering the export intensity of downstream industries $FDI\_Forward\_X_{Jt}$ measures the degree of spillovers for a manufacturing industry *J* supplying inputs to other manufacturing and services industries.

$$FDI\_Forward\_X_{Jt} = \sum_{\forall K \neq J} \phi_{KJ} * FDI\_Own_{Kt} * X_{Kt} \quad (4.4)$$

Where X_{Kt} is the following for the downstream industry *K*:

$$X_{Kt} = \frac{\text{total value of exports of sector K at time t}}{\text{total output produced by sector K at time t}} .$$

As regards to the alternative backward linkage variable $FDI\_Backward\_X_{Jt}$ considers the export intensity in the upstream industries of manufacturing and services and measures the degree of spillovers for any manufacturing industry *J* which outsource inputs from those manufacturing and services industries, where X_{Kt} is the share of exports in total output of the upstream industry K as defined above:

$$FDI\_Backward\_X_{Jt} = \sum_{\forall K \neq J} \gamma_{KJ} * FDI\_Own_{Kt} * X_{Kt} \quad (4.5)$$

One key contribution of this study is that we also define a second set of alternative spillover variables that are now defined at the firm level. The effect of FDI-related spillovers on domestically owned firms could vary extensively across firms due to the characteristics regarding their production structures. We ask whether the association between foreign presence in downstream (upstream) industries and exporting behaviour of the firms in upstream (downstream) industries tends to vary according to the intensity of their intermediate goods production (intermediate goods usage). Using firm level spillover variables what we aim is to test the importance of firms' share of outputs produced as inputs and their input usage within the context of forward and backward measures, respectively. If spillover effects do arise from the foreign presence in upstream or downstream industries via buyer/supplier relations, ignoring the importance of intermediate goods in firms' production process and total goods production might cause underestimating these effects.

In terms of forward spillovers we hypothesize that domestic firms whose intermediate goods production constitutes a larger share in the total production are expected to benefit more from the forward linkages. Hence, we derive the firm level forward spillover variables by using the coefficient IP_{iJt} defined as the share of output of firm *i* operating in industry *J* produced as inputs at year *t*. Note that as denoted in the earlier section we get IP_{iJt} coefficient from AIPS dataset providing information on the type of goods produced under the classification of United Nations by Broad Economic Categories (BEC) that define products in three broad categories as consumption goods, intermediate goods and capital goods. That is, $FDI\_Forward\_IP_{iJt}$ measures the degree of spillovers for firm i operating in a manufacturing industry *J* supplying inputs of intermediate goods to other manufacturing and services industries *K*.

$$FDI\_Forward\_IP_{iJt} = IP_{iJt} * \sum_{\forall K \neq J} \gamma_{KJ} * FDI\_Own_{Kt} \quad (4.6)$$

Where,

$$IP_{iJt} = \frac{\text{output of firm i produced as inputs at time t}}{\text{total output produced by firm i at time t}}.$$[51,52]

For the backward spillovers, we assume that domestic firms with a greater percentage of intermediate goods usage in their production processes are more likely benefit from the backward linkages. Accordingly, we calculate firm level backward spillover variables by employing the coefficient IU_{iJt} which is relevant for the firm *i* that is influenced by the foreign presence. This coefficient is described as the share of intermediate inputs in the total output of firm *i* operating in the manufacturing industry *J* at year *t*. Thus, $FDI\_Backward\_IU_{iJt}$ measures the degree of spillovers for firm *i* operating in a manufacturing industry *J* outsourcing inputs of intermediate goods from other manufacturing and services industries *K*.

$$FDI\_Backward\_IU_{iJt} = IU_{iJt} * \sum_{\forall K \neq J} \phi_{KJ} * FDI\_Own_{Kt} \quad (4.7)$$

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[51] The nominator of the IP_{jt} ratio comes from AIPS dataset. AIPS is not a census for firms with 20+ employees as the other two datasets AISS and ATS. Therefore, in order to avoid losing approximately 1/3 of the observations in the subsequent regressions we took 4-digit industry-NUTS2 region-size-year means and impute the empty observations.

[52] Note that $FDI\_Forward\_IP_{iJt}$ can be reformulated as $FDI\_Forward\_X_{Jt} * IP$.

Where,

$IU_{ijt} = \frac{\text{total inputs used by firm i at time t}}{\text{total output produced by firm i at time t}}$.

4.3.3 Empirical strategy

To analyse the existence of spillover effects originating from the presence of foreign firms, we employ an empirical model which is grounded on the studies of Aitken et al. (1997), Greenaway et al. (2004) and Kneller and Pisu (2007). The underlying model let us investigate whether the linkages raised by foreign firms impact on the decision of domestic firms to export and their export performance. According to the firm heterogeneity framework in the existence of sunk costs, export market entrance of firms could be treated as a two-stage decision process by which they first decide whether or not to export, and secondly what, how much, where to export. To account for both stages, we use the Heckman's (1979) selection model that controls for selection bias.[53] Selection happens if observations are sorted non-randomly into distinct groups, consequently leading possible coefficient bias in procedures of estimation procedures such as OLS. (Maddala, 1991). Heckman (1979) develops a standard approach to control for this bias which is referred as the selection model. In our case, the non-random sample of exporters can give rise to selection bias if the determinants of becoming an exporter are correlated with the error term.

The implementation of this model requires identifying exogenous independent variables from the first-stage equation of export decision, which could be validly eliminated from the set of independent variables in the second-stage estimation. The estimated equations are as follows:

$$d_{ijt} = \alpha d_{ijt-1} + X_{Jt-1}\beta + Controls_{ijt-1} + u_{ijt} \quad (4.8)$$

$$y_{ijt} = X_{Jt-1}\delta + Controls_{ijt-1} + \mu_{ijt} \quad (4.9)$$

[53] Controlling for selection bias Heckman's two step estimation process is a well-recognised method in export spillover literature applied in many papers which use a similar data structure with us (see among others Kneller and Pisu, 2007; Karpaty and Kneller, 2011; Anwar and Nguyen, 2011; Chen et al., 2013; Duran and Ryan, 2014).

Where, d_{ijt} is a binary variable having the value 1 if firm *i* in industry *J* exports in year t and, 0 otherwise. d_{ijt-1} is firm's lagged export status and takes value 1 if it was exporting at time $t-1$ and, 0 otherwise. What is essential for the identification of the sample selection model is that the set of regressors in the export decision and export performance equations cannot be the same. Thus, following Helpman et al. (2007) we include d_{ijt-1} in the selection equation as the exclusion restriction and motivate this as a measure of the sunk-costs of exporting.[54] y_{ijt} is firm *i*'s export performance indicator whose definitions are provided in Table 4.2. Just as our analysis on export spillovers consider both the intensive and extensive margins of exporting activity we assess the export performance of firms by various outcome variables. X_{Jt-1} includes our linkage variables of forward spillovers, backward spillovers, as well as the one capturing the horizontal spillovers. The error terms u_{ijt} and μ_{ijt} are random variables capturing the impact of omitted variables that are presumed to be distributed bivariate normal with correlation ρ. If $\rho \neq 0$ estimating only the equation of export performance leads to selection bias for the estimates of β coefficients since μ_{ijt} and X_{Jt-1} would be correlated. In order to evade this bias both equations are to be estimated. Hence, we use Heckman's (1979) maximum likelihood method involving estimating inverse Mill's ratio as well as the coefficients in the two equations by employing a full maximum likelihood process.

Although the average forward and backward linkage for manufacturing and services industries varies over time, the source of variation identifying parameters in equation 4.8 is mainly coming from cross sectional sectoral differences. However, although the identification is essentially coming from such cross-section variation, our empirical model exploring the existence of spillover effects on firms is well grounded on the seminal studies of Aitken et al. (1997), Greenaway et al. (2004) and Kneller and Pisu (2007). Further, controlling for selection bias by Heckman's two step estimation process is a well-recognised method in export spillover literature applied in many papers which use a similar data structure with us (see among others Kneller and Pisu, 2007; Karpaty and Kneller, 2011; Anwar and Nguyen, 2011; Chen et al., 2013; Duran and Ryan, 2014).

Another issue that may arise is that of endogeneity between the linkage variables and the export performance indicators. First of all, the standard linkage variables (see section

[54] See Roberts and Tybout (1997) and Bernard and Jensen (2004) for the identification of past export experience as a measure of sunk costs.

4.3.2.1) are computed at two-digit industry level. Secondly while one pair of the alternative linkage variables (see section 4.3.2.2) is also defined at sectoral level the remaining pair is computed at firm level. These firm level variables are also highly dependent on the standard linkage variables which are calculated at aggregate industry level. This fact attenuates the potential causal relationship from firm's export indicator towards spillover variables. Further, with the aim of taking the problem into account we incorporate the linkage variables in the regressions in their one-year lagged values. By this means, we further consider the fact that spillovers might take some time to effect on the exporting behaviour of domestic firms. That is, the lagged values of linkage variables are less likely to respond to a shock to the export behaviour of the firm occurred in current period.

In this study, we are mainly concerned with the spillover effects on the exporting behaviour of firms that may arise from foreign presence in those sectors which have vertical linkages. We also need to control for other factors that have the potential to impact on the relationship between our spillover measures and export behaviour of Turkish firms. Thus, our vector of covariates $Controls_{ijt-1}$ includes firms' and industries' characteristics (see Table 4.A4 in Appendix). We include firm specific variables; hence we are able to control for other firm level features that may influence the correlation of the linkage measures with the exporting behaviour of Turkish firms. By this means, throughout the analysis, we bring out the relevance of firm characteristics for the association between foreign presence and firms' export performance. Accordingly, one of the ultimate findings of this analysis develops as providing evidence on the trade models of firm heterogeneity.

In order to avoid for possible endogeneity between firm controls and their exporting behaviour, the firm-specific variables are contained in the regressions in their one-year lagged values. They are TFP estimated by Levinsohn and Petrin's (2003) approach as we expect that due to presence of sunk costs of exporting firms with higher productivity levels are more likely to export; number of employees for firm size; wage-per-employee to proxy for skill intensity of workers since larger firms with a better qualified labour force are expected to be more likely to export; tangible investment dummy (gets value 1 if the firm invested in tangible assets), intangible investment dummy (gets value 1 if the firm invested in intangible assets) and; import dummy representing whether the firm was

an importer or not. We include four-firm concentration ratio (CR4) computed as four-digit sectoral level to consider changes to the competitiveness of each industry across time and accordingly to eliminate general competition effects arose within industries. Additionally, we incorporate year dummies, region dummies (recognising 12 regions dispersed according to classification of NUTS2) and, four-digit industry dummies classified with respect to NACE Rev. 2. We use year dummies to consider for the shocks common to the whole set of firms, such as changes in trade policy regimes or exchange rate movements. Region and sector fixed effects are included in order to control for omitted time-invariant regional and sectoral factors, such as labour market conditions and infrastructure. Note that all the regressions apply just to the sample of domestically owned firms.

4.4 Results

4.4.1 Baseline results

4.4.1.1 Spillovers from manufacturing

We document our baseline results in Table 4.5 and 4.6. Table 4.5 shows the export spillover effects for Turkish manufacturing firms arising from linkages with manufacturing industries, whereas Table 4.6 presents spillovers effects for Turkish manufacturing firms arose by their linkages with services industries. The second columns in both Tables 4.5 and 4.6 show the results from the first stage equation while the subsequent columns show the results from the second stage equation on our various outcome variables. Note that, the two equations are jointly estimated and in reference to the Wald tests for the overall validity of the Heckman selection model, the hypothesis of non-correlation between the two error terms from the export decision equation and the performance indicator equation (i.e. $\rho = 0$) is rejected. In addition, provided in the tables, λ is the estimated coefficient on the inverse Mills ratio and its significance points out to the existence of sample selection bias validating further the Heckman selection model.[55]

In Tables 4.5 and 4.6, Panel A presents the spillover effects over our standard linkage variables while Panel B and C provides results over the alternative sector level and firm

[55] All the estimates of ρ and λ reported in the subsequent tables are significantly different from zero.

level linkage variables respectively.[56] Throughout both tables, in all specifications, the significantly positive coefficients on the lagged export status in the first stage equations imply hysteresis for firms' export behaviour. This typically suggests the existence of sunk costs for starting to export (Roberts and Tybout, 1997; Bernard and Wagner, 1997; Tybout, 2003; Bernard and Jensen, 2004). Table 4.A5 and 4.A6 in Appendix provide coefficient estimates on the control variables reflecting firm heterogeneity and industry characteristics. They are usually in the expected sign and corroborate previous findings in studies on exports and firm heterogeneity (Bernard and Wagner, 1997; Girma et al., 2004). Particularly, productivity is found to impact the export decision and performance of firms positively. Such a relationship is compatible with the theoretical basis for the models of trade with firm heterogeneity as pioneered by Melitz (2003) implying that firms that are more productive are more likely to cover the sunk costs and self-select into exporting.

The well-founded linkage between exports and firm size is also conformed in both export decision and export performance equations. That is both, the probability of being an exporter and export performance are rising in the size of the firm since larger firms have more capacity in covering any sunk costs of entering into export markets and to benefit from economies of scale in their exporting process. The coefficients on the wage per employee indicate that firms hiring workers which have more skill intensity have a higher probability to export (see columns 2 in Table 4.A5 and Table 4.A6) and this positive effect is validated for the export performance indicators of both intensive margins (see columns 3, 4, 7, 8, 9 in Table 4.A5 and Table 4.A6) and extensive margins (see columns 5, 6 in Table 4.A5 and Table 4.A6). The coefficients of the dummies indicating whether the firm made tangible investments in the previous year, is significantly positive in export decision equation whereas it turns to be insignificant in the export performance equations except for the number of products exported. On the other hand, intangible investments significantly impact on export decision and export performance of firms both at intensive and extensive margins. Since investment decision incurs additional financial burdens on firms, those that made investments may better position themselves to cover sunk costs and engage into export markets in the next period. And once the sunk costs are

[56] All standard errors are robust to cluster (industry) correlation to take account for the fact that we have regressions with industry level explanatories and firm level dependents (see Williams, 2000; Wooldridge, 2003).

internalized, the intangible investments bear additional pay-offs such as reducing costs and improving the production efficiency and promotes firms' exporting behaviour further.

In parallel with the firm heterogeneity literature previous import status positively influences both the decision to export and export performance of firms. Finally, we report that the four-firm concentration ratio capturing the changes to the competitiveness of each industry across time is revealed to affect the likelihood of exporting and export performance of firms positively. Given the inclusion of year dummies this finding suggests that in sectors where competitiveness has decreased, domestic firms perform better in export markets. Such positive effects might be attributable to the fact that the higher degree of industry concentration creates economies of scale conditions and leads to better export performance both at intensive and extensive margins. This is compatible with the stylized fact provided by the new-new international trade literature that within narrow industry borders, only a small number of firms export a large number of products to a large number of destinations. Because of the reason that the significance and sign of the coefficients on the control variables reflecting firm heterogeneity and industry characteristics remain unchanged throughout different specifications, in the remainder of this chapter we will only discuss about the coefficients of our spillover variables indicating foreign presence.

Table 4.5 and 4.6 present the spillover effects over various linkage variables including the vertical linkages from manufacturing and services sectors, respectively. Note that while the vertical linkages are constructed both for manufacturing and services sectors, the estimation sample is restricted to firms operating only in the manufacturing sectors. Hence our horizontal linkage variable defined as the share of output within the same sector due to foreign-owned firms is constructed only for manufacturing industries. Note that we discover the impact of the linkage variables on the extensive margins as well as intensive margin of exports.

Excepting the equation on the number of destinations, the coefficients of the horizontal linkage variables are significantly negative for all performance indicators of the intensive and extensive margins as well as for the weighted unit values. However, the co-existence of multinationals is found to positively influence the export decision. While the foreign presence within the same industry might be the source of export spillovers through

technological knowledge-related spillovers and information externalities about foreign markets[57], the finding of the significantly positive effect with regard to the export decision and country extensive margin equations is compatible with the view that regarding the foreign market-related information externalities, non-exporter firms within an industry might benefit from foreign firms via the leakage or information spillovers including export market intelligence, marketing and export operations know-how. Thus, the significantly positive coefficients on the horizontal linkage variables regarding the export decision and number of destinations suggest the possible presence of export related information externalities arising from multinationals within the industry which could reduce the sunk costs of non-exporters and increase their probability of selecting into export markets.

On the other side, the rationale behind the finding that foreign presence within the same industry is not a source of spillovers for domestic firms in terms of other performance indicators may be in line with the view which advocates that foreign affiliated firms may prevent technology-related knowledge spillovers to domestic firms that are in the same industry owing to competition effects (e.g. through patents). Besides foreign firms might prevent information leakages (e.g. ideas of how to organize production) towards domestic firms via labour mobility. Within the same industry as the share of foreign firms increases, this may exert competitive pressure impacting on domestically owned firms' access to skilled workers, arising from higher wages and this could dominate the positive effect of market-related information externalities.[58]

[57] See Kneller and Pisu, 2007 and Fu, 2011.
[58] See Aitken and Harrison, 1999; Hu et al., 2005; Blalock and Gertler, 2008.

