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SANTA CRUZ

**ESSAYS ON INTERNATIONAL TRADE AND
FIRM BUSINESS STRATEGIES**

A dissertation submitted in partial satisfaction
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

INTERNATIONAL ECONOMICS

by

Aadil G. Nakhoda

June 2012

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Abstract

Aadil G. Nakhoda

Essays on International Trade and Firm Business Strategies

Exposure to international trade has a significant influence on business strategies of firms. I focus on the relationship between the exporting activities and the importing of foreign inputs by firms, the influence of financial leverage of the firms on their decision to expand their international trading activities and whether pressure from foreign competition impacts the probability that firms will switch products in their product range. In the first chapter, I study the effect of the influence of the extensive margin of export status and the intensive margin of export sales on the extensive and intensive margins of imports of foreign inputs. Splitting the sample into EU member and non-EU countries, I find that the extensive margin of export status has a significant effect on the extensive margin of imports within both samples. However, it is only in the EU countries that I observe the intensive margin of export sales to have an influence on the extensive and the intensive margins of imports of foreign inputs. This may signify the existence of production networks between firms in the EU member countries. In the second chapter, I determine whether financial leverage influences firms to become two way traders rather than export only, import only and trade only within the national market. It is observed that the intensity of financial leverage is likely to inhibit expansion of trading activities of firms, particularly those that import only or trade only within the national market. Interestingly, firms that export only rather than trade two way are not significantly influenced by the intensity of the financial leverage. In the third chapter, I analyze the effect of the pressure

from foreign competition on the decision of firms to introduce new products and on production costs as firms may add and drop products rather than add products only, drop products only and not undertake any product switching activities. I find that the effect of pressure from foreign competition is more likely to influence firms to add and drop products rather than add products only and not undertake any product switching activities.

Dedication

I dedicate this dissertation to my parents, brother, sister-in-law, nieces and all my family members and friends who have been very supportive throughout my academic career.

I also dedicate this dissertation to all the policymakers, researchers and entrepreneurs who strive for greater global economic integration of countries through international trade.

Acknowledgments

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1 Introduction

The exposure to international trade through an increase in access to foreign markets can influence the business strategies of firms. The potential of accumulating greater profits through the expansion of the customer base for firms has created opportunities to maximize profits. However, the participation in international trading activities may require firms to adjust their business strategies in order to take into account the demands of the consumers within various foreign markets. For instance, exporting firms may require to import foreign inputs in order to satisfy the demands of foreign consumers, while several firms may require to borrow externally and finance the purchase of their fixed assets through bank loans as they seek to pay the costs associated with participation in international trading activities. Further, the effect of pressure from foreign competition on decisions to introduce new products and on production costs may induce firms to add new products and drop old products from their range of products in order to achieve either a better quality-based or a more cost-effective range of products as demanded by their consumers, in both foreign as well as home markets.

In the first chapter, I determine the influence of the extensive and intensive margins of exporting activities on the various margins of importing activities by firms within the Central and Eastern European and Central Asian countries. I divide the sample into EU member and non-EU countries and I find evidence of different patterns of international trading activities by firms in a region that has become increasingly integrated with Western Europe over the recent years. The influence of extensive margin (export status) of exports is significant on the extensive margin of imports across the membership status. However, the effects of

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the intensive margin (export sales as a percentage of total sales) of exports on the extensive and intensive margins of imports of foreign inputs for exporting firms and two way traders vary. Further, there can be reverse causality between the exporting and importing activities. I implement an instrumental variable estimation using an excluded instrument that accounts for the export status of the median firm and the percentage of export sales by the median firm for the extensive and the intensive margins of exports respectively. In addition, regressions at the industry level are implemented in order to introduce an exogenous variation based on the intensity of the contractual agreement between the buyers and the suppliers. This helps to determine whether exporting activities influences importing activities within industries characterized by various contract intensities.