Table 4.5: Exports and foreign presence in manufacturing sectors

VARIABLES	Export Decision	Total Exports	Export Intensity	Number of Products	Number of Destinations	Exports per Product	Exports per Destination	Exports per Product and Destination
PANEL A								
Export Dummy (i,t-1)	2.1353***							
	(0.000)							
FDI Own (s,t-1)	0.2090***	-0.3497***	-0.0110*	-0.1621***	0.0832***	-0.1876**	-0.4329***	-0.1664*
	(0.000)	(0.000)	(0.065)	(0.001)	(0.000)	(0.018)	(0.000)	(0.081)
FDI Forward (s,t-1)	1.0956***	0.1444***	0.1574***	0.0612***	0.0525***	0.0832***	0.0919***	0.0701***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward (s,t-1)	0.6380	0.0745	0.0357	0.0263	0.0329	0.0482	0.0416	0.0404
	(0.149)	(0.301)	(0.402)	(0.187)	(0.464)	(0.409)	(0.332)	(0.645)
Lambda		-0.27***	-0.11***	-0.16***	-0.17***	-0.11***	-0.10***	-0.12***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.431***	-0.232***	-0.310***	-0.505***	-0.369***	-0.349***	-0.394***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3906	-3213	-3234	-3262	-3776	-3788	-3901
Number of Observations	136269	136269	136269	136269	136269	136269	136269	136269
PANEL B								
Export Dummy (t-1)	2.1332***							
	(0.000)							
FDI Own (s,t-1)	0.1896***	-0.3278***	-0.0163***	-0.1579***	0.0811***	-0.1699***	-0.4089***	-0.1616**
	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.044)
FDI Forward with Sectoral Export Intensity (s,t-1)	4.6493***	0.3630***	0.4071***	0.1644***	0.1336***	0.1986***	0.2294***	0.1763***
	(0.000)	(0.000)	(0.008)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Sectoral Export Intensity (s,t-1)	1.7904***	0.1543***	0.0792***	0.0719	0.0651	0.0824*	0.0892	0.0957
	(0.000)	(0.000)	(0.000)	(0.214)	(0.744)	(0.087)	(0.828)	(0.216)
Lambda		-0.27***	-0.11***	-0.16***	-0.17***	-0.11***	-0.10***	-0.11***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.437***	-0.235***	-0.307***	-0.509***	-0.373***	-0.344***	-0.394***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3921	-3254	-3216	-3289	-3799	-3801	-3913
Number of Observations	136269	136269	136269	136269	136269	136269	136269	136269

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Table 4.5: Exports and foreign presence in manufacturing sectors (Continued)

VARIABLES	Export Decision	Total Exports	Export Intensity	Number of Products	Number of Destinations	Exports per Product	Exports per Destination	Exports per Product and Destination
PANEL C								
Export Dummy (i,t-1)	2.1416***							
	(0.000)							
FDI Own (s,t-1)	0.1776***	-0.2986***	-0.0146***	-0.1599***	0.0823***	-0.1387***	-0.3809***	-0.1576***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	4.0945***	0.3357***	0.3185***	0.1429***	0.1199***	0.1928***	0.2158***	0.1530***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	1.0224	0.1689	0.0653	0.0702	0.0611	0.0987	0.1078	0.0969
	(0.393)	(0.458)	(0.298)	(0.401)	(0.275)	(0.319)	(0.639)	(0.294)
Lambda		-0.28***	-0.11***	-0.16***	-0.18***	-0.12***	-0.11***	-0.12***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.444***	-0.239***	-0.312***	-0.510***	-0.379***	-0.344***	-0.388***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3917	-3232	-3228	-3299	-3802	-3822	-3918
Number of Observations	135403	135403	135403	135403	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Panel A, Table 4.5 also gives the coefficients on our standard spillover variables associated with vertical links between and domestic and foreign owned manufacturing firms. The results imply that only forward linkages between domestic and foreign manufacturing firms appear to create spillover effects. Note that, as for the forward linkage variable the spillover effect stems from the downstream sectors reflecting the fact that forward spillovers are related to foreign presence in downstream sectors. The findings suggest that the spillovers occur with regard to both export decision and the other export performance outcome variables.

Estimates in columns 3, 4, 7, 8 and 9 reflect the spillovers for the intensive margins of exports. Given the composition of our forward linkage variable, the effect of a rise in the output share with respect to foreign presence in downstream manufacturing sectors is dependent on the share of the total output of the upstream manufacturing industry supplied as inputs to those downstream industries. For instance, for firms operating in the chemical products industry that sells a quarter of its total output to downstream manufacturing industries as inputs; a 10-percentage point increase in share of output due to foreign presence in the chemical products sector's downstream sectors implies on

average a 0.36 percent increase in total export value of firms, a 0.39 percent increase in their export intensity defined as total value of exports over total sales.[59]

First, the evident forward spillovers might be stemming from technology-related knowledge externalities. The existence of foreign firms in downstream industries necessitate their local suppliers to draw near international standards that they are already engaged with; regarding variety, quality and technology level in production processes. Thus, foreign firms help their upstream domestic suppliers of intermediate inputs to increase their competitiveness by improving their production efficiency and thus reducing their marginal costs via creating technology externalities. Second, as domestic firms witness foreign firms' business activities operating in downstream sectors they supply and, as they try to catch up with the international standards; their behaviour is expected to be further improved to secure their contracts with foreign firms. Further, our finding of the expansion in export intensity (see column 4 in Panel A of Table 4.5) signals domestic firms' changing their market orientation from domestic markets towards international markets. This suggests export market-related information externalities might also be arising through the business linkages with foreign firms in downstream sectors reducing sunk costs of international sales relative to same costs of domestic sales.

The regressions mentioned so far show significant effects along the intensive margin of total exports. This might be due to increased exports to existing destinations and existing products or due to new destinations and new products. That is, whether the changes taking place because of changes at the intensive margins or at the extensive margins (i.e. entry into new destination markets and into exporting of new products) and which changes have more importance is not clear. In order to explore whether foreign presence in downstream manufacturing sectors separately affect both the extensive margins and the intensive margins in terms of products/destinations, we further explore, within firm, the number of products/destinations and the average export value per product/destination. The decomposition of exports into extensive margins in columns 5 and 6 (Panel A in Table 4.5) reveal that supplying downstream manufacturing industries with foreign presence, create spillovers improving domestic firms' performance at both product and country extensive margins. Note that estimates in columns 5 and 7 and, those in columns 6 and 8

[59] These number are derived from the coefficients on total exports and export intensity respectively for FDI_forward in Panel A of Table 4.5.

each sum up to those in column 3. Accordingly, the larger part of the effect of foreign presence in downstream manufacturing industries on total exports of domestic suppliers in upstream sectors works along the intensive margins (columns 6 and 7), while the estimates for the extensive margins (columns 4 and 5) are smaller. This signals that technological knowledge externalities are at work more compared to export market related externalities. Nevertheless, new products and new destinations comprise a non-negligible 42% and 36% respectively of the increase in trade. Further, results shown in the following columns 7, 8 and 9 suggest that the extra products and extra destination markets added regarding interaction with downstream foreign affiliated firms are marginal products and destinations with significant export values such that average export value per product, export value per destination and average export value per product-destination pair increase.

One way of shedding light on the extent to which the changes might be driven by export-market related information externalities, is to examine the effects where we also take account the export intensity of the firms. Hence, we explore whether export-oriented industries are more likely to be the source of export spillovers than local market-oriented ones, through our alternative spillover variable which adjusts for export intensity. Thus, assessing the importance of export operations of the sectors with foreign presence in this way in addition to the assumption that "a domestic firm benefit more from vertical linkages if foreign firms comprise of a larger portion of output in its downstream/upstream industries" we further hypothesize that "a domestic firm benefit more from vertical linkages if the downstream/upstream sectors with foreign presence engage in exporting more intensively".

Panel B in Table 4.5 presents the results associated with the alternative vertical linkage definitions What is interesting is that the estimates regarding forward linkages remain qualitatively similar but become substantially larger for all the outcome variables in question. Particularly, domestic firms in upstream industries benefit more from interacting with foreign owned firms in downstream manufacturing industries as the export intensity of the vertically linked manufacturing industries gets higher. That is supplying to sectors with higher foreign presence as well as with more intensive exporting tasks creates greater effect on the export performance of domestic firms at both intensive and extensive margins of exports. For example, for a firm operating in an upstream

industry which sells a quarter of its total output to downstream manufacturing industries as inputs, say, ceteris paribus, there exist a 10-percentage point increase in export intensity of all downstream manufacturing sectors that the firm supplies; it implies on average a 0.91 percent increase in firms' total export value, a 1.01 percent increase in its export intensity defined as total value of exports over total sales. Such stronger effects driven by consideration of industries' engagement with export markets suggest that export-market related information externalities are at work.

What is also different from Panel A is that, though still being weaker than that of forward linkages, backward linkages now appear to affect the likelihood of exporting, export value and export intensity of firms. In other words, the existence of foreign firms in upstream industries with higher export intensity not only enhances the probability that domestic firms in the vertically linked downstream sector will start to export but, it also gives rise to a significant rise in their export intensity. The existence of foreign owned firms in upstream sectors is expected to affect domestic firms' export performance in downstream sectors mainly via outsourcing intermediate inputs comprising of more advanced technological knowledge. That is, access to new, improved, or less costly intermediate inputs produced by foreign firms leads to improvements in production efficiency and hence increases in the export competitiveness of domestic firms. Nevertheless, in our case, backward linkages between foreign and domestic manufacturing firms seem to create spillover effects only when the intensity of the export tasks of the upstream industries is taken into account. An explanation for this is that the spillover effects in question could stem from export-market related information externalities. In other words, positive backward spillovers conditioning upon the exporting behaviour of the source sectors points out the fact that domestic non-exporter firms which interact with foreign owned suppliers benefit from the linkages as long as those upstream industries with intensive export tasks conveys information about foreign markets that domestic firms need to have about the preferences and operations in export markets. Yet, the results concerning the alternative backward linkage variable in question tell a different story particularly for the outcome variables representing the extensive margins of exports. It is shown that backward linkages do not seem to be a source of export spillovers at the product and country extensive margins. This result together with the existence of backward spillovers for export value and export intensity point out that backward

spillovers leads to increases in exports to existing destinations and existing products instead of exporting to new destinations and new products.

Next, we look for additional evidence on the spillover effects and possible channels arising these effects found so far, by allowing for heterogeneity among firms which may be subject to the spillovers. Panel C in Table 4.5 presents the results associated with alternative vertical linkage definitions which are defined at the firm level considering whether export spillovers associated with foreign presence changes with respect to supplier/buyer firms' characteristics regarding their production structures. Specifically, we ask whether our results would alter if we control for the heterogeneity of firms in terms of their intermediate goods production/usage. This would enable to search whether technical and managerial knowledge externalities are also at work as well as a robustness check for the results obtained so far. Put differently, if the forward spillover effects do arise via interacting downstream industries with foreign presence then, ignoring the importance of intermediate goods in firms' production process and total goods production might underestimate the importance of the spillovers. Accordingly, we hypothesize that domestic firms whose intermediate goods production constitutes a larger share in the total production can benefit more from the forward linkages via technological knowledge externalities. Our alternative firm level forward linkage variable represents a new weighted measure by weighting according to the share of the domestic supplier's intermediate goods production (usage). In this way we also eliminate those firms that are not producing inputs since domestic firms might not be uniform in their ability to benefit from spillovers.[60]

Comparing the coefficients on forward linkage variables in Panel C with those in Panel A, we again observe that they remain qualitatively similar in terms of significance but once again are substantially larger for all the outcome variables in question. Accordingly, we capture those effects are at work that foreign firms require their domestic suppliers to catch international standards in terms of quality, variety, managerial and technological know-how which in turn increase domestic firms' production efficiency and export competition in foreign markets. To illustrate, for a firm operating in an upstream industry

[60] In this case, since each of these firm level spillover variables are derived as an interaction of firm level intermediate goods production/usage and sector level original linkage variable; we alternatively run regressions where we also include the first-degree variables of the regarding interaction terms. The results are consistent with the estimates without first degree variables (see Tables 4.A7, 4.A8, 4.A9, 4.A10, 4.A11 and 4.A12 in Appendix.)

which sells a quarter of its total output to downstream manufacturing industries as inputs, let, ceteris paribus, there exist a 10-percentage-point increase in firm's share of output produced as intermediate inputs; this implies on average a 0.84 percent increase in firms' total export value, a 0.79 percent increase in its export intensity defined as total value of exports over total sales.

4.4.1.2 Spillovers from services

For a complete characterization of spillovers, we differentiate between the spillover effects coming from services sectors. In particular, we investigate the exporting behaviour of producers in downstream/upstream manufacturing sectors to the extent of foreign presence in upstream/downstream services sectors. Table 4.6 presents the spillover effects for Turkish manufacturing firms stemming from their buyer/supplier relationships with foreign owned services firms. One should note that, since our sample of estimation is restricted to firms operating only in the manufacturing sectors, the horizontal linkage variable in these estimations are the same with those in the estimations where the vertical linkage variables are defined for manufacturing industries. Thus, we proceed by commenting on vertical linkage variables.

With regards to backward linkage we do not see any evidence of spillover effects. This finding is yet at odds with the literature regarding the association between services sectors liberalization and the firm performance in downstream manufacturing industries (see among others Arnold, et al., 2007, 2012; Correa-Lopez and Domenech, 2017). The literature suggests that liberalization in upstream services sector lowers equilibrium input prices in these sectors through boosting competition. Hence the price of intermediate inputs sourced by downstream manufacturing firms decreases bringing improvements in their production efficiency and thus impacting on the export competitiveness of downstream manufacturing firms. Despite these theoretical discussions, empirical evidence on the issue is still ambiguous. Particularly, Correa-Lopez and Domenech (2017) show that in order for downstream manufacturing firms to benefit from a reduction in intermediate good prices, they should retain bargaining power which is rather dependent on their size. Namely, a more competitive input market environment can only improve the export performance of large firms. In our case Turkish manufacturing industry is essentially composed of small and medium sized firms. Thus, our finding of no evidence on backward spillovers from services sectors is compatible with this view.

Table 4.6: Exports and foreign presence in services sectors

VARIABLES	Export Decision	Total Exports	Export Intensity	Number of Products	Number of Destinations	Exports per Product	Exports per Destination	Exports per Product and Destination
PANEL A								
Export Dummy (i,t-1)	2.1447***							
	(0.000)							
FDI Own (s,t-1)	0.0588***	-0.3361***	-0.0179***	-0.1450*	0.0868***	-0.1911***	-0.4229***	-0.1515*
	(0.000)	(0.004)	(0.000)	(0.053)	(0.000)	(0.000)	(0.000)	(0.095)
FDI Forward (s,t-1)	0.9897*	0.1260***	0.1218***	0.0541***	0.0411	0.0719*	0.0849***	0.0580
	(0.083)	(0.000)	(0.000)	(0.000)	(0.641)	(0.091)	(0.000)	(0.516)
FDI Backward (s,t-1)	0.5563	0.0273	0.0339	0.0079	0.0061	0.0194	0.0212	0.0157
	(0.376)	(0.386)	(0.432)	(0.677)	(0.819)	(0.103)	(0.289)	(0.295)
Lambda		-0.26***	-0.11***	-0.16***	-0.17***	-0.11***	-0.09***	-0.12***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.443***	-0.237***	-0.314***	-0.512***	-0.373***	-0.348***	-0.402***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3918	-3233	-3243	-3768	-3797	-3772	-3914
Number of Observations	136269	136269	136269	136269	136269	136269	136269	136269
PANEL B								
Export Dummy (i,t-1)	2.1443***							
	(0.000)							
FDI Own (s,t-1)	0.1860***	-0.3242*	-0.0164***	-0.1398***	0.0801***	-0.1844***	-0.4043***	-0.1435*
	(0.000)	(0.057)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.091)
FDI Forward with Sectoral Export Intensity (s,t-1)	4.0114***	0.3129***	0.2828***	0.1437***	0.1108*	0.1692***	0.2021***	0.1562***
	(0.006)	(0.000)	(0.000)	(0.000)	(0.091)	(0.000)	(0.000)	(0.000)
FDI Backward with Sectoral Export Intensity (s,t-1)	1.6149	0.1372	0.0545	0.0613	0.0656	0.0759	0.0716	0.0678
	(0.160)	(0.285)	(0.297)	(0.892)	(0.151)	(0.199)	(0.901)	(0.322)
Lambda		-0.27***	-0.12***	-0.16***	-0.17***	-0.10***	-0.10***	-0.13***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.446***	-0.235***	-0.319***	-0.506***	-0.365***	-0.351***	-0.403***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-4026	-3288	-3286	-3771	-4856	-3710	-3865
Number of Observations	136269	136269	136269	136269	136269	136269	136269	136269

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Table 4.6: Exports and foreign presence in services sectors (Continued)

VARIABLES	Export Decision	Total Exports	Export Intensity	Number of Products	Number of Destinations	Exports per Product	Exports per Destination	Exports per Product and Destination
PANEL C								
Export Dummy (i,t-1)	2.1441***							
	(0.000)							
FDI Own (s,t-1)	0.1748***	-0.2977***	-0.0176***	-0.1418**	0.0792***	-0.1559***	-0.3769***	-0.1473***
	(0.000)	(0.000)	(0.000)	(0.014)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	2.8020**	0.2758***	0.2508***	0.1252***	0.1021***	0.1506***	0.1737***	0.1368***
	(0.024)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	1.0150	0.1112	0.0435	0.0514	0.0498	0.0598	0.0614	0.0566
	(0.407)	(0.281)	(0.331)	(0.364)	(0.907)	(0.393)	(0.671)	(0.385)
Lambda		-0.26***	-0.11***	-0.16***	-0.18***	-0.09***	-0.09***	-0.13***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.449***	-0.232***	-0.317***	-0.508***	-0.371***	-0.352***	-0.408***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-4098	-3332	-3243	-3725	-4912	-3678	-3856
Number of Observations	135403	135403	135403	135403	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Regarding forward spillovers we reveal significantly positive coefficients on our standard forward linkage variable (see Panel A in Table 4.6) for all the outcome variables except the number of export destinations and exports per product and destinations. Compared with the coefficients from the estimations which capture the linkages between manufacturing industries in Table 4.5, the coefficients coming from the estimations representing the linkages with services sectors are lower and less significant. In terms of the alternative vertical linkage definitions in Table 4.6 (see Panel B and C), although the results remain qualitatively similar to those in Table 4.5 (see Panel B and C), they are always weaker for services linkages. Therefore, we clearly show that there also exist spillover effects between services and manufacturing, but that the former is weaker than the latter. The reason behind this finding might be simply the fact that the way exporting manufacturing firms is linked to manufacturing and services industries through buyer-supplier relations is different.

First of all, the vertical linkage variables are the weighted sum of output with respect to foreign presence where the weights are derived from input-output tables. Looking at the spillover variables in Table 4.4, it is obvious that both the forward and backward linkages for manufacturing industries are larger than those for services. Despite the significant values in the share of output produced by foreign firms in services sector over our analysis period, the weaker linkage variables indicate that in Turkey, the reliance of manufacturing firms on services inputs as well the reliance of services firms on manufacturing inputs is low. Next, owing to the significant effects we find for services linkages; the two channels of foreign-market related information externalities and technological knowledge externalities that give rise to forward spillovers seem to be still at work but in a less pronounced manner with respect to manufacturing linkages. Benefiting from technological knowledge externality is more difficult for a manufacturing firm which supply inputs to services firms compared to a manufacturing firm which supply inputs to manufacturing firms as product and sector specific know-how is expected to more easily transferred within the borders of manufacturing industry. Consequently, our finding of weaker evidence for services linkages is consistent with there being weaker spillovers through technological knowledge externality channel.

4.4.2 Potential alternative explanations by unit values

So far, our findings confirm that there exist important export spillovers from downstream foreign presence and the impact of foreign presence in downstream manufacturing industries is concentrated at the intensive margin, although there are also significant effects on the extensive margin. One of the plausible explanations for these spillover effects from foreign demanders of inputs to domestic suppliers, is that the foreign presence in downstream industries increases the export competitiveness of upstream domestic suppliers via improving their production efficiency which in turn reduce their costs. The increased competitiveness might be reflected in two contrary effects on export unit values by domestically owned firms. On the one hand it might lead to exporting higher-quality (i.e. exports with higher unit value) products. On the other hand, via such linkages, domestic firms might be able to produce and export the same products at lower prices (i.e. lower unit-value). In order to shed light on the issue whether existing spillovers are taking place contemporaneously by lowering prices or increasing quality of exports, we now focus on the unit values of exports which are given by value of the export flows

divided by the physical quantity. First, we rely on firm level weighted unit values where weights are defined as the share of each product-destination pair in total export value of a firm and products are defined at HS-12 level.

The results from firm level unit value estimations are shown in the second columns of Table 4.7 and Table 4.8 respectively. Table 4.7 shows the spillover effects coming from manufacturing sectors whereas Table 4.8 shows the spillover effects coming from services sectors, respectively.[61] From the second column in Table 4.7 one can see that none of the vertical linkage variables appear to have an effect on firm level export unit values even for the alternative specifications. So far, as the forward spillovers are found to be at work; the insignificant coefficient on forward linkage variables in the firm level unit value regressions in Table 4.7 contradicts our expectation that supplying foreign firms should, if anything, lead to either an increase in quality of exports or a decrease in price of exports.

In order to dig deeper we proceed by exploring two more dimensions and estimate the effect of linkage variables on firm-product and firm-product-destination level unit values which are expected to identify the unit values more accurately. Firm-product level unit values are constructed for the export flow of each product of each firm at HS-6 level whereas; the firm-product-destination level unit values are constructed as unit values of export flows for each product-destination pair of each firm where the product dimension is defined at a more disaggregated level of HS-12. The results confirm our expectations such that we find a strong negative relationship between the forward linkage variables and the unit values in both the firm-product and firm-product-destination level regressions (see Panel A, B and C in Table 4.7). This implies that as the foreign presence in downstream manufacturing sectors increases, unit values of exports at product and product-destination level decrease. Therefore, spillovers are indeed taking place through lowering prices which in turn make domestic firms more competitive in export markets and lead domestic non-exporter firms to start to export and the growth in export values of existing exporters confirming our earlier findings. As mentioned earlier, the extent that foreign owned firms give rise to export spillovers through lowering prices may originate from efficiency gains through interaction with foreign firms. That is, as foreign

[61]Since these first stage estimations are unchanged throughout all the specifications we do not present and comment on these regressions.

downstream firms possess higher value of intangible assets in terms of more advanced technologies[62], superior organizational structures and in turn superior productivity, domestic firms that interact with those firms might have efficiency gains. Such efficiency gains might lead to producing and selling at lower prices. Yet, one should still bear in mind that lower prices might be driven by changes in demand in export markets, rather than improvements in firm-level efficiency due to knowledge externalities.

Our finding further explains the more pronounced effect (in Tables 4.5 and 4.6) at the intensive margins with respect to the extensive margins; while foreign owned firms in downstream industries can move the domestic firms in upstream sectors along the intensive margin by leading to relatively higher quantities of exports in existing products and destinations as a result of lower export prices.

[62] Foreign affiliated firms account for a majority of the World's research and development (UNCTAD, 2005).

Table 4.7: Export unit values and foreign presence in manufacturing

VARIABLES	Firm-Level Weighted Unit values	Firm-Product Level Export Unit values	Firm-Product-Destination Level Export Unit values
PANEL A			
FDI Own (s,t-1)	-0.3021***	-0.1217***	-0.0917***
	(0.000)	(0.000)	(0.000)
FDI Forward (s,t-1)	-4.6548	-0.3659***	-0.2715***
	(0.428)	(0.000)	(0.000)
FDI Backward (s,t-1)	0.4782	0.0021	0.0009
	(0.546)	(0.978)	(0.643)
Lambda	-0.18***	-0.07***	-0.03***
	(0.000)	(0.004)	(0.000)
Rho	-0.523***	-0.121***	-0.029***
	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-4278	-5902	-8444
Number of Observations	136269	865730	2393064
PANEL B			
FDI Own (s,t-1)	-0.2343***	-0.1443***	-0.0843***
	(0.000)	(0.000)	(0.000)
FDI Forward with Sectoral Export Intensity (s,t-1)	4.7078	-1.2427***	-0.9782***
	(0.340)	(0.000)	(0.000)
FDI Backward with Sectoral Export Intensity (s,t-1)	1.9541	-1.4854***	-1.1052***
	(0.798)	(0.002)	(0.000)
Lambda	-0.18***	-0.07***	-0.03***
	(0.000)	(0.004)	(0.009)
Rho	-0.530***	-0.124***	-0.032***
	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-4227	-5853	-8498
Number of Observations	136269	865730	2393064

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Table 4.7: Export unit values and foreign presence in manufacturing (Continued)

VARIABLES	Firm-Level Weighted Unit values	Firm-Product Level Export Unit values	Firm-Product-Destination Level Export Unit values
PANEL C			
FDI Own (s,t-1)	-0.2850***	-0.1367***	-0.0811***
	(0.000)	(0.000)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	5.6922	-0.1926***	-0.1295***
	(0.856)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	0.6333	0.0010	0.0002
	(0.529)	(0.439)	(0.367)
Lambda	-0.18***	-0.08***	-0.03***
	(0.000)	(0.004)	(0.009)
Rho	-0.522***	-0.128***	-0.039***
	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-4287	-5917	-8401
Number of Observations	135403	863288	2357107

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

As regards to the backward linkages we find that foreign presence in upstream manufacturing industries leads to lower export prices of firms in downstream manufacturing industries only when the intensity of the export tasks in those upstream industries is considered. This finding also confirms our previous evidence on positive backward spillovers conditioning upon the export intensity of the source sectors. This suggests that, in our case backward linkages between foreign and domestic manufacturing firms generate export market-related information externalities which in turn reduces fixed costs of exporting which might be reflected in lower export prices.

Turning our attention to the spillover effects arising from services sector linkages (Table 4.8), we cannot find robust evidence on the effect of backward linkages on unit values at any level of aggregation (firm, firm-product, firm-product-destination). In terms of forward linkages, for all alternative measures, similar to the manufacturing case, we find that foreign presence in downstream services sectors is negatively related with unit values of exports at firm-product and firm-product-destination levels with smaller coefficients. This weaker effect on unit values corroborates our previous finding of weaker spillovers

in terms of services linkages compared to those in terms of manufacturing linkages via technological knowledge externality channels.

Table 4.8: Export unit values and foreign presence in services sectors

VARIABLES	Firm-Level Weighted Unit value	Firm-Product Level Export Unit values	Firm-Product-Destination Level Export Unit values
PANEL A			
FDI Own (s,t-1)	-0.2825***	-0.1713***	-0.0823***
	(0.000)	(0.000)	(0.000)
FDI Forward (s,t-1)	1.3481	-0.3100***	-0.2489***
	(0.452)	(0.000)	(0.000)
FDI Backward (s,t-1)	0.2974	3.8194***	1.0827
	(0.437)	(0.000)	(0.129)
Lambda	-0.18***	-0.06***	-0.03***
	(0.000)	(0.004)	(0.000)
Rho	-0.525***	-0.128***	-0.028***
	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-4365	-5813	-8394
Number of Observations	136269	865730	2393064
PANEL B			
FDI Own (s,t-1)	-0.2132***	-0.1338***	-0.0564***
	(0.000)	(0.000)	(0.000)
FDI Forward with Sectoral Export Intensity (s,t-1)	4.1394	-3.4232***	-2.291***
	(0.605)	(0.006)	(0.006)
FDI Backward with Sectoral Export Intensity (s,t-1)	0.118	-4.7751**	-2.0181**
	(0.491)	(0.015)	(0.016)
Lambda	-0.18***	-0.07***	-0.04***
	(0.000)	(0.004)	(0.000)
Rho	-0.527***	-0.126***	-0.036***
	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-4298	-5839	-8401
Number of Observations	136269	865730	2393064

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Table 4.8: Export unit values and foreign presence in services sectors (Continued)

VARIABLES	Firm-Level Weighted Unit value	Firm-Product Level Export Unit values	Firm-Product-Destination Level Export Unit values
PANEL C			
FDI Own (s,t-1)	-0.2382***	-0.1416***	-0.0687***
	(0.000)	(0.000)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	4.6348	-0.0649***	-0.1093***
	(0.688)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	2.0512	0.0074**	0.0041
	(0.722)	(0.016)	(0.183)
Lambda	-0.17***	-0.07***	-0.03***
	(0.000)	(0.000)	(0.008)
Rho	-0.532***	-0.127***	-0.042***
	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-4244	-5801	-8492
Number of Observations	135403	863288	2357107

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

4.4.3 Spillovers via import fragmentation

Considering the fact that increased exports in developing economies are strongly correlated with increased use of imported inputs, foreign presence might be creating export spillovers on domestic firms by increasing their imports of intermediate goods. Such increases in imports of intermediate goods, namely import fragmentation could essentially lower sunk costs of importing through export-market related information externalities aroused by buyer-supplier linkages with foreign owned firms. The literature on import fragmentation highlights two sources via which imported intermediates could affect firms' export behaviour. First importing relatively cheaper inputs might decrease production costs which are in turn reflected in lower prices of firms' exports. Second, importing inputs means importing technological knowledge embodied in raw materials, intermediate good and capital goods which then improves firms' production efficiency as well as their cost competitiveness. Indeed, a significant characteristic of manufacturing firms in Turkey is their dependence on imported intermediate goods. Thus, one could possibly argue that generating knowledge externalities about foreign markets, interaction with foreign firms yield import fragmentation and create export spillovers.

To test the possibility of whether foreign linkages enhance import fragmentation, we rely on the BEC classification by United Nations and consider the relation between the structure of production at the level of firm, and our linkage variables. Specifically, the outcome variables are defined as the share of imported intermediates in total inputs of a firm, share of imported intermediates in a firm's total production and the firm level average unit values[63] of intermediate imports.

The results, where the estimates of the second stage equations are grounded on the sample of manufacturing firms that import inputs are shown in Tables 4.9 and 4.10.[64] Table 4.9 contains results for linkages with manufacturing industries while Table 4.10 shows estimates based on linkages with services industries. In Table 4.9 we see that foreign presence in the same sector affects import fragmentation of firms negatively while it has no effect on weighted unit values of imported intermediates. This result might be capturing domestic producers facing higher competition from foreign firms within the same industry. This is also compatible with our previous findings where we saw a negative association between the horizontal linkage variables and the export behaviour of firms. In Table 4.9 it is further shown that backward linkages have a negative association with import fragmentation of domestic firms.

As regards to the forward linkage variables, the share of imported intermediates in total inputs and share of imported intermediates in total production rises with the presence of foreign owned firms in the downstream sectors. Interacting with foreign owned firms might allow the firms to get additional info on the business environment of foreign markets which in turn might affect the ability of these firms to penetrate trade markets and outsource inputs. And the further estimations on unit values in column 4 of Table 4.9 directly test the hypothesis whether foreign presence in downstream manufacturing sectors induces domestic firms in upstream sectors to source cheaper imported inputs. The estimates modestly show that, as was the case with unit values of exports, unit values of imported inputs seem to be negatively related to the existence of foreign firms in the

[63] To construct these weighted average unit values; first of all, for each product-defined at HS-6 level-within a firm, the unit value is calculated as the monetary value of the import flow divided by its physical quantity. As in the case for exports, the supplementary units are given by pieces, litres, square metres or other units for imports. When both measures are available, the unit values of import flows are constructed by using supplementary units and kilograms are used otherwise. We define weights for each product as the share of that product's import value in total intermediate imports of the firm where the weights sum to one.
[64] Since the first stage estimations are unchanged with respect to previous specifications we do not present and comment on these regressions.

downstream manufacturing sectors. More clearly, the significantly negative coefficients related to downstream linkages support our hypothesis in question showing that unit values of imported inputs tend to be decreasing with foreign presence.[65] Thus downstream linkages provide access to cheaper imports of intermediate goods and improve domestic firms' competitiveness in export markets as well in domestic markets. Such decrease in costs of imported inputs endorses our earlier findings on decreasing unit values of exports and provides an explanation on the existence of export spillovers due to foreign presence in downstream industries.

Focusing on the spillovers from services sector linkages, Table 4.10 shows that backward linkages of manufacturing firms with services sectors neither increase import fragmentation nor decrease the costs of imported inputs. This result corroborates our finding that backward linkages with upstream services sectors do not lead to export spillovers. In terms of forward linkages, we find that foreign existence in downstream services sectors is positively related with domestic firms' share of imported intermediates in total inputs, share of imported intermediates in total production only with alternative specifications of linkage variables while it negatively impacts on unit values of intermediate imports for all spillover variables. Looking at the estimations on the outcome variables regarding imports of intermediate goods by manufacturing firms in Table 4.10, although they seem qualitatively similar to coefficients in Table 4.9; they are always smaller for services linkage variables. This suggests foreign market related information externalities, which generates import fragmentation and thus allows for cheaper inputs, are poorly at work in terms of services linkages with respect to those from manufacturing linkages.

[65] Note that the results are qualitatively similar and coefficients become larger under alternative definitions of forward spillover variables (see Panel B and C in Table 4.9).

Table 4.9: Import fragmentation and foreign presence in manufacturing

VARIABLES	Share of Imported Intermediates in Total Inputs	Share of Imported Intermediates in Total Production	Firm-Level Weighted Unit Values of Imported Intermediates	Proxy for Simultaneous Changes in Unit Values of Exports&Imports
PANEL A				
FDI Own (s,t-1)	-0.0464***	-0.0538***	0.0328	0.0081
	(0.000)	(0.000)	(0.458)	(0.483)
FDI Forward (s,t-1)	0.3744***	0.3764***	-0.0929***	0.1279***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward (s,t-1)	-0.2191***	-0.1453***	0.0428	0.0928
	(0.000)	(0.000)	(0.304)	(0.398)
Lambda	-0.43***	-0.39***	-0.27***	-1.16***
	(0.000)	(0.000)	(0.000)	(0.000)
Rho	-0.674***	-0.606***	-0.718***	-0.799***
	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-2863	-2967	-4398	-5134
Number of Observations	136269	136269	136269	136269
PANEL B				
FDI Own (s,t-1)	-0.0524	-0.0569	0.0294	0.0129
	(0.503)	(0.186)	(0.287)	(0.597)
FDI Forward with Sectoral Export Intensity (s,t-1)	0.9970***	0.9558***	-0.1132***	0.1301***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Sectoral Export Intensity (s,t-1)	-3.3885***	-3.2286***	0.0523	0.0943
	(0.000)	(0.000)	(0.673)	(0.594)
Lambda	-0.42***	-0.39***	-0.28***	-1.17***
	(0.000)	(0.000)	(0.000)	(0.000)
Rho	-0.678***	-0.612***	-0.711***	-0.803***
	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-2917	-2998	-4373	-5153
Number of Observations	136269	136269	136269	136269

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Table 4.9: Import fragmentation and foreign presence in manufacturing (Continued)

VARIABLES	Share of Imported Intermediates in Total Inputs	Share of Imported Intermediates in Total Production	Firm-Level Weighted Unit Values of Imported Intermediates	Proxy for Simultaneous Changes in Unit Values of Exports&Imports
PANEL C				
FDI Own (s,t-1)	-0.0468***	-0.0542***	0.0267	0.0099
	(0.000)	(0.000)	(0.427)	(0.538)
FDI Forward with Share of Inputs Produced (i,t-1)	0.5131***	0.5703***	-0.0942***	0.1228***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	-0.0026***	-0.0046***	0.0589	0.1043
	(0.000)	(0.000)	(0.217)	(0.489)
Lambda	-0.42***	-0.38***	-0.29***	-1.15***
	(0.000)	(0.000)	(0.000)	(0.000)
Rho	-0.684***	-0.609***	-0.720***	-0.769***
	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-2901	-3034	-4353	-5182
Number of Observations	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Finally, one might be concerned about whether the observed declines in unit values of exported products and imported intermediates are truly related. To attenuate this concern, we therefore test whether the firms experiencing decreases in their unit values of exports and in the unit values of imported inputs are the same firms. To do so we rely on firm-product level unit values of exports and imports where products are described at HS-6 level. Following Bajgar and Javorcik (2016), we first determine the firms that experience a greater annual change in unit values of exports than a median change within all the firm-product observations. Next, we compute the share of those products exported for each firm. In terms of imported intermediates, we do an analogous calculation of changes in unit values and find the share of those intermediate products imported in total import value of firms. The two shares regarding the products exported and inputs imported take values between zero and one, whereas their multiplication serves as a proxy for the simultaneous decrease in unit values of exported and imported products. Accordingly, in this case, while the first stage equation is run on the whole sample of manufacturing firms; the second stage equation is estimated over a sample of exporting & importing firms that

experience a larger decrease in the unit values with respect to the median change within any firm from one year to another. Results from the estimations are provided in the fifth columns of Table 4.9 and 4.10, and they show that our generic dependent variable is positively and significantly affected by foreign presence in both downstream manufacturing and services sectors. Namely, supplying to foreign owned firms in downstream industries increases the share of both exported products and imported inputs which experience larger annual changes in unit values indicating that same firms are exposed to decreases in unit values of exports and intermediate goods imports