In the second chapter, I study the effect of financial leverage (percentage of assets funded by bank loans) of firms on their decision to participate in various trading activities, such as exporting, importing and two way trading (firms that export and import). I determine that the intensity of financial leverage does not inhibit firms which export only from becoming two way traders, but it does inhibit firms which either import only or operate only within the national market to become two way traders. The effect is determined to be stronger for firms that operate only within the national market than firms that import only. Since unobserved factors may influence both trading activity and financial leverage, I instrument for financial leverage using a variable that combines overdue payments to suppliers and the relationship of firms with their lenders. I contribute to the literature as I augment a model that determines the effect of financial leverage on various trading activities by implementing differences between industries due to their levels of external dependence and asset tangibility. Hence, the effect of

financial leverage is determined to vary between different trading activities within industries that exhibit different levels of external dependence and asset tangibility.

In the third chapter, I determine the effect of pressure from foreign competition on the decision to introduce new products and on production costs in influencing firms to participate in product switching activities. Firms switch products if they either add or drop products within their product range. I test whether pressure from foreign competition is likely to influence firms that concurrently add and drop (churn) products rather than firms that i) do not undertake any product switching activity, ii) add products only, and iii) drop products only. Firms pay substantial fixed costs to switch products and their productivity levels are likely to determine such ability. I consider whether firms that invest in research and development activities and export their final products are likely to churn products as they are able to generate greater productivity levels than firms that undertake either of the two activities. As firms constrained by the lack of education of their workers may have workers who cannot adapt to different set of skills necessary for product switching activities, I consider whether firms within this group are likely to churn products as they are exposed to pressure from foreign competition in comparison to firms with the group not constrained by the lack of education of their workers. In addition, the contract intensive nature of an industry can also dictate whether firms exposed to foreign competition can churn products as they may be constrained due to their contract obligations with their buyers and suppliers. The results indicate that pressure from foreign competition is likely to influence the decision of firms to churn products rather than add products only and undertake neither product switching activities. There is little evidence that firms facing pressure from foreign competition will churn products rather than

drop products only, except for the most productive firms that invest in research and development activities and export participation.

With the focus on different aspects of international trade and its impact on business strategies of firms, this dissertation contributes to the literature as it determines the relationship between various business strategies, such as externally financing their asset purchases, investments in product switching activities, and the expansion of their international trading activities as firms face greater opportunities in foreign markets. This dissertation will help researchers and policymakers alike, as it concludes that business strategies of firms are closely related to their international trading activities as firms are likely to adjust their business strategies as a cause and effect of their exposure to international trade.

2 Are Exporters Likely to be Importers of Foreign Inputs? Firm Level Study at the Extensive and Intensive Margins

2.1 Introduction

The relationship between the decision of firms to export their final products and import foreign inputs is a focus of many recent studies. The existence of cost complementarities between international trading activities has generated interest for researchers and policymakers alike. Firms import foreign inputs by either purchasing inputs and supplies (imports of intermediate materials) from foreign origins instead of domestic origins, or installing production equipment that is licensed by a foreign owned company or implementing internationally recognized quality certifications, such as ISO 9002, HACCP, AATCC or other certifications that are granted by international rather than national institutions[1]. The foreign inputs consist of those inputs that are not indigenously produced and contain elements that are borrowed from institutions and producers located in a foreign country. Firms that either import foreign inputs or export their final product are likely to perform better than firms that undertake neither of the activities. Firms that undertake both activities, two way traders, are likely to be the best performing firms amongst all categories of traders. As exporters generate greater revenue than

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[1] Liang (2009) discusses certain channels of trade with foreign firms that domestic firms may undertake. The most common channel of imports in this dataset is the purchasing of intermediate materials of foreign origins. Roughly, only 20% of the firms are accredited by an internationally recognized certificate but do not import foreign inputs or purchase foreign-licensed equipment. The aggregate variable accounting for all types of imports will be defined as imports of foreign inputs.

non-exporters, exporting firms will more likely invest in foreign inputs embedded with higher technology that can result in better product quality and greater production efficiency. The purpose of this paper is to determine whether exporting activities influence importing activities of firms.