Table 4.10: Import fragmentation and foreign presence in services

VARIABLES	Share of Imported Intermediates in Total Inputs	Share of Imported Intermediates in Total Production	Firm-Level Weighted Unit Values of Imported Intermediates	Proxy for Simultaneous Changes in Unit Values of Exports&Imports
PANEL A				
FDI Own (s,t-1)	-0.0179***	-0.0187***	0.0256	0.0101
	(0.000)	(0.000)	(0.347)	(0.613)
FDI Forward (s,t-1)	-0.0371**	-0.0491**	-0.0362*	0.1192***
	(0.012)	(0.020)	(0.091)	(0.000)
FDI Backward (s,t-1)	-1.1503***	-1.3812***	0.0113	0.0859
	(0.000)	(0.000)	(0.415)	(0.445)
Lambda	-0.41***	-0.37***	-0.28***	-1.14***
	(0.000)	(0.000)	(0.000)	(0.000)
Rho	-0.658***	-0.616***	-0.695***	-0.814***
	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-2903	-2945	-4412	-5179
Number of Observations	136269	136269	136269	136269
PANEL B				
FDI Own (s,t-1)	-0.0248***	-0.0338***	0.0261	0.0114
	(0.000)	(0.008)	(0.302)	(0.378)
FDI Forward with Sectoral Export Intensity (s,t-1)	0.8963***	0.9077***	-0.0853***	0.1199***
	(0.000)	(0.001)	(0.001)	(0.001)
FDI Backward with Sectoral Export Intensity (s,t-1)	-4.1700**	-4.7740***	0.0361	0.0902
	(0.012)	(0.000)	(0.536)	(0.612)
Lambda	-0.42***	-0.37***	-0.27***	-1.14***
	(0.000)	(0.000)	(0.000)	(0.000)
Rho	-0.673***	-0.635***	-0.744***	-0.782***
	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-2936	-2952	-4422	-5189
Number of Observations	136269	136269	136269	136269

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

Table 4.10: Import Fragmentation and Foreign Presence in Services (Continued)

VARIABLES	Share of Imported Intermediates in Total Inputs	Share of Imported Intermediates in Total Production	Firm-Level Weighted Unit Values of Imported Intermediates	Proxy for Simultaneous Changes in Unit Values of Exports&Imports
PANEL C				
FDI Own (s,t-1)	-0.0329***	-0.0373***	0.0203	0.0096
	(0.000)	(0.000)	(0.000)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	0.3305***	0.4257***	-0.0629***	0.1036***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	-0.0035***	-0.0110***	0.0248	0.0997
	(0.000)	(0.000)	(0.000)	(0.000)
Lambda	-0.41***	-0.36***	-0.26***	-1.15***
	(0.000)	(0.000)	(0.000)	(0.000)
Rho	-0.702***	-0.648***	-0.753***	-0.799***
	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-2958	-3044	-4401	-5213
Number of Observations	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate. All regressions include firm level controls as number of employees, total factor productivity, wage-per-employee, tangible investment, intangible investment, import dummies in their lagged values together with the 4-firm concentration ratio of the 4-digit sector the firm is operating in as well as 4-digit industry, region and year fixed effects.

4.5 Concluding Remarks

Over the last decades, Turkey has faced a substantial increase in the degree of its international exposure due to its enlarged foreign direct investment into its manufacturing and services industries and improved exporting activity. A recent literature postulates that foreign direct investment might have strong effects on the export behaviour of domestically owned firms through horizontal and vertical linkages (see among others Aitken et al., 1997; Javorcik, 2004; Karpaty and Kneller, 2011). Further, another literature claims that not all firms are able to export and hence comprehending the drivers behind the exporting performance of firms is crucial. Against this background, this study aims to explore how foreign presence influences export performance of Turkish manufacturing firms, namely the existence and extent of export spillovers. Employing firm-level data over a recent period 2006-2014, we relate the exporting behaviour of producers in manufacturing sectors with foreign presence in both manufacturing and services sectors through horizontal and vertical linkages. We carry out a comprehensive analysis making

use of alternative measures of foreign presence that are hypothesized to effect on both extensive and intensive export margins generating results that lead us to understand particular nature of export spillovers in the Turkish context.

It would appear from our results that foreign presence can indeed be such a factor that stimulates export decision and performance of domestically owned firms. We find robust evidence that foreign firms operating in downstream manufacturing sectors is a significant source of export spillovers towards domestic manufacturing companies in upstream sectors. Spillovers are at work for both export decision and other outcome variables indicating that if domestic firms supply to the sectors with stronger foreign presence, they are more likely to enter the export markets and they are likely to export more of their output as well. The decomposition of exports into its intensive and extensive margins show that export spillovers are mainly due to increased exports to existing destinations and existing products rather than due to additional destinations and additional products. These findings are economically meaningful since foreign firms help their upstream domestic suppliers of intermediate inputs to enhance their competitiveness by decreasing their marginal production costs via creating technological knowledge externalities or reducing their export export-related costs via foreign market-related information externalities. Our results further suggest domestic firms in upstream industries benefit more from interacting with foreign firms in downstream manufacturing industries as the export intensity of the vertically linked manufacturing industries gets higher. This more pronounced finding which is generated by consideration of downstream industries' engagement with export markets indicates that foreign-market related information externalities are at work.

Further, we provide more accurate and robust results of spillovers by eliminating those firms that are not producing inputs via alternative specification of the forward linkage variable, and thus controlling for firm heterogeneity in terms of the intensity of intermediate goods production. Correspondingly, firms with greater intensity of intermediate goods production are found to benefit more from foreign presence in downstream industries. These stronger results raised by firm heterogeneity suggest technological knowledge externalities are also at work as a driver of export spillovers as foreign firms may help their upstream domestic suppliers increase their competitiveness by improving their production efficiency.

A complete characterization of spillovers by differentiating between the spillover effects coming from manufacturing and services sectors; show that spillover effects stemming from the manufacturing industries are, if anything, stronger than those stemming from services industries. This result emerges to be consistent with the view that the way exporting manufacturing firms is linked to manufacturing and services industries through buyer-supplier relations is different. In fact, our descriptive evidence reveals weaker forward linkage variable derived from services industries since reliance of services firms on manufacturing inputs and share of output due to foreign presence is low in Turkey. Consistent with our interpretation of results, in terms of creating export spillovers, our findings indicate foreign-market related information externalities and technological knowledge externalities might be still at work for services linkages but in a less pronounced manner with respect to those of manufacturing. knowledge externalities than foreign-market related information externalities.

One way of export spillovers arising from foreign presence in downstream industries is create technological knowledge externalities which bring about improvements in the competitiveness of upstream domestic suppliers by enhancing their production efficiency. Since increased competitiveness might have two opposite effects on unit values of exports, we further uncover whether existing spillovers are taking place through lowering prices or increasing quality of exports. Our findings provide evidence that spillovers, both through manufacturing and services linkages, are indeed taking place through lowering prices which in turn make domestic manufacturing firms more competitive confirming our earlier conclusions. Still, we find less pronounced effect of foreign presence in services sectors on the export unit values; corroborating our finding of weaker spillovers for services linkages where technological knowledge externalities are less effective.

Foreign market related information externalities might lead to export spillovers by increasing domestic firms' imports of intermediate goods, namely import fragmentation. The related literature highlights that import fragmentation can affect on firms' export behaviour via allowing for access to cheaper inputs or access to inputs embodying technological knowledge which in turn improve firms' production efficiency and competitiveness. Our findings pinpoint towards interpreting that as domestic manufacturing firms supply to foreign firms in downstream manufacturing industries their reliance on imported inputs increases. This suggests that interacting with foreign

owned firms lead domestic firms to obtain additional information about foreign markets which in turn might affluence those firms penetrate international markets to outsource inputs. In addition, we reveal that downstream linkages provide access to cheaper imports of intermediate goods. Such decrease in costs of imported inputs endorses our earlier findings on decreasing unit values of exports and provides an explanation on the existence of export spillovers due to foreign presence in downstream industries. A further assessment uncovers that firms that are exposed to decreases in unit values of exports and intermediate goods imports are indeed the same firms.

Overall, this study indicates that foreign direct investment offers a potential way for improving export performance in a developing country such as Turkey revealing significant influences of foreign presence on firms stemming from their buyer/supplier relations.

5 Conclusion

The theoretical framework of firms' engagement in international trade has been principally inspired by Melitz's (2003) and Bernard et al.'s (2003) seminal works while, the micro econometrics was pioneered by Aw and Hwang (1995); Bernard et al. (1995), and Roberts and Tybout (1997). This thesis is related to several theoretical contributions and empirical findings which have explored the behaviour of firms in international trade. It is composed of three individual yet related empirical studies which thoroughly assess the behaviour of firms that make international trade in Turkey. It adds to the existing literature in three main directions. First essay presents a detailed and comprehensive picture of firms that make international trade in Turkish manufacturing industry in the light of the importance of manufacturing trade for Turkey. It concentrates on self-selection into trade by firms that are exporting and importing, and on the existence of variable costs and sunk costs differentiating between exporters and importers across different categories of products. Second essay suggests further investigation of firms by taking the diversity and the features of the markets and products firms trade into account. It explores the disparities in the post-entry effects of exporting to world markets with dissimilar income levels. Controlling for export quality, the study analyses if the post-entry effects on firm productivity are driven by changes in physical productivity, as opposed to quality/price mark-up effects. The third essay investigates whether and how inward foreign direct investments influence the export behaviour of firms operating in Turkish manufacturing industry. Particularly it searches the existence and extent of export spillovers that stem from buyer-supplier relations between domestic and foreign firms; within manufacturing industry and between manufacturing and services industries. This concluding chapter of the thesis provides a sum of the results for each chapter in turn.

Chapter 2- Costs of Trade and Self-selection into Exporting and Importing: The Case of Turkish Manufacturing Firms launches a set of stylized facts in line with the firm heterogeneity in trade literature. Therefore, it summarizes the prominent features of Turkish international trade over a period where there is a significant rise in trade activity. Conditioning upon the existence of variable costs and sunk costs differentiating between importers and exporters across different kinds of products, the chapter mainly focus on self-selection by importing and exporting firms. The key conclusion from this chapter are:

- Self-selection effect is confirmed for both exporting firms and importing firms with a stronger effect for importers.
- The mechanism of self-selection is also linked to variable costs. Particularly, if the tariff related variable costs of trade are considered the relative sunk costs for importing are even larger than those for exporting.
- The results indicate the significance of further research investigating the determinants of both sunk costs and variable costs in trade, and the differential costs that are likely to be present between exporters and importers.

Chapter 3- Does It matter Where You Export and Does Productivity Rise with Exporting? integrates and extends the existing empirical literature on the relationship between exports and productivity. It adds fresh evidence to the existing literature by exploring the differences in the post-entry effects of exporting to world markets with dissimilar income levels. In doing so PSM and DiD methodologies are employed. PSM controls for the self-selection while DiD estimates further eliminates effects of common shocks to the productivity. Apart from the present literature based on matching between export starters and non-exporters, the control groups are redefined as always-exporters. Redefining such control groups improves the quality of the matching procedure as it is still possible that in some other unobserved dimension the export starters are different to the non-exporters and that selection issues may remain. Information on export quality is proxied by weighted unit values and whether the post-entry effects are driven by changes in physical productivity, as opposed to quality/price mark-up effects is explored. The key conclusions are:

- It is documented that once quality effects and the possible remaining selection problems associated with the control group definitions are controlled for, learning-by-exporting effects are larger for HI countries.
- There is little evidence of an increase in physical productivity for exporting to MLI destinations.
- For HI destinations, there is bigger impact on productivity for high-technology, skill-labour intensive products and differentiated products. Although this could be consistent with changes in mark-ups and/or quality, given that we have controlled for quality, these results suggest that the increase is more likely to be driven by learning by exporting.

- In terms of HI-starters the positive impact of exporting gets larger the greater the number of products exported, and countries exported to, indicating economies of scope.

Chapter 4- Export Spillovers from FDI–investigates whether and how inward foreign direct investments influence the export behaviour of firms over the period 2006-2014, where Turkey witnessed a remarkable inflow of foreign direct investments and a rapid rise in exports. Overall, findings from this study indicates that foreign direct investment offers a potential way for improving export performance of Turkish firms revealing significant influences of foreign presence on firms stemming from their buyer/supplier relations. The key conclusion from this chapter are:

- Foreign firms operating in downstream manufacturing sectors is an important source of export spillovers towards domestic manufacturing companies in upstream sectors.
- Export spillovers are mainly due to increased exports to existing destinations and existing products rather than due to additional destinations and additional products.
- A complete characterization of spillovers by differentiating between the spillover effects coming from manufacturing and services sectors additionally show that spillover effects stemming from the manufacturing industries are, if anything, stronger than those stemming from services industries.
- Firms with greater intensity of intermediate goods production are found to benefit more from foreign presence in downstream industries. This finding raised by firm heterogeneity suggest technological knowledge externalities are at work as a driver of export spillovers as foreign firms may help their upstream domestic suppliers increase their competitiveness by improving their production efficiency.
- Since increased competitiveness might be reflected in two opposite effects on unit values of exports, whether existing spillovers are taking place through lowering prices or increasing quality of exports is further explored. The findings show that spillovers are indeed taking place through lowering prices which in turn make domestic firms more competitive confirming the earlier conclusions.
- As foreign presence might be creating export spillovers on domestic firms by increasing their imports of intermediate goods, the investigation in this chapter is

extended by testing whether foreign linkages enhance import fragmentation. The results suggest that as domestic manufacturing firms supply to foreign firms in downstream manufacturing industries their reliance on imported inputs increases as well as with access to cheaper imports of intermediate goods.

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6 Appendix

6.1 Appendix to Chapter 2

6.1.1 Evolution of the sample

Table 2.A1 presents the number of firms and total number of employees in each year. On average we have 17000 firms over the analysis period. There is a big growth in the number of firms over 2003-2010. Accordingly, we observe that between the starting (2003) and the end period (2010) the entire sample of manufacturing firms has increased by 42 percent. The total number of employees hired by these firms was over 1232802 at the beginning of the period and reached 1957774 towards the end of the period. It is not surprising to observe a significant slump in the sample size in 2009 since Turkish economy was seriously hit by the global crisis in 2008.

6.1.2 Concentration of trade in Turkey

Empirical evidence highlights that trade is more concentrated than employment or sales. In Table 2.A2, we record Gini and Theil coefficients and confirm this finding for Turkish manufacturing industry. Investigating by sectors, while there is clear sectoral heterogeneity, trade is more concentrated than sales and employment, for every Turkish manufacturing sector.

These findings could be attributable to inter-industry trade specialization (where trade is concentrated in few sectors) and also intra-industry trade specialization (where within the sector a subset firms carry out most of the trade). To clarify whether the trade patterns in Turkey are consistent with traditional trade theories or with the modern ones we decompose our entropy concentration measure, Theil index, into its within and between industry components in Table 2.A3. When we decompose the Theil index, it is the intra-industry component of the Theil index that explains the largest proportion of the concentration of trade i.e. trade is typically concentrated in a handful of firms within an industry.

Our data also provides some evidence on the negative relationship between the product/country extensive margins and number of firms. This finding is consistent with the theoretical view that exporters (importers) incur additional costs of engaging in foreign markets and thus only a small number of firms can exist in international markets. In Tables 2.A4 and 2.A5, we present the share of exporting firms (importing firms

respectively) along with country and product extensive margins in 2003 together with firms' share of trade volumes.

We show that a small proportion of firms account for a high proportion of the value of trade and this can be seen both the product and country extensive margins. For instance, according to the upper panel of Table 2.A4, in 2003 46 percent of all exporting firms serve in up to 5 countries and 5 products, whereas 2.5 percent of firms export more than 20 products to more than 20 countries. From the lower panel of Table 2.A4 one can infer that this small share of firms performs approximately 41 percent of total export value in Turkish manufacturing industry.

Table 2.A1: Number of firms and total employment over 2003-2010

	Number of Firms	Number of Employees
2003	14,788	1232802
2004	16,446	1482741
2005	18,463	1717504
2006	19,536	1817297
2007	18,481	1874599
2008	17,926	1853687
2009	15,487	1631150
2010	21,089	1957774

Table 2.A2: Concentration of trade, employment and sales

	Gini				Theil			
	2003	2005	2007	2009	2003	2005	2007	2009
Employee	0.62	0.60	0.59	0.60	0.95	0.91	0.89	0.89
Sales	0.80	0.80	0.80	0.81	1.00	1.00	1.90	1.00
Exports	0.88	0.90	0.90	0.89	2.42	2.00	2.00	2.63
Imports	0.89	0.92	0.92	0.91	2.39	2.84	2.00	2.00
Total Trade	0.88	0.91	0.91	0.90	2.00	2.00	2.00	2.00

Table 2.A3: Decomposition of trade concentration

	Within				Between			
	2003	2005	2007	2009	2003	2005	2007	2009
Employee	96.07	96.52	96.83	96.69	3.93	3.48	3.17	3.31
Sales	86.42	86.92	87.33	87.37	13.53	13.08	12.67	12.63
Exports	86.49	85.02	83.70	85.11	13.51	14.98	16.03	14.89
Imports	78.89	77.58	77.49	78.07	21.11	22.42	22.51	21.93
Total Trade	82.37	81.08	80.56	81.74	17.63	18.92	19.44	18.26

Table 2.A4: Distribution of exports along the extensive margins (2003)

		NCE				
%Exporting Firms		1--5	6--10	11--20	21+	Total
NPE	1—5	46.4	6.9	3.9	0.9	58
	6—10	8.8	4.7	3.2	1.3	18
	11--20	5.2	3.6	3.2	1.8	14
	21+	2.3	2.5	2.7	2.5	10
	Total	63	18	13	6	100
% Export Volume						
NPE	1—5	4.8	3.8	3.9	2.5	15
	6—10	1.9	2.1	4.6	5	14
	11--20	1.7	2.8	5.2	8.9	19
	21+	1.3	3	7	41.3	53
	Total	10	12	21	58	100

Table 2.A5: Distribution of Imports along the extensive margins (2003)

		NCI				
%Importing Firms		1--5	6--10	11--20	21+	Total
NPI	1—5	49.8	1.6	0.1	0	51
	6—10	12.5	6	0.5	0	19
	11--20	5.3	9.3	2.9	0	18
	21+	1.9	5.9	11.7	4.3	24
	Total	70	23	15	4	112
%Import Volume						
NPI	1—5	3	0.5	0.1	0	4
	6—10	1.7	2.2	0.3	0	4
	11--20	1.1	3.8	2.4	0	7
	21+	0.7	4.3	24.4	55.6	85
	Total	6	11	27	56	100

6.1.3 Results of the seemingly unrelated regressions (SUR)

We jointly estimate the following equations using SUR methodology:

$$y_{it-\rho} = \beta_0 + \alpha_i + \beta_1 D_{it}^{Exp} + \delta Controls_{t-\rho} + \varepsilon_{it,}\ with\ 1 \leq \rho \leq 2 \qquad (6.1)$$

$$y_{it-\rho} = \gamma_0 + \alpha_i + \gamma_1 D_{it}^{Imp} + \delta Controls_{t-\rho} + u_{it,}\ with\ 1 \leq \rho \leq 2 \qquad (6.2)$$

where the subscript *i* denotes individual firms and *t* indexes year. The dependent variable y_{it} measures the logarithm of either firms' labour productivity (LP) or total factor productivity (TFP). Dummies for the trading status are denoted by D_{it}^{Imp} and D_{it}^{Exp}, respectively, dummy variables for a importer and exporter. We utilize a series of control variables denoted by the vector of controls including the logarithm of firm' employment,

capital intensity and wage per employee as a proxy of skill intensity as well as foreign affiliation, two-digit sector, region and year dummies. Results are reported in Table 2.A6. We test for the equivalence of the coefficients on export/import dummies., and observe that they are statistically different. However, note that these coefficients do not directly provide insights on the self-selection effect since an exporter/importer firm might have also been exporting/importing at *t-2* and/or *t-1*.

Table 2.A6: Seemingly unrelated regression (SUR) results

	LP		TFP	
	(t-2)	*(t-1)*	*(t-2)*	*(t-1)*
Exporter in t (dummy)	0.00444***	0.00496***	0.00443***	0.00494***
	(0.00119)	(0.00109)	(0.00122)	(0.00111)
Observations	70101	88832	70101	88832
R-squared	0.364	0.369	0.805	0.806
Importer in t (dummy)	0.0114***	0.0127***	0.0114***	0.0127***
	(0.00126)	(0.00115)	(0.00129)	(0.00118)
Observations	70101	88832	70101	88832
R-squared	0.365	0.371	0.805	0.807

6.2 Appendix to Chapter 3

Table 3.A1: Comparison of treatment and control groups: Matched vs. unmatched

Panel A

Treatment Group: Firms that start exporting only to the HI countries

Control Group: Never-exporters

	Matched Sample			Unmatched Sample		
(Lagged values)	Starter	Never-exporter	T-Test for the Mean Differences	Starter	Never-exporter	T-Test for the Mean Differences
TFP	8.1346	8.0401	0.9	8.1299	7.1763	11.51
LP	10.154	10.06	1.69	10.144	9.7217	11.7
WAGE_L	8.6837	8.6622	0.65	8.6904	8.5472	6.92
EMP	4.1204	4.1156	0.09	4.1198	3.7389	12.93
CAPINT	10.663	10.557	1.14	10.597	10.239	6.03
Sample Size	691	15,472		1,044	58,740	

Panel B

Treatment Group: Firms that start exporting only to the MLI countries

Control Group: Never-exporters

	Matched Sample			Unmatched Sample		
(Lagged values)	Starter	Never-exporter	T-Test for the Mean Differences	Starter	Never-exporter	T-Test for the Mean Differences
TFP	7.4697	7.3492	1.17	7.4495	7.1763	2.73
LP	9.9757	9.9394	0.7	9.9593	9.7217	6.63
WAGE_L	8.6077	8.5972	0.41	8.6021	8.5472	2.87
EMP	3.8496	3.8137	0.82	3.8434	3.7389	2.53
CAPINT	10.633	10.592	0.4	10.621	10.206	4.96
Sample Size	734	15,308		1,104	58,740	

Panel C

Treatment Group: MLI exporters start to export to HI countries

Control Group: Always MLI exporters

	Matched Sample			Unmatched Sample		
(Lagged values)	Starter	Always MLI-exporter	T-Test for the Mean Differences	Starter	Always MLI-exporter	T-Test for the Mean Differences
TFP	7.7317	7.5546	1.01	7.7241	7.4367	2.92
LP	10.222	10.221	0.02	10.295	9.9566	3.17
WAGE_L	8.7129	8.6237	0.47	8.7006	8.5852	2.55
EMP	4.0893	4.0511	0.9	4.1062	3.6067	5.24

CAPINT	10.814	10.681	1.4	10.799	10.413	3.2
Sample Size	852	110		1,255	1,632	

Panel D

Treatment Group: HI exporters start to export to MLI countries

Control Group: Always HI exporters

	Matched Sample			**Unmatched Sample**		
(Lagged values)	Starter	Always HI-exporter	T-Test for the Mean Differences	Starter	Always HI-exporter	T-Test for the Mean Differences
TFP	7.9142	7.8749	0.96	7.8925	7.6704	3.09
LP						
WAGE_L	8.7645	8.7383	1.25	8.7645	8.5655	5.29
EMP	4.2876	4.1783	0.91	4.2876	3.8905	5.42
CAPINT	10.828	10.841	-1.26	10.836	10.446	6.42
Sample Size	1,127	201		1,602	1,565	

Table 3.A2: Average treatment effects from PSM-DiD (Sensitivity analysis)

	PSM			DID
	TFPt	*TFPt+1*	*TFPt+2*	*TFPt+1-TFPt-1*
ATT (Non-Exporter Firms Start to Export to HI with share>50)	0.574***	0.595***	0.657***	0.063**
	(0.041)	(0.042)	(0.049)	(0.028)
ATT (Non-Exporter Firms Start to Export to HI with share>75)	0.628***	0.633***	0.691***	0.066**
	(0.038)	(0.038)	(0.051)	(0.029)
ATT (Non-Exporter Firms Start to Export to HI with share>90)	0.670***	0.689***	0.737***	0.071**
	(0.047)	(0.043)	(0.056)	(0.028)
ATT (Non-Exporter Firms Start to Export to MLI with share>50)	0.188***	0.267***	0.295***	0.045*
	(0.042)	(0.045)	(0.052)	(0.024)
ATT (Non-Exporter Firms Start to Export to MLI with share>75)	0.180***	0.239***	0.288***	0.032*
	(0.042)	(0.049)	(0.055)	(0.019)
ATT (Non-Exporter Firms Start to Export to MLI with share>90)	0.176***	0.225***	0.268***	0.030*
	(0.055)	(0.051)	(0.059)	(0.018)

6.3 Appendix to Chapter 4

Table 4.A1: Output shares of industries due to foreign presence

Industry NACE Code	Industry Definition	Share of Output due to Foreign-owned firms
C10-C12	Food, beverages and tobacco products	24.35
C13-C15	Textiles, wearing apparel, leather and related products	4.63
C16	Wood and of products of wood and cork, except furniture	5.11
C17	Paper and paper products	29.58
C18	Printing and recording services	2.37
C19	Coke and refined petroleum products	11.12
C20	Chemicals and chemical products	40.04
C21	Basic pharmaceutical products and pharmaceutical preparations	49.06
C22	Rubber and plastic products	26.07
C23	Other non-metallic mineral products	18.7
C24	Basic metals	12.33
C25	Fabricated metal products, except machinery and equipment	16.36
C26	Computer, electronic and optical products	43.09
C27	Electrical equipment	31.14
C28	Machinery and equipment n.e.c.	26.42
C29	Motor vehicles, trailers and semi-trailers	74.7
C30	Other transport equipment	18.17
C31_C32	Furniture and other manufactured goods	6.18
C33	Repair and installation services of machinery and equipment	8.62
D35	Electricity, gas, steam and air conditioning	18.38
E36	Natural water; water treatment and supply services	1.67
E37-E39	Sewerage services	4.23
G45	Wholesale and retail trade and repair services of motor vehicles and motorcycles	18.96
G46	Wholesale trade services, except of motor vehicles and motorcycles	33.98
G47	Retail trade services, except of motor vehicles and motorcycles	22.81
H49	Land transport services and transport services via pipelines	10.96
H50	Water transport services	26.62
H51	Air transport services	11.52
H52	Warehousing and support services for transportation	26.57
H53	Postal and courier services	38.59
I55-56	Accommodation and food services	13.44
J58	Publishing services	21.6
J59_J60	Motion picture, video and television programme production services, sound recording and music publishing	10.73
J61	Telecommunications services	64.32
J62_J63	Computer programming, consultancy and related services; Information services	28.59
L68AB	Real estate services	9.13

M69_M70	Legal and accounting services; Services of head offices	11.71
M71	Architectural and engineering services	24.36
M72	Scientific research and development services	9.97
M73	Advertising and market research services	33.03
M74_M75	Other professional, scientific and technical services and veterinary services	28.9
N77	Rental and leasing services	38.76
N78	Employment services	24.64
N79	Travel agency, tour operator and other reservation services and related services	19.72
N80-N82	Security and investigation services; services to buildings and landscape	9.49
P85	Education services	1.05
Q86	Human health services	6.43
Q87_Q88	Residential care services	8.11
R90-R92	Creative, arts, entertainment, library, archive, museum, other cultural services	21.83
R93	Sporting services and amusement and recreation services	2
S95	Repair services of computers and personal and household goods	13.62
S96	Other personal services	1.2

Table 4.A2: Outcome variables over manufacturing sectors

Industry NACE Code	Industry Definition	*Total Export Value*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*	*Unit Value of Exports*
C10-C12	Food, beverages and tobacco products	61.463	0.227	5.760	8.282	15.932	7.564	14.824	8.397
C13-C15	Textiles, wearing apparel, leather and related products	26.831	0.237	10.892	6.119	2.437	3.355	2.273	38.511
C16	Wood and of products of wood and cork, except furniture	19.894	0.106	7.188	4.933	1.801	1.705	1.593	14.744
C17	Paper and paper products	16.739	0.114	5.131	7.575	3.172	1.276	2.924	10.342
C18	Printing and recording services	7.305	0.071	5.125	4.846	1.323	0.933	1.265	19.761
C19	Coke and refined petroleum products	1575.780	0.137	5.784	11.095	107.033	47.403	66.589	163.539
C20	Chemicals and chemical products	43.309	0.181	11.299	10.760	5.884	2.700	5.626	94.785
C21	Basic pharmaceutical products and	32.039	0.107	8.821	8.350	4.560	2.226	4.348	311.070

	pharmaceutical preparations								
C22	Rubber and plastic products	25.790	0.155	7.815	8.382	3.050	1.749	2.807	10.396
C23	Other non-metallic mineral products	21.915	0.192	5.917	7.321	4.374	2.289	4.171	102.113
C24	Basic metals	176.361	0.237	9.380	9.070	26.170	11.402	24.111	99.665
C25	Fabricated metal products, except machinery and equipment	20.876	0.183	8.341	6.289	3.024	2.796	2.847	27.030
C26	Computer, electronic and optical products	33.849	0.147	10.560	8.504	1.930	2.208	1.833	373.531
C27	Electrical equipment	71.132	0.188	10.238	9.993	5.936	3.111	5.407	22.913
C28	Machinery and equipment n.e.c.	17.063	0.207	10.343	8.007	1.924	1.911	1.821	28.542
C29	Motor vehicles, trailers and semi-trailers	42.597	0.241	10.362	8.089	4.232	3.642	3.934	14.743
C30	Other transport equipment	90.742	0.329	15.449	4.754	19.931	27.513	19.698	508.939
C31_C32	Furniture and other manufactured goods	12.937	0.196	9.900	6.934	3.326	1.657	3.264	2474.689
C33	Repair and installation services of machinery and equipment	26.280	0.119	10.345	3.812	4.149	5.896	4.119	285.518

Table 4.A3: Vertical linkage variables via manufacturing and services sectors

Industry NACE Code	Industry Definition	Manufacturing FDI Forward	Service_FDI_ Forward	Manufacturing_ FDI Backward	Service_FDI_ Backward
C10-C12	Food, beverages and tobacco products	0.136	2.508	1.729	3.442
C13-C15	Textiles, wearing apparel, leather and related products	0.980	0.527	3.456	2.757
C16	Wood and of products of wood and cork, except furniture	6.637	4.177	4.236	3.287
C17	Paper and paper products	10.732	5.790	5.021	3.350
C18	Printing and recording services	3.016	29.071	9.139	3.365
C19	Coke and refined petroleum products	3.428	17.111	0.094	1.059

C20	Chemicals and chemical products	27.026	3.024	1.227	3.293
C21	Basic pharmaceutical products and pharmaceutical preparations	1.715	3.892	5.699	4.153
C22	Rubber and plastic products	12.733	4.264	14.255	3.139
C23	Other non-metallic mineral products	3.234	5.799	2.889	3.603
C24	Basic metals	17.615	1.734	1.262	3.591
C25	Fabricated metal products, except machinery and equipment	8.587	3.635	5.866	2.649
C26	Computer, electronic and optical products	13.232	8.294	4.629	3.727
C27	Electrical equipment	6.355	4.312	8.833	3.958
C28	Machinery and equipment n.e.c.	12.229	1.572	7.483	3.392
C29	Motor vehicles, trailers and semi-trailers	0.649	1.547	6.836	3.505
C30	Other transport equipment	2.108	2.419	6.086	2.864
C31_C32	Furniture and other manufactured goods	0.411	1.219	5.409	3.621
C33	Repair and installation services of machinery and equipment	14.127	8.670	6.528	2.694

Figure 4.A1: Variation of horizontal linkage variable w.r.to sectors

Figure 4.A1: Variation of horizontal linkage variable w.r.to sectors Cont'd

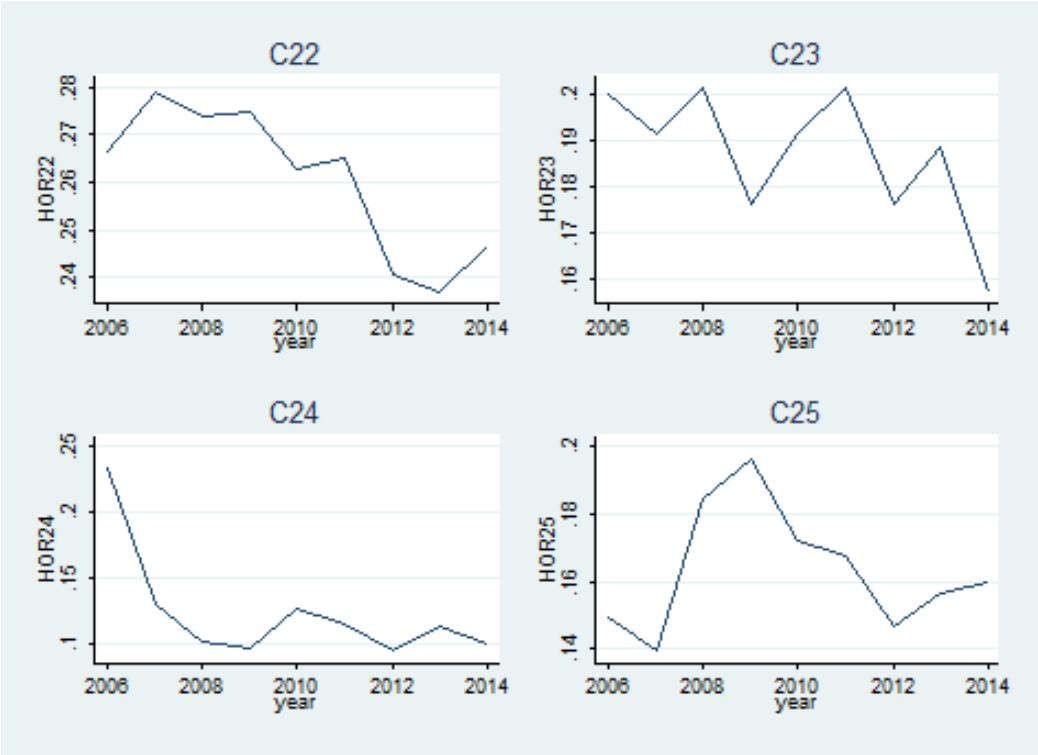


Figure 4.A1: Variation of horizontal linkage variable w.r.to sectors Cont'd

Figure 4.A2: Variation of forward linkage from manufacturing within sectors

Figure 4.A2: Variation of forward linkage from manufacturing within sectors Cont'd

Figure 4.A2: Variation of forward linkage from manufacturing within sectors Cont'd