Introduced in the seminal paper, Melitz (2003), and then followed by subsequent studies on firm level heterogeneity and its role on international trading activities, such as Bernard et al (2007), Yeaple (2005) and Bustos (2011), firms that participate in various international trading activities pay substantial costs to undertake such activities in the international market. Bernard et al (2007) describe the differences between exporters and non-exporters, where exporters are known to earn greater revenue, pay greater wages to their employees and exhibit better firm level characteristics than the non-exporting firms. Yeaple (2005) discusses the effect of reduction of trade costs and trade friction on firms that employ inputs embedded with high technology as lower trade costs increases the incentive for firms to augment their share of revenue and labor employed within the sectors that adopt inputs embedded with high technology to produce their output. In turn, this increases the wages of high skilled workers that are employed within sectors that adopt high technology and also increases the incentive for firms within such sectors to export. Kasahara and Lapham (2007) assert the importance of cost complementarities between exporting and importing activities as they discuss the presence of two way traders that observe better firm level characteristics than their counterparts. With such cost complementarities existing between international trading activities, it is important to study the relationship between the decision of firms to export their final product and import foreign inputs at the extensive margin as well as the intensive margin.

Theories on self-selection hypothesis and learning effects on productivity improvements also explain the trading patterns of firms. Several papers contend the self-selection hypothesis for exporters such as Melitz (2003), Bernard and Jensen (1999, 2004) and Chaney (2008). On the other hand, De Loecker (2007) discusses the importance of destination markets of exports on the productivity levels for exporters in Slovenia as exporting to the more developed and advanced markets leads to gains in the productivity levels of firms. Serti and Tomasi (2008) determine that Italian firms are likely to gain productivity levels by exporting to developed markets that are located at a distance, such as the US and Canada. Similar gains are observed by importing inputs embedded with high technology from the more developed and advanced markets. These are important contributions in relation to this paper as they suggest that firms within countries that have smaller home markets are likely to invest in more advanced technologies in order to reduce the costs of production or produce at a higher standard required by customers in foreign markets. Such firms are likely to generate 'learning effects' as they export their product, which in turn helps to earn the revenue necessary to purchase inputs embedded with high technology that is more likely to be imported.

Recent papers have contended the self-selection hypothesis for importers such as Kasahara and Lapham (2007) and Amiti and Konings (2007). Bustos (2011) considers the productivity shocks as the result of a trade liberalization process that occurred between MERCUSOR members, allowing firms to upgrade their technology choice due to their export revenues[2]. Kugler and Verhoogen (2010)

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[2]The extensive margin of exports can also be considered as the extensive margin of export revenues. Similar can be implied for the intensive margin of exports. However, for the purpose of this paper, the intensive margin of exports is defined as the export sales over total sales and the intensive margin of imports is defined as foreign inputs over total inputs.

explain the increase in quality inputs associated with imports and the enhancement of the productivity levels of firms. Although, there have been several papers that have studied the self-selection hypothesis, only a few have studied a decision of firms to become two-way traders as they participate in international trading activity as exporters or importers, giving importance to the idea of cost complementarties between international trading activities. Muuls and Pisu (2008) and Castellani et al (2010) study differences in firm level characteristics of two way traders as they outperform firms that trade in one direction or sell only within the national market. With the benefits of cost complementarities between exporting and importing activities, I will test the hypothesis that the i) export status is likely to influence the import status of firms, ii) exporters that increase their percentage of export sales will increase the likelihood that they will import their inputs, and iii) two way traders that increase their percentage of export sales will increase the percentage of inputs imported as well.