Figure 4.A3: Variation of forward linkage from services within sectors

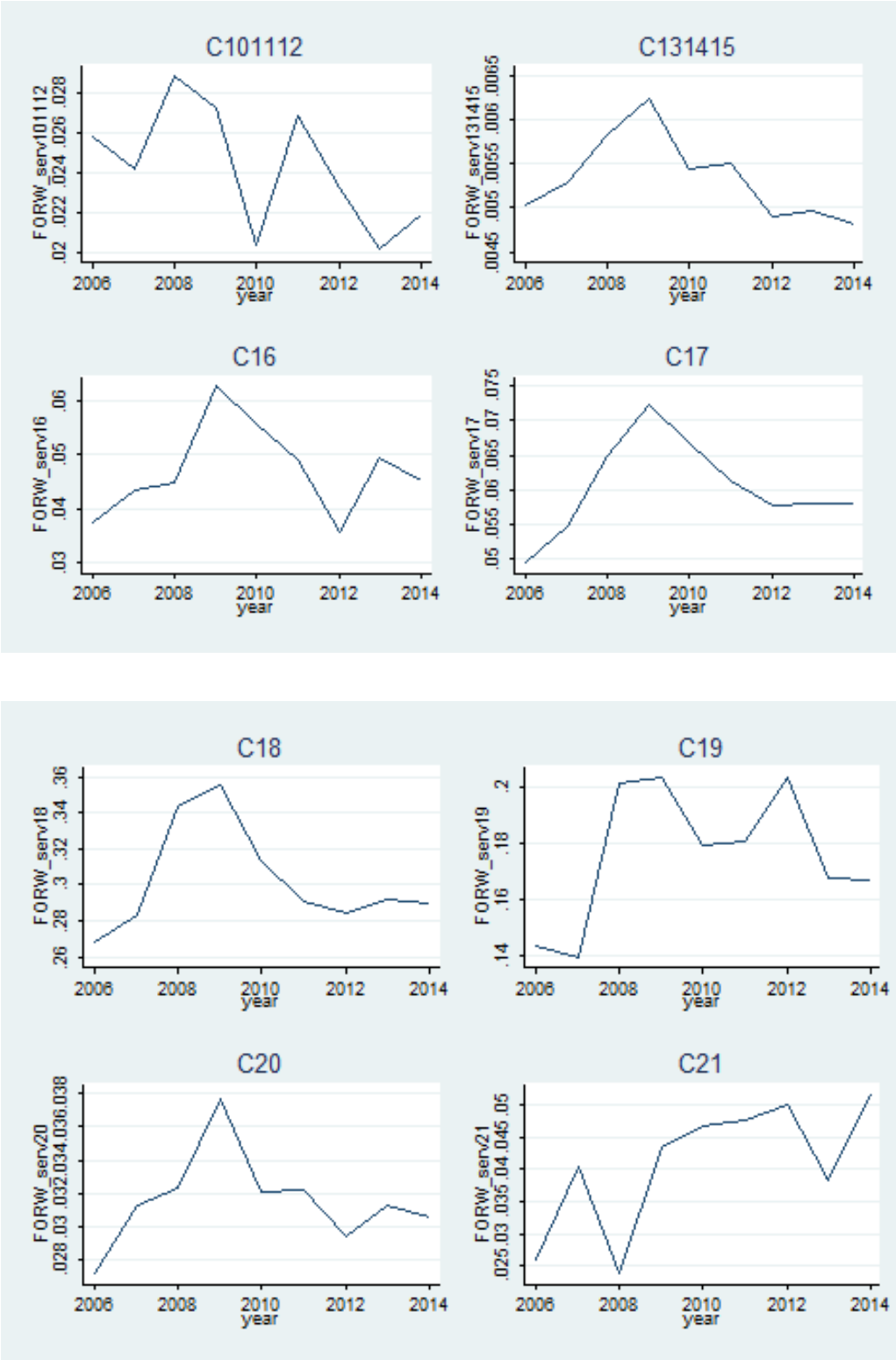
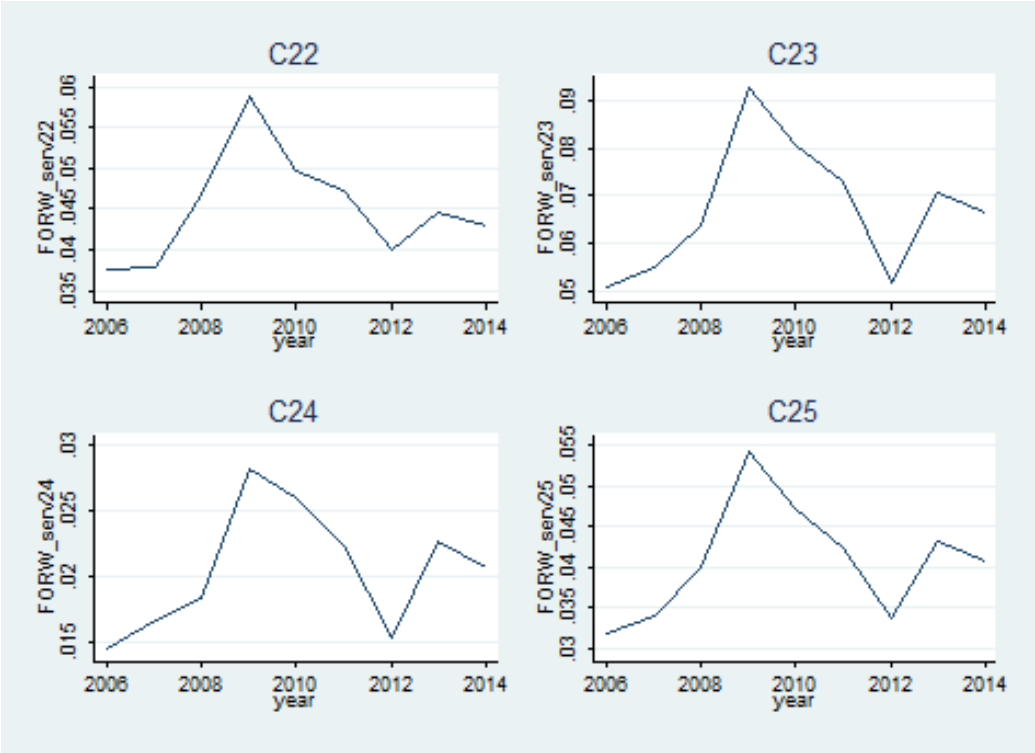


Figure 4.A3: Variation of forward linkage from services within sectors Cont'd



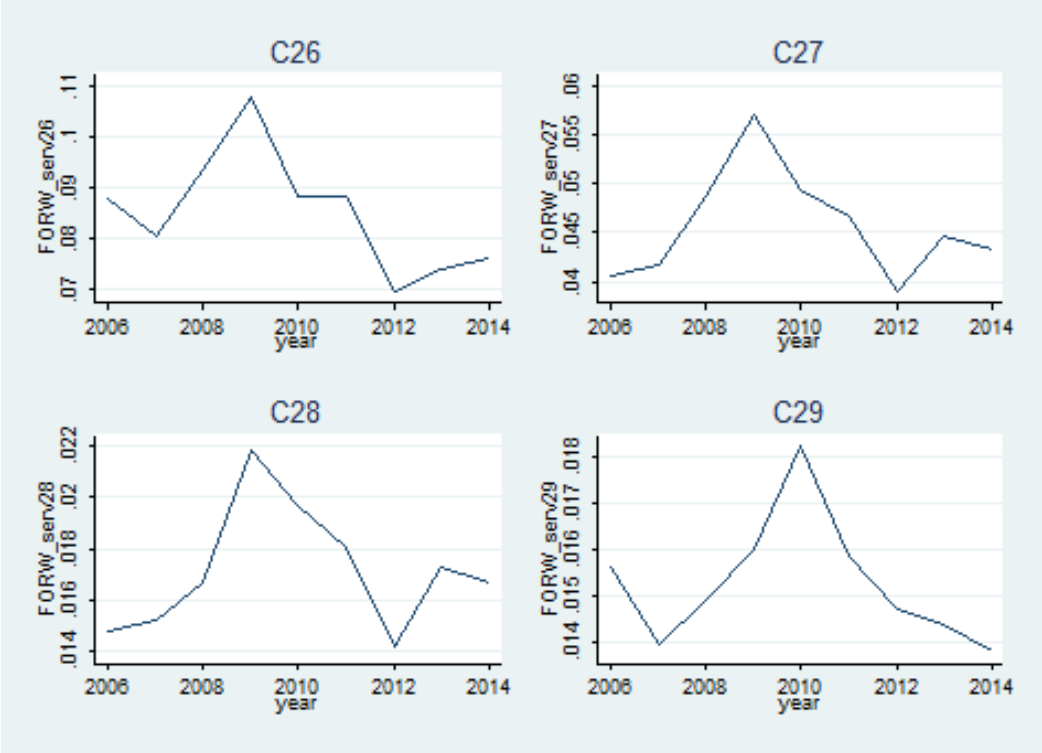


Figure 4.A3: Variation of forward linkage from services within sectors Cont'd

Figure 4.A4: Variation of backward linkage from manufacturing within sectors

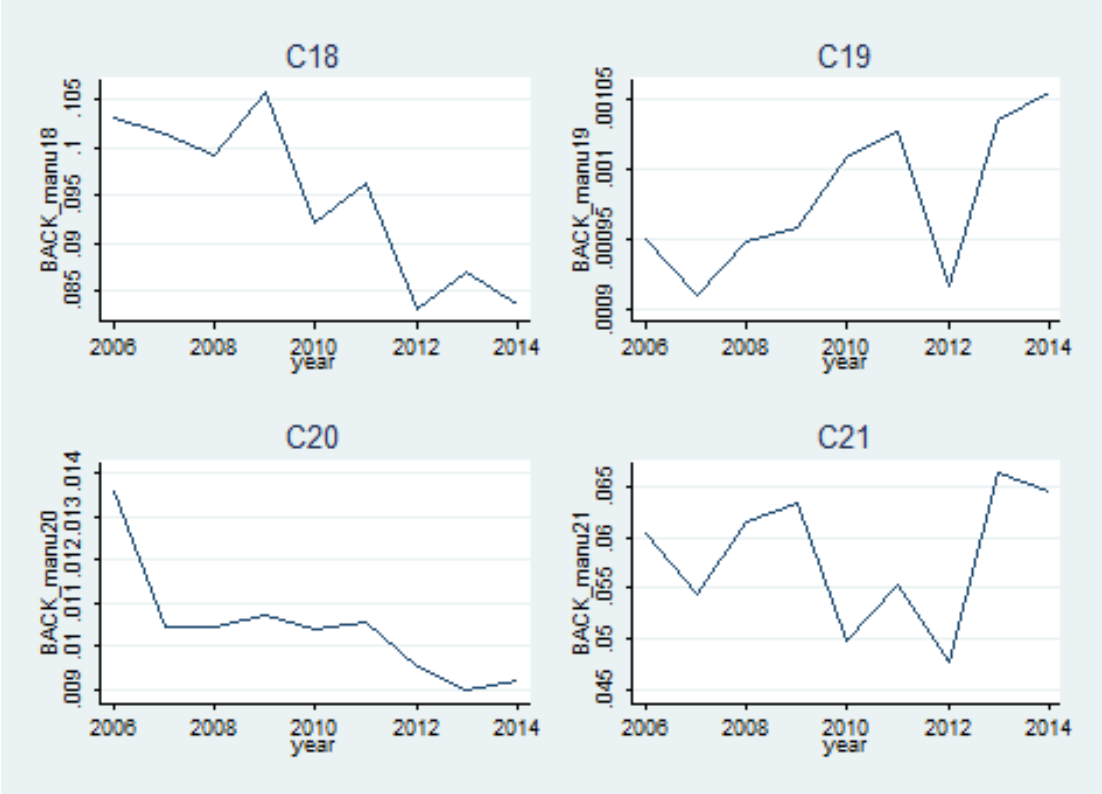
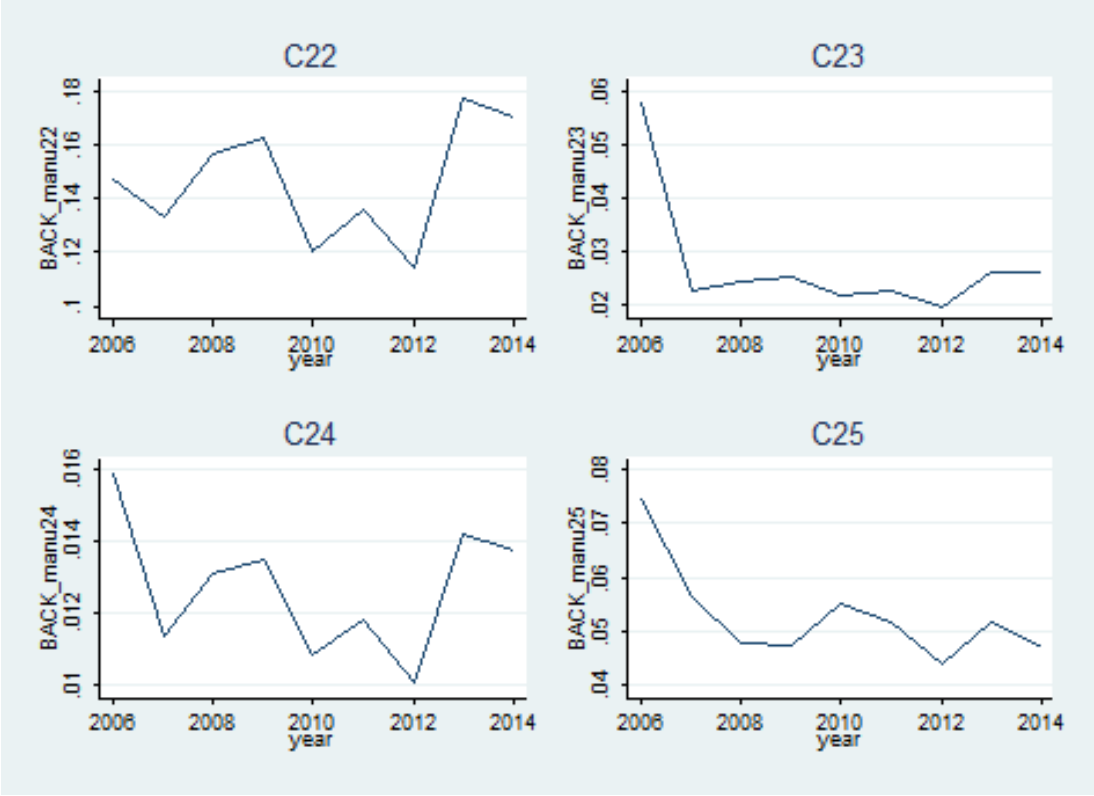


Figure 4.A4: Variation of backward linkage from manufacturing within sectors Cont'd



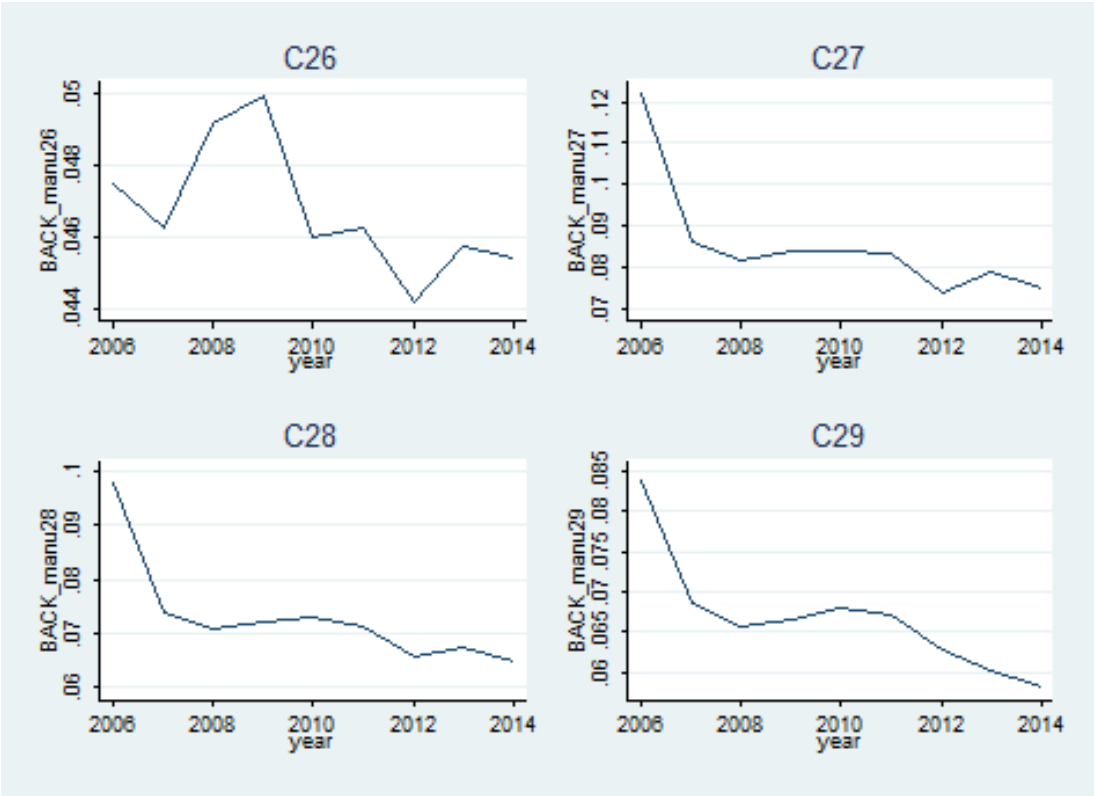


Figure 4.A4: Variation of backward linkage from manufacturing within sectors Cont'd

Figure 4.A5: Variation of backward linkage from services within sectors

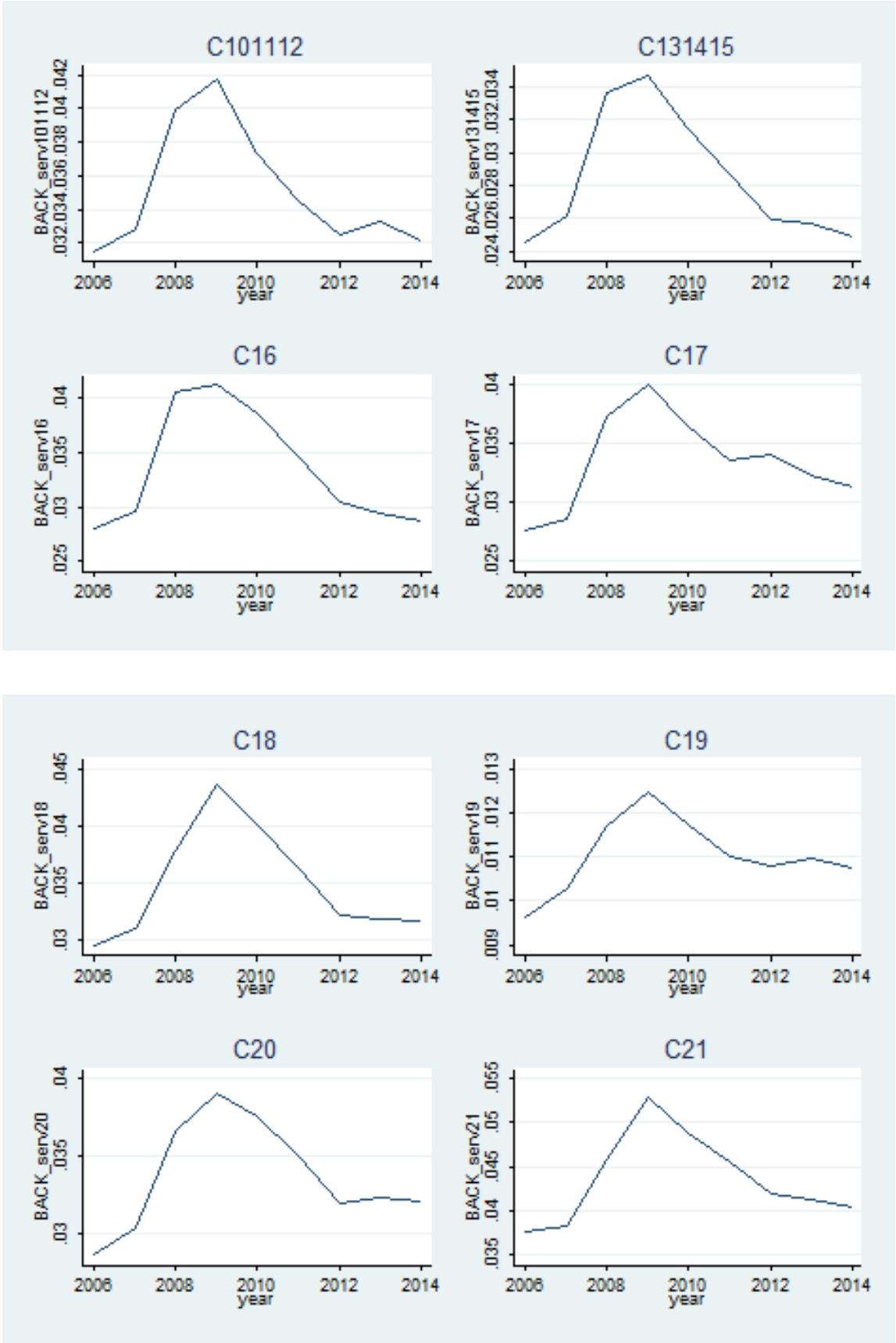


Figure 4.A5: Variation of backward linkage from services within sectors Cont'd

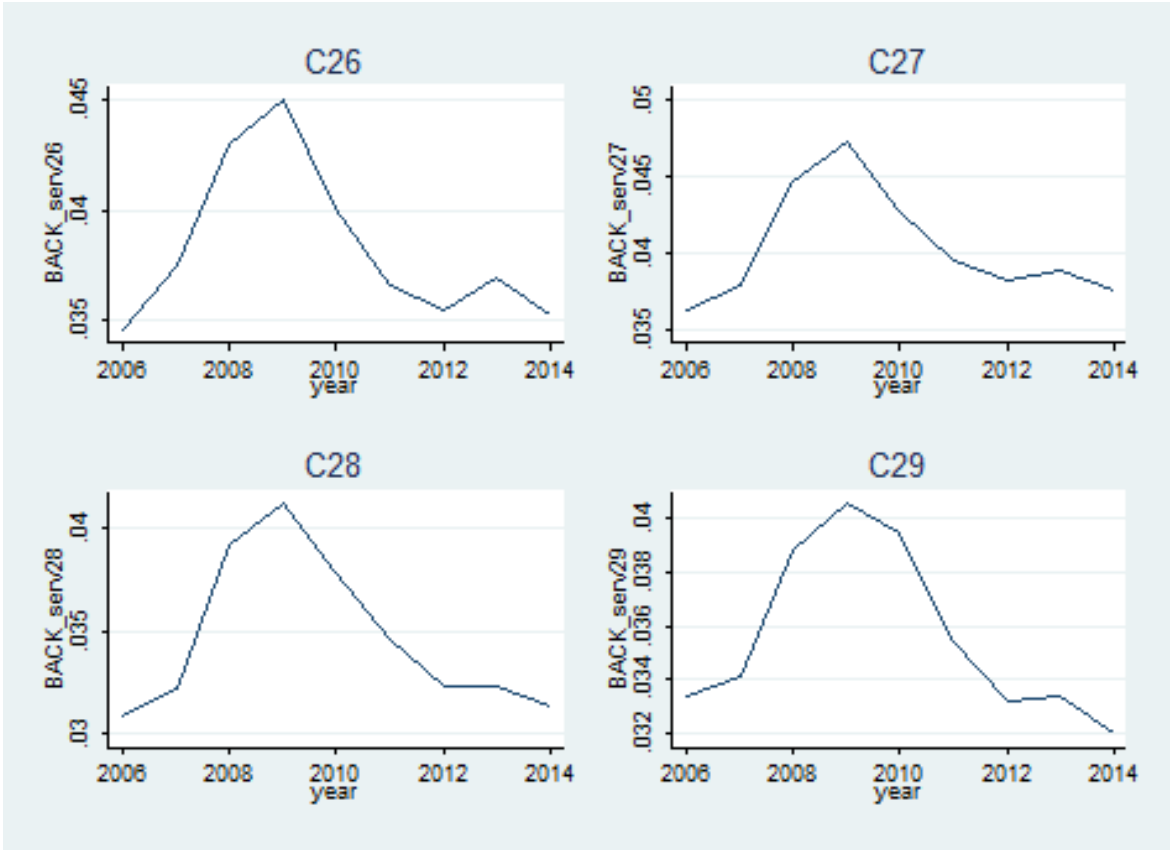


Figure 4.A5: Variation of backward linkage from services within sectors Cont'd

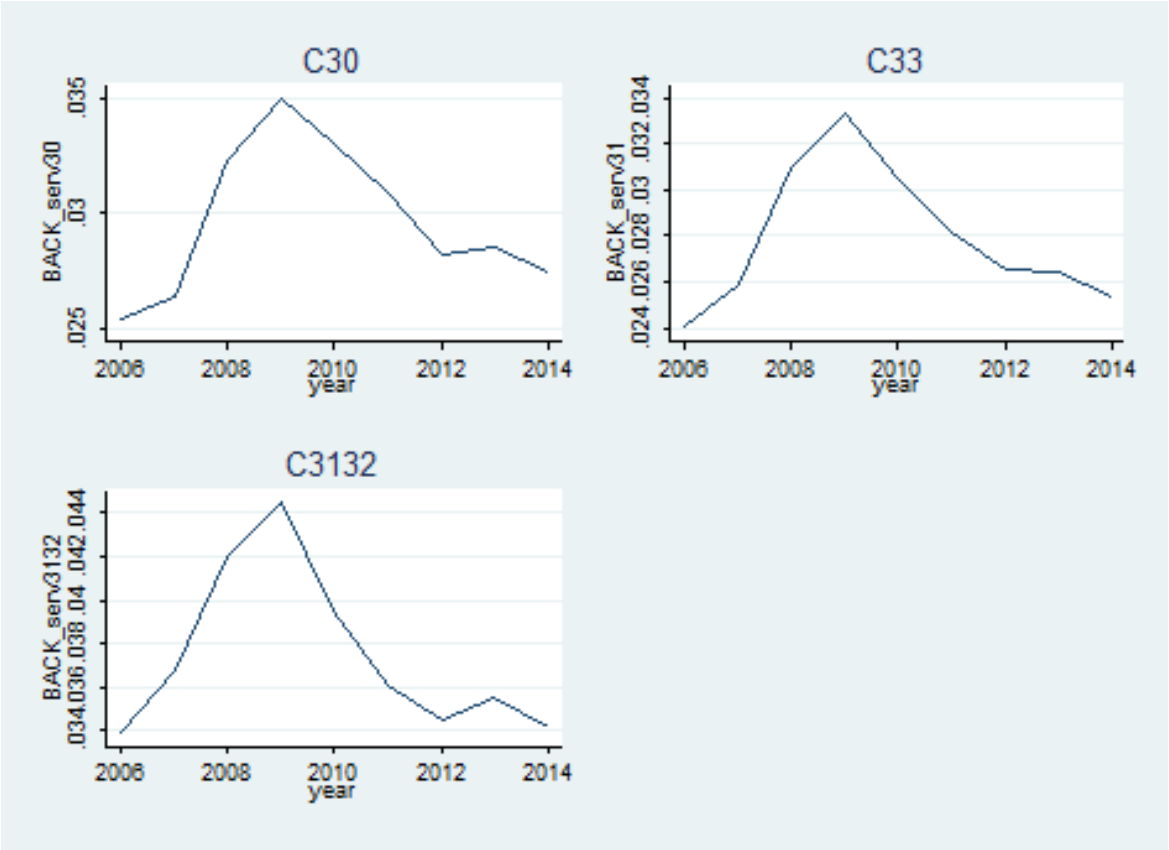


Table 4.A4. Definitions of control variables

Variables	*Definition*
TFP	Logarithm of Total Factor Productivity
Employee	Logarithm of Number of employees
Wage per Employee	Logarithm of real wages per employee
CR4	Four-firm concentration ratio computed at 4-digit sectoral level
Import Status	Dummy variable that takes value 1 if firm imports
Intangible Investment Dummy	Dummy variable that takes value 1 if the firm invested in intangible assets
Tangible Investment Dummy	Dummy variable that takes value 1 if the firm invested in tangible assets

Table 4.A5: Exports and foreign presence in manufacturing sectors

VARIABLES	*Export Decision*	*Total Exports*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*
PANEL A								
Export Dummy (i,t-1)	2.1353***							
	(0.000)							
FDI Own (s,t-1)	0.2090***	-0.3497***	-0.0110*	-0.1621***	0.0832***	-0.1876**	-0.4329***	-0.1664*
	(0.000)	(0.000)	(0.065)	(0.001)	(0.000)	(0.018)	(0.000)	(0.081)
FDI Forward (s,t-1)	1.0956***	0.1444***	0.1574***	0.0612***	0.0525***	0.0832***	0.0919***	0.0701***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward (s,t-1)	0.6380	0.0745	0.0357	0.0263	0.0329	0.0482	0.0416	0.0404
	(0.149)	(0.301)	(0.402)	(0.187)	(0.464)	(0.409)	(0.332)	(0.645)
Employee (i,t-1)	0.0847***	0.7219***	0.1829***	0.2645***	0.2758***	0.4574***	0.4462***	0.3482***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP (i,t-1)	0.0674***	0.1525***	0.0151***	0.1274***	0.0720***	0.0251*	0.0804***	0.0359***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.058)	(0.000)	(0.000)
Wage_L (i,t-1)	0.0784***	0.3239***	0.0019*	0.0761***	0.1425***	0.2478***	0.1814***	0.2235***
	(0.000)	(0.000)	(0.067)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tangible Investment (i,t-1)	0.0793***	0.1459	-0.0912	0.0569***	0.0254	0.0890	0.1205	0.0930
	(0.000)	(0.258)	(0.342)	(0.000)	(0.121)	(0.362)	(0.275)	(0.342)
Intangible Investment (i,t-1)	0.1035***	0.0622***	0.0099***	0.0103***	0.0268***	0.0519***	0.0354***	0.0394***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CR4_real_output	0.1677***	0.0523***	0.0072***	0.0358***	0.0137***	0.0165***	0.0386***	0.0345**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.028)
Import Dummy (i,t-1)	0.4492***	0.0476**	0.0159***	0.0119**	0.0129***	0.0357**	0.0347***	0.0387**
	(0.000)	(0.022)	(0.000)	(0.048)	(0.000)	(0.049)	(0.000)	(0.026)
4-digit sector dummies	X	X	X	X	X	X	X	X
Region dummies	X	X	X	X	X	X	X	X
Year Dummies	X	X	X	X	X	X	X	X
Lambda		-0.27***	-0.11***	-0.16***	-0.17***	-0.11***	-0.10***	-0.12***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.431***	-0.232***	-0.310***	-0.505***	-0.369***	-0.349***	-0.394***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3906	-3213	-3234	-3262	-3776	-3788	-3901
Number of Observations	136269	136269	136269	136269	136269	136269	136269	136269

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A5: Exports and foreign presence in manufacturing sectors (Continued)

VARIABLES	*Export Decision*	*Total Exports*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*
PANEL B								
Export Dummy (i,t-1)	2.1332***							
	(0.000)							
FDI Own (s,t-1)	0.1896***	-0.3278***	-0.0163***	-0.1579***	0.0811***	-0.1699***	-0.4089***	-0.1616**
	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.044)
FDI Forward with Sectoral Export Intensity (s,t-1)	4.6493***	0.3630***	0.4071***	0.1644***	0.1336***	0.1986***	0.2294***	0.1763***
	(0.000)	(0.000)	(0.008)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Sectoral Export Intensity (s,t-1)	1.7904***	0.1543***	0.0792***	0.0719	0.0651	0.0824*	0.0892	0.0957
	(0.000)	(0.000)	(0.000)	(0.214)	(0.744)	(0.087)	(0.828)	(0.216)
Employee (i,t-1)	0.0854***	0.7164***	0.1720***	0.2705***	0.2750***	0.4458***	0.4414***	0.3415***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP (i,t-1)	0.0660***	0.1806***	0.0155***	0.1407***	0.0741***	0.0399***	0.1065***	0.0278***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)
Wage_L (i,t-1)	0.0782***	0.2889***	0.0014**	0.0731***	0.1416***	0.2158***	0.1473***	0.1894***
	(0.000)	(0.000)	(0.015)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tangible Investment (i,t-1)	0.0798***	0.1392	-0.0915	0.0556***	0.0253	0.0836	0.1139	0.1015
	(0.000)	(0.104)	(0.245)	(0.000)	(0.222)	(0.453)	(0.456)	(0.342)
Intangible Investment (i,t-1)	0.1037***	0.0638***	0.0109***	0.0101***	0.0369***	0.0537***	0.0269***	0.0367***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CR4_real_output	0.1576***	0.0576***	0.0077***	0.0354***	0.0132***	0.0222***	0.0444***	0.0402***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Import Dummy (i,t-1)	0.4498***	0.0398*	0.0162***	0.0112***	0.0169***	0.0286***	0.0229***	0.0308*
	(0.000)	(0.055)	(0.000)	(0.009)	(0.000)	(0.000)	(0.000)	(0.094)
4-digit sector dummies	X	X	X	X	X	X	X	X
Region dummies	X	X	X	X	X	X	X	X
Year Dummies	X	X	X	X	X	X	X	X
Lambda		-0.27***	-0.11***	-0.16***	-0.17***	-0.11***	-0.10***	-0.11***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.437***	-0.235***	-0.307***	-0.509***	-0.373***	-0.344***	-0.394***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3921	-3254	-3216	-3289	-3799	-3801	-3913
Number of Observations	136269	136269	136269	136269	136269	136269	136269	136269

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A5: Exports and foreign presence in manufacturing sectors (Continued)

VARIABLES	*Export Decision*	*Total Exports*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*
PANEL C								
Export Dummy (i,t-1)	2.1416***							
	(0.000)							
FDI Own (s,t-1)	0.1776***	-0.2986***	-0.0146***	-0.1599***	0.0823***	-0.1387***	-0.3809***	-0.1576***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	4.0945***	0.3357***	0.3185***	0.1429***	0.1199***	0.1928***	0.2158***	0.1530***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	1.0224	0.1689	0.0653	0.0702	0.0611	0.0987	0.1078	0.0969
	(0.393)	(0.458)	(0.298)	(0.401)	(0.275)	(0.319)	(0.639)	(0.294)
Employee (i,t-1)	0.0745***	0.7435***	0.1731***	0.2567***	0.2698***	0.4868***	0.4737***	0.3723***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP (i,t-1)	0.0731***	0.1614***	0.0168***	0.1419***	0.0784***	0.0195***	0.0910***	0.0209***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.010)
Wage_L (i,t-1)	0.0786***	0.3378***	0.0024*	0.0567***	0.1398***	0.2811***	0.1980***	0.2169***
	(0.000)	(0.000)	(0.053)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tangible Investment (i,t-1)	0.0754***	0.1502	-0.0082	0.0535***	0.0260*	0.0937	0.1242	0.1135
	(0.000)	(0.339)	(0.411)	(0.000)	(0.089)	(0.234)	(0.199)	(0.312)
Intangible Investment (i,t-1)	0.1030***	0.0657***	0.0103***	0.0106***	0.0474***	0.0551***	0.0183***	0.0379***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CR4_real_output	0.1372***	0.0668***	0.0071***	0.0298***	0.0155***	0.0370***	0.0513***	0.0393***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Import Dummy (i,t-1)	0.4542***	0.0328**	0.0164***	0.0187*	0.0170***	0.0141**	0.0158***	0.0155**
	(0.000)	(0.021)	(0.000)	(0.072)	(0.000)	(0.038)	(0.000)	(0.022)
4-digit sector dummies	X	X	X	X	X	X	X	X
Region dummies	X	X	X	X	X	X	X	X
Year Dummies	X	X	X	X	X	X	X	X
Lambda		-0.28***	-0.11***	-0.16***	-0.18***	-0.12***	-0.11***	-0.12***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.444***	-0.239***	-0.312***	-0.510***	-0.379***	-0.344***	-0.388***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3917	-3232	-3228	-3299	-3802	-3822	-3918
Number of Observations	135403	135403	135403	135403	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A6: Exports and foreign presence in services sectors