Blalock and Gertler (2004) and Blalock and Veloso (2007) put forward the hypothesis that the learning effect from importing inputs helps improve the productivity levels of firms. Blalock and Gertler (2004) provide an example of an exporter in Indonesia that purchases foreign inputs in order to improve its access into foreign markets and harmonize its product according to the demands of the foreign market. Blalock and Veloso (2007) emphasize the importance of vertical supply relationships of exporters, which is essential in driving the import related technology transfer between firms. Examples include an engine producer which decides to import an engine block to meet the demand of quality and standards approved by its foreign clients and in turn improve its productivity levels. Firms switch domestic inputs with foreign inputs as they prefer to import a higher qual-

ity product and expose themselves to foreign technology. Although, the aforementioned literature discuss the importance of productivity improvements related to importing of foreign inputs, I consider the relationship between exports of the final product and imports of foreign inputs and the effect the extensive and intensive margins of export sales has on the purchase of foreign inputs.

Bustos (2011) regresses adoption of technology against the decision of firms to export, determining whether exporting activities promote their decision to purchase inputs embedded with high technology as they are exposed to trade liberalization episodes. The importance of technology adoption is indicated through the participation in the export market. Lileeva and Trefler (2010) suggest a strong link between exporting activities and purchase of advanced inputs which embody more superior technology for Canadian plants that export to the US. Therefore, the decision of firms to export their final product should significantly influence their decision to import foreign inputs, specifically if that relates to upgrading the technology embedded in the inputs. I adopt a similar strategy as I study the effect on firms that export their final product on their import of foreign inputs for firms in transition economies within the CEEC and Central Asia. Martins and Opromella (2011) suggest that firms which import foreign inputs, such as importers only and two way traders are likely to pay higher average wages and employ better educated and more able workers than firms that export only and trade only within the national market. Altomonte and Bekes (2010) find that importers are likely to be more productive than exporters and determine a strong evidence for self-selection for importers. This again strengthens the notion that exporters will import foreign inputs as the generation of export revenues and improvements in productivity levels through 'learning effects' may allow such firms

to undertake the costs associated with imports of foreign inputs.

Some recent papers focus on whether import of inputs increases the probability that firms will export their final product. Bas and Strauss-Kahn (2011), using data provided by French Customs, determine the effect of importing inputs on exporting. They argue the importance of input varieties that increase the productivity levels of firms and make it possible for firms to pay the fixed costs associated with exporting. In turn, firms are also able to increase the variety of their exports or the export scope. Aristei et al. (2011) consider the effect of lagged exporting or importing activities on current importing or exporting activities respectively. They suggest that importing foreign inputs will increase the probability that firms will export in the future but do not find evidence that lagged exporting activities affect the decision to import in the future for firms in the Central and Eastern European and Central Asian countries. Although, the main purpose is very similar to one presented in this paper, it is different in the way the relationship between trading activities is approached as I focus on the effect of the contemporaneous trading status, rather than the lagged status. The issue with lagged status is that it can be highly correlated with current status but may not include exporters that have entered the export market in the current year nor dropped out in the current year. My approach determines whether exporting firms use imported intermediate inputs in their current production and considers those firms that are actively participating in international trade within a given year. Second, Bas and Strauss-Kahn(2011) consider the improvements in the productivity levels associated with importing foreign inputs that allows firms to export their products.

I analyze the role of the extensive and intensive margins of exports on the extensive and intensive margins of imports of foreign inputs. The extensive margin

of exports is likely to significantly influence the extensive margin of imports of foreign inputs as the export status of firms is likely to increase the probability that firms import foreign inputs. However, the intensive margin of exports may not play a significant role if the share of export revenues of exporters (firms that have already paid the up-front fixed costs to export and increase the share of export sales to total sales) may not necessarily generate the incentive to import foreign inputs or increase the percentage of their inputs that are foreign imports. In other words, the benefits of cost complementarity may relate to the extensive margins of exporting and importing but not to the respective intensive margins. Although, there have been several studies that have determined the relationship between the extensive margins of exports and the extensive margin of imports, there is a lack of studies that focus on the relationship between the intensive margins of exports on the extensive margins of imports by exporting firms and on the intensive margins of imports by two way traders.