VARIABLES	*Export Decision*	*Total Exports*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*
PANEL A								
Export Dummy (i,t-1)	2.1447***							
	(0.000)							
FDI Own (s,t-1)	0.0588***	-0.3361***	-0.0179***	-0.1450*	0.0868***	-0.1911***	-0.4229***	-0.1515*
	(0.000)	(0.004)	(0.000)	(0.053)	(0.000)	(0.000)	(0.000)	(0.095)
FDI Forward (s,t-1)	0.9897*	0.1260***	0.1218***	0.0541***	0.0411	0.0719*	0.0849***	0.0580
	(0.083)	(0.000)	(0.000)	(0.000)	(0.641)	(0.091)	(0.000)	(0.516)
FDI Backward (s,t-1)	0.5563	0.0273	0.0339	0.0079	0.0061	0.0194	0.0212	0.0157
	(0.376)	(0.386)	(0.432)	(0.677)	(0.819)	(0.103)	(0.289)	(0.295)
Employee (i,t-1)	0.0688***	0.7328***	0.1752***	0.2572***	0.2647***	0.4756***	0.4681***	0.3646***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP (i,t-1)	0.0697***	0.1756***	0.0187***	0.1376***	0.0763***	0.0380***	0.0993***	0.0457***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)
Wage_L (i,t-1)	0.0948***	0.3585***	0.0022**	0.0645***	0.1578***	0.2940***	0.2007***	0.2118***
	(0.000)	(0.000)	(0.012)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tangible Investment (i,t-1)	0.0771***	0.1556	-0.0873	0.0553***	0.0264	0.1003	0.1292	0.1002***
	(0.000)	(0.221)	(0.341)	(0.000)	(0.417)	(0.254)	(0.120)	(0.000)
Intangible Investment (i,t-1)	0.1060***	0.0563***	0.0085***	0.0108***	0.0322***	0.0455***	0.0241***	0.0304***
	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CR4_real_output	0.1472***	0.0438***	0.0064***	0.0286***	0.0149***	0.0152**	0.0289***	0.0276***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.021)	(0.000)	(0.000)
Import Dummy (i,t-1)	0.4581***	0.0486*	0.0188***	0.0166***	0.0116***	0.0320***	0.0370***	0.0395*
	(0.000)	(0.073)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.057)
4-digit sector dummies	X	X	X	X	X	X	X	X
Region dummies	X	X	X	X	X	X	X	X
Year Dummies	X	X	X	X	X	X	X	X
Lambda		-0.26***	-0.11***	-0.16***	-0.17***	-0.11***	-0.09***	-0.12***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.443***	-0.237***	-0.314***	-0.512***	-0.373***	-0.348***	-0.402***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3918	-3233	-3243	-3768	-3797	-3772	-3914
Number of Observations	136269	136269	136269	136269	136269	136269	136269	136269

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A6: Exports and foreign presence in services sectors (Continued)

VARIABLES	*Export Decision*	*Total Exports*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*
PANEL B								
Export Dummy (i,t-1)	2.1443***							
	(0.000)							
FDI Own (s,t-1)	0.1860***	-0.3242*	-0.0164***	-0.1398***	0.0801***	-0.1844***	-0.4043***	-0.1435*
	(0.000)	(0.057)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.091)
FDI Forward with Sectoral Export Intensity (s,t-1)	4.0114***	0.3129***	0.2828***	0.1437***	0.1108*	0.1692***	0.2021***	0.1562***
	(0.006)	(0.000)	(0.000)	(0.000)	(0.091)	(0.000)	(0.000)	(0.000)
FDI Backward with Sectoral Export Intensity (s,t-1)	1.6149	0.1372	0.0545	0.0613	0.0656	0.0759	0.0716	0.0678
	(0.160)	(0.285)	(0.297)	(0.892)	(0.151)	(0.199)	(0.901)	(0.322)
Employee (i,t-1)	0.0700***	0.7419***	0.1734***	0.2566***	0.2713***	0.4853***	0.4706***	0.3693***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP (i,t-1)	0.0699***	0.1725***	0.0176***	0.1454***	0.0705***	0.0271***	0.1020***	0.0362***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wage_L (i,t-1)	0.0867***	0.3207***	0.0039*	0.0598***	0.1418***	0.2609***	0.1789***	0.2024***
	(0.000)	(0.000)	(0.054)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tangible Investment (i,t-1)	0.0772***	0.1554	-0.0914	0.0575***	0.0286	0.979	0.1268	0.1104
	(0.000)	(0.322)	(0.289)	(0.000)	(0.410)	(0.435)	(0.153)	(0.243)
Intangible Investment (i,t-1)	0.1057***	0.0589***	0.0097***	0.0106***	0.0390***	0.0483***	0.0199***	0.0286***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CR4_real_output	0.1385***	0.0537***	0.0065***	0.0276***	0.0138***	0.0261**	0.0399***	0.0485***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)	(0.000)	(0.000)
Import Dummy (i,t-1)	0.4615***	0.0411**	0.0182***	0.0179***	0.0178***	0.0232*	0.0233***	0.0234
	(0.000)	(0.049)	(0.000)	(0.000)	(0.000)	(0.068)	(0.000)	(0.132)
4-digit sector dummies	X	X	X	X	X	X	X	X
Region dummies	X	X	X	X	X	X	X	X
Year Dummies	X	X	X	X	X	X	X	X
Lambda		-0.27***	-0.12***	-0.16***	-0.17***	-0.10***	-0.10***	-0.13***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.446***	-0.235***	-0.319***	-0.506***	-0.365***	-0.351***	-0.403***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-4026	-3288	-3286	-3771	-4856	-3710	-3865
Number of Observations	136269	136269	136269	136269	136269	136269	136269	136269

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A6: Exports and foreign presence in services sectors (Continued)

VARIABLES	*Export Decision*	*Total Exports*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*
PANEL C								
Export Dummy (i,t-1)	2.1441***							
	(0.000)							
FDI Own (s,t-1)	0.1748***	-0.2977***	-0.0176***	-0.1418**	0.0792***	-0.1559***	-0.3769***	-0.1473***
	(0.000)	(0.000)	(0.000)	(0.014)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	2.8020**	0.2758***	0.2508***	0.1252***	0.1021***	0.1506***	0.1737***	0.1368***
	(0.024)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	1.0150	0.1112	0.0435	0.0514	0.0498	0.0598	0.0614	0.0566
	(0.407)	(0.281)	(0.331)	(0.364)	(0.907)	(0.393)	(0.671)	(0.385)
Employee (i,t-1)	0.0712***	0.7432***	0.1675***	0.2592***	0.2677***	0.4840***	0.4755***	0.3706***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP (i,t-1)	0.0702***	0.1562***	0.0151***	0.1315***	0.0773***	0.0247***	0.0789***	0.0348***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)	(0.001)	(0.000)
Wage_L (i,t-1)	0.0881***	0.3593***	0.0049*	0.0486***	0.1456***	0.3107***	0.2137***	0.2391***
	(0.000)	(0.000)	(0.064)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tangible Investment (i,t-1)	0.0760***	0.1603	-0.0071	0.0518***	0.0271**	0.1085	0.1331	0.1199
	(0.000)	(0.213)	(0.378)	(0.000)	(0.014)	(0.367)	(0.479)	(0.000)
Intangible Investment (i,t-1)	0.1033***	0.0668***	0.0106***	0.0104***	0.0535***	0.0564***	0.0133***	0.0298***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CR4_real_output	0.1459***	0.0554***	0.0071***	0.0295***	0.0175***	0.0259*	0.0379***	0.0344***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.097)	(0.000)	(0.000)
Import Dummy (i,t-1)	0.4582***	0.0437**	0.0178***	0.0232	0.0214***	0.0205**	0.0223***	0.0271
	(0.000)	(0.012)	(0.000)	(0.278)	(0.000)	(0.020)	(0.000)	(0.102)
4-digit sector dummies	X	X	X	X	X	X	X	X
Region dummies	X	X	X	X	X	X	X	X
Year Dummies	X	X	X	X	X	X	X	X
Lambda		-0.26***	-0.11***	-0.16***	-0.18***	-0.09***	-0.09***	-0.13***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.449***	-0.232***	-0.317***	-0.508***	-0.371***	-0.352***	-0.408***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-4098	-3332	-3243	-3725	-4912	-3678	-3856
Number of Observations	135403	135403	135403	135403	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A7: Exports and foreign presence in manufacturing sectors- Panel C alternative specification

VARIABLES	*Export Decision*	*Total Exports*	*Export Intensity*	*Number of Products*	*Number of Destinations*	*Exports per Product*	*Exports per Destination*	*Exports per Product and Destination*
PANEL C								
FDI Own (s,t-1)	0.1838***	-0.3042***	-0.0094	-0.1121***	0.0505***	-0.1921***	-0.3547***	-0.1529*
	(0.000)	(0.000)	(0.520)	(0.000)	(0.000)	(0.000)	(0.000)	(0.079)
FDI Forward (s,t-1)	1.0712***	0.1022***	0.1159***	0.0489***	0.0402***	0.0533***	0.0620***	0.0727***
	(0.000)	(0.000)	(0.125)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward (s,t-1)	0.5923	0.0729	0.0233	0.0295	0.0501	0.0434	0.0228	0.0319
	(0.198)	(0.238)	(0.389)	(0.264)	(0.757)	(0.428)	(0.645)	(0.460)
IP_firm	0.0056***	0.0043***	0.0029***	0.0016***	0.0025**	0.0027***	0.0018***	0.0036***
	(0.000)	(0.004)	(0.000)	(0.000)	(0.035)	(0.000)	(0.004)	(0.000)
IU_firm	0.0009***	0.0008***	0.0007***	0.0002	0.0005	0.0006***	0.0003***	0.0013***
	(0.002)	(0.001)	(0.002)	(0.134)	(0.214)	(0.000)	(0.008)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	5.0052***	0.3663***	0.3403***	0.1862***	0.1858***	0.1801***	0.1805***	0.1699***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	1.0096	0.1956	0.0782	0.0707	0.0557	0.1249	0.1439	0.0964
	(0.338)	(0.550)	(0.364)	(0.876)	(0.178)	(0.431)	(0.983)	(0.345)
Lambda		-0.29***	-0.10***	-0.16***	-0.18***	-0.12***	-0.12***	-0.12***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.438***	-0.239***	-0.311***	-0.518***	-0.371***	-0.339***	-0.393***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-3957	-3240	-3250	-3272	-3751	-3863	-3950
Number of Observations	135403	135403	135403	135403	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A8: Exports and foreign presence in services sectors- Panel C alternative specification

VARIABLES	Export Decision	Total Exports	Export Intensity	Number of Products	Number of Destinations	Exports per Product	Exports per Destination	Exports per Product and Destination
PANEL C								
FDI Own (s,t-1)	-0.3078***	-0.0148***	-0.1279***	0.0772***	-0.1799***	-0.2306***	-0.4080***	0.0529***
	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
FDI Forward (s,t-1)	0.0877***	0.1032***	0.0413***	0.466	0.0464***	0.0411	0.0634***	0.8424***
	(0.000)	(0.000)	(0.000)	(0.623)	(0.000)	(0.365)	(0.000)	(0.006)
FDI Backward (s,t-1)	0.0233	0.0288	0.0042	0.0048	0.0191	0.0185	0.0301	0.5820
	(0.341)	(0.529)	(0.276)	(0.377)	(0.002)	(0.953)	(0.334)	(0.256)
IP_firm	0.0022***	0.0012***	0.0004***	0.0012**	0.0018***	0.0010***	0.0009***	0.0047***
	(0.000)	(0.000)	(0.000)	(0.031)	(0.000)	(0.000)	(0.000)	(0.006)
IU_firm	-0.0064	-0.0005	-0.0045	-0.0026	-0.0019	-0.0038	0.0003	0.0011
	(0.201)	(0.418)	(0.370)	(0.744)	(0.264)	(0.112)	(0.852)	(0.284)
FDI Forward with Share of Inputs Produced (i,t-1)	0.3014***	0.2977***	0.1228***	0.1222***	0.1786***	0.1792***	0.1590***	2.8463***
	(0.006)	(0.000)	(0.001)	(0.006)	(0.000)	(0.000)	(0.000)	(0.002)
FDI Backward with Share of Inputs Used (i,t-1)	0.1366	0.0526	0.0554	0.0548	0.0812	0.0818	0.0568	1.1194
	(0.524)	(0.462)	(0.345)	(0.427)	(0.505)	(0.601)	(0.216)	(0.558)
Lambda		-0.26***	-0.11***	-0.15***	-0.17***	-0.10***	-0.11***	-0.13***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rho		-0.456***	-0.238***	-0.321***	-0.512***	-0.372***	-0.356***	-0.411***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood		-4042	-3375	-3259	-3702	-4959	-3722	-3819
Number of Observations	135403	135403	135403	135403	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A9: Export unit values and foreign presence in manufacturing-Panel C alternative specification

VARIABLES	*Firm-Level Weighted Unit values*	*Firm-Product Level Export Unit values*	*Firm-Product-Destination Level Export Unit values*
PANEL C			
FDI Own (s,t-1)	-0.2612***	-0.1132***	-0.0756***
	(0.000)	(0.000)	(0.000)
FDI Forward (s,t-1)	-4.089	-0.3215***	-0.2476***
	(0.789)	(0.000)	(0.000)
FDI Backward (s,t-1)	0.4452	0.0017	0.0007
	(0.654)	(0.234)	(0.543)
IP_firm	-0.0074	0.0003***	0.0004***
	(0.564)	(0.000)	(0.000)
IU_firm	0.0009***	0.0009***	0.0012***
	(0.006)	(0.002)	(0.004)
FDI Forward with Share of Inputs Produced (i,t-1)	5.8896	-0.2027***	-0.1304***
	(0.901)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	0.6125	0.0012	0.0002
	(0.608)	(0.673)	(0.345)
Lambda	-0.17***	-0.08***	-0.04***
	(0.000)	(0.002)	(0.000)
Rho	-0.531***	-0.126***	-0.032***
	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-4315	-5790	-8666
Number of Observations	135403	863288	2357107

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A10: Export unit values and foreign presence in services-Panel C alternative specification

VARIABLES	*Firm-Level Weighted Unit values*	*Firm-Product Level Export Unit values*	*Firm-Product-Destination Level Export Unit values*
PANEL C			
FDI Own (s,t-1)	-0.2683***	-0.1532***	-0.0693***
	(0.000)	(0.000)	(0.006)
FDI Forward (s,t-1)	1.2181	-0.2834***	-0.2267***
	(0.657)	(0.001)	(0.008)
FDI Backward (s,t-1)	0.2781	3.0023	0.9702
	(0.743)	(0.104)	(0.227)
IP_firm	0.0115*	0.0012***	0.0007***
	(0.075)	(0.000)	(0.000)
IU_firm	0.0018**	0.0017***	0.0005***
	(0.012)	(0.000)	(0.000)
FDI Forward with Share of Inputs Produced (i,t-1)	4.7276	-0.1056***	-0.1125***
	(0.901)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	2.697	0.0127	0.0078
	(0.979)	(0.543)	(0.421)
Lambda	-0.18***	-0.08***	-0.03***
	(0.000)	(0.000)	(0.000)
Rho	-0.533***	-0.123***	-0.033***
	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-4311	-5679	-8513
Number of Observations	135403	863288	2357107

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A11: Import fragmentation and foreign presence in manufacturing-Panel C alternative specification

VARIABLES	*Share of Imported Intermediates in Total Inputs*	*Share of Imported Intermediates in Total Production*	*Firm-Level Weighted Unit Values of Imported Intermediates*	*Proxy for Simultaneous Changes in Unit Values of Exports&Imports*
PANEL C				
FDI Own (s,t-1)	-0.0394***	-0.0501***	0.0268	0.0094
	(0.000)	(0.000)	(0.745)	(0.645)
FDI Forward (s,t-1)	0.3103***	0.3397***	-0.0824***	0.1304***
	(0.000)	(0.000)	(0.000)	(0.004)
FDI Backward (s,t-1)	-0.1989***	-0.1138***	0.0357	0.1004
	(0.000)	(0.000)	(0.520)	(0.734)
IP_firm	0.0059***	0.0058***	0.0014	0.0001
	(0.002)	(0.000)	(0.201)	(0.422)
IU_firm	-0.0029***	-0.0009**	0.0012	0.0005
	(0.004)	(0.022)	(0.453)	(0.756)
FDI Forward with Share of Inputs Produced (i,t-1)	0.5450***	0.6003***	-0.1056***	0.1165***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	-0.0042***	-0.0064***	0.0756	0.0956
	(0.001)	(0.000)	(0.376)	(0.856)
Lambda	-0.44***	-0.38***	-0.27***	-1.17***
	(0.000)	(0.000)	(0.000)	(0.000)
Rho	-0.711***	-0.636***	-0.702***	-0.779***
	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-2899	-2932	-4435	-5142
Number of Observations	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.

Table 4.A12: Import fragmentation and foreign presence in services-Panel C alternative specification

VARIABLES	Share of Imported Intermediates in Total Inputs	Share of Imported Intermediates in Total Production	Firm-Level Weighted Unit Values of Imported Intermediates	Proxy for Simultaneous Changes in Unit Values of Exports&Imports
PANEL C				
FDI Own (s,t-1)	-0.0161***	-0.0154***	0.0231	0.0092
	(0.000)	(0.000)	(0.634)	(0.754)
FDI Forward (s,t-1)	-0.0338***	-0.0399***	-0.0311***	0.1009***
	(0.002)	(0.000)	(0.000)	(0.000)
FDI Backward (s,t-1)	-1.1231***	-1.2975***	0.0097	0.0863
	(0.000)	(0.000)	(0.932)	(0.529)
IP_firm	0.0083***	0.0096***	0.0001	0.0003
	(0.000)	(0.000)	(0.343)	(0.654)
IU_firm	-0.0069***	-0.0057***	0.0001	0.0002
	(0.001)	(0.001)	(0.856)	(0.939)
FDI Forward with Share of Inputs Produced (i,t-1)	0.3541***	0.4684***	-0.0827***	0.1099***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI Backward with Share of Inputs Used (i,t-1)	-0.0036***	-0.0133***	0.0303	0.1045
	(0.000)	(0.000)	(0.687)	(0.876)
Lambda	-0.42***	-0.38***	-0.29***	-1.15***
	(0.000)	(0.000)	(0.000)	(0.000)
Rho	-0.699***	-0.614***	-0.736***	-0.774***
	(0.000)	(0.000)	(0.000)	(0.000)
Log pseudo likelihood	-3916	-2961	-4429	-5203
Number of Observations	135403	135403	135403	135403

Notes: Reported in parentheses are p-values below the coefficients. Asterisks show significance levels *** p<0.01, ** p<0.05, * p<0.1. Lambda is the coefficient estimate of the inverse Mills ratio. Significance of this Lambda implies the existence of sample selection bias. Rho is the estimated correlation between the error terms of the two equations. If it is different from zero it is suggested that the two equations are related and that the selection model is appropriate.