In order to empirically estimate the relationship between exporting and importing activities, probit estimations and OLS are conducted, with several firm level characteristics used as controls. Although, I consider the role of the export status of firms and their percentage of export sales on the extensive and the intensive margin of imports of foreign inputs, reverse causality may exist between this relationship. Such endogeneity issues can bias the results upward and render it inefficient. To account for this problem, an instrumental variable estimation is performed, with the industry level 'exportability' of firms as an excluded instrument. This variable is based on the median number of exporters and the percentage of export sales to total sales by the median firm within their respective industry. This variable will affect the participation of firms as exporters or

their percentage of export sales to total sales but will not directly influence the decision of firms to import foreign inputs or their percentage of inputs of foreign origin.

Industry level characteristics which measure contractual agreements between suppliers and customers, borrowed from Nunn (2007), are adopted to determine the pattern of relationship between exporters and importers of foreign inputs. Acemoglu et al (2007) and Antras (2011) discuss the implications of contracting relationships between the buyers and the sellers, Gamberoni et al (2010) stress the importance of timely deliverance of intermediate inputs and ability of firms to enforce contractual agreements as an important determinant to trade in intermediary inputs.

The dataset, borrowed from Business Environment and Enterprise Performance Surveys (BEEPS), is a firm level study across many Central and Eastern European and Central Asian countries. This survey of 7,288 observations and 6,628 firms, records several firm characteristics that can be useful as controls for the purpose of an empirical study[3]. For instance, information provided on total sales, costs of production, number of employees, employee characteristics and exporter and importer status as well as percentage of sales exported and percentage of inputs of foreign origin allow a comprehensive study on the patterns of international trading activities undertaken by firms. In addition, the sample of countries is divided into the respective European Union (EU) membership status of the countries, with EU members generally being more advanced and developed than

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[3]There are a total of 7288 observations recorded, with 3,600 firms surveyed in 2005 and 3,688 firms surveyed in 2009. Although, the surveys were conducted extensively in manufacturing and service industries, I only consider surveys for firms in manufacturing industries within ISIC Rev 3.1 15 to 37. Observations believed to be inaccurate by the interviewers are dropped.

their non-member counterparts. This division into EU membership status allows to determine whether the influence of the exporting activities on the importing activities of firms is stronger in EU members than in non-EU countries.

One of the major factor that allows for the accession into the EU is the development of the legal structure and stronger safeguards to property rights within the countries. The membership status has a varying impact on the relationship between the decision of firms to export their final product and import foreign inputs. With better safeguards of creditor rights in EU countries, contractual agreements between the buyers and the sellers are more likely to be protected by law. Such legal systems can be necessary to form production networks and supply chains as contracts are signed between firms in developed countries and the lesser developed members of the European Union. Eckel et al (2010) suggest that there is a perceived quality premium within industries characterized by differentiated products, or in which contracts are likely, that promote firms to upgrade the technology embedded in the inputs. On the other hand, Eckel et al (2010) also suggest that there is a cost-based preference on production within industries characterized by non-differentiated products, or within industries in which contracts are not likely. Within production networks, it should be likely for exporters that sell differentiated products within industries characterized by high contract intensity to influence the extensive margin of their imports with an increase in the intensity of export sales. However, with lower trade costs, two way traders are likely to increase their intensive margin of imports as their intensity of export sales increases, particularly within industries characterized by non-differentiated products or low contract intensity, where products are likely to be sensitive to trade costs.

2.2 Theoretical Background

Similar to Bustos (2011), I assume that the supply side is characterized by monopolistic competition and that firms are heterogeneous in their production as marginal costs vary across firms. I also assume that before entering production the productivity levels of firms are given, but firms can enhance their productivity levels in the production stage. The importing of foreign inputs requires firms to pay higher fixed costs and adjust production facilities in order to accommodate production. The source of revenue to undertake such investments can be through export sales. The foreign inputs imported by firms can either be cheaper or entail better quality and be more expensive than the domestic substitutes. The studies that have focused on the characteristics of imported inputs suggest the latter. Martins and Opromolla (2011) consider importers to observe greater firm level characteristics than non-importers, while Serti and Tomasi (2008), Kugler and Verhoogen (2009) suggest that importing firms are likely to purchase inputs embedded with high technology.

As per the model discussed in Melitz (2003), Helpman et al (2004), Yeaple (2005) and Bustos (2011), ranking the firms according to their productivity levels will result in the least productive firms to exit the industry, the less productive firms will only produce for the domestic market, the more productive firms will export but not import foreign inputs, while the most productive firms will import foreign inputs and will export their final goods. The last group of firms can also be defined as two way traders. However, there will be firms that import foreign inputs but do not export and, for the purpose of simplification of the model, can observe similar levels of productivity and firm characteristics as the firms that export but do not import foreign inputs.

Similar to Seker (2009), the profits can be ranked as $\pi^{ne,nm} < \{\pi^{m,ne}, \pi^{e,nm}\} < \pi^{me}$ where ne are not exporters, nm are not importers, m are importers, e are exporters. me are two way traders. The relatively more productive firms self-select themselves into export markets and the most productive of these firms also import foreign inputs, hence described as two way traders. In other words, exporting firms that have paid the substantial fixed costs to export may also be more likely to pay the fixed costs to import foreign inputs and benefit from the possible cost complementarities. Certain productivity shocks or exogenous trade liberalization episodes, as described in Bustos (2011), may contribute to higher revenues for an exporter that would eventually allow such firms to import foreign inputs. Therefore, even though the self-selection hypothesis is strong, where two way traders do observe generally better firm level characteristics, it can also be the case that participation in export markets by firms are inducing some learning effects. The least productive of the firms will trade only within the national market.

Variable trade costs can influence trade friction between countries, where a reduction in trade costs can lead to greater demand for firms to import foreign inputs instead of domestic inputs. As discussed in Yeaple (2005), if variable trade costs such as transportation costs and costs to clear customs influence international trading activities, I may not observe export sales to increase the percentage of inputs imported as exporting firms can face a reduction in their revenues and other firm characteristics. This can also lower the desire to import more advanced foreign inputs.

Acemoglu et al (2007) incorporates the effects of contractual incompleteness between the suppliers and inputs complementarity as firms develop relationships

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with their suppliers. As firms determine the best inputs available to produce their product, they undertake relationship-specific activities, a fraction of which can be contracted where firms have to pay a certain fixed costs in order to establish relationships with either their suppliers or their buyers. The remaining fraction of the activity can be non-contracted and unverifiable. Considering the standard CES model implemented in Melitz (2003), these relationships require the parties to pay up-front fixed costs, f_C due to legal fees, associated with contracts and legal agreements between the buyers and the sellers. The amount of fixed costs can be based on the contract intensity at the industry level, as firms belonging to an industry which is highly dependent on contracted agreements may pay larger fixed costs as they are compelled to use a greater proportion of their intermediate inputs supplied under contracted agreements. However, suppliers under contracted agreements are more likely to provide inputs that meet the requirements of the producers, through better quality or otherwise. Input complementarity for firms within contract-intensive industries is likely to result in higher productivity levels. Hence, a parameter Z indicates the gain in productivity firms may enjoy as a result of the contract-intensive nature of their industry.

Assuming $Z \geq 1$, I solve for the profit function as follows for the non-importers selling in the domestic market:

$$\pi(\varphi) = \frac{Zr(\varphi)}{\sigma} - f - f_C$$

and for the importers selling only within the domestic market:

$$\pi_m(\varphi) = \frac{Zr_m(\varphi)}{\sigma} - \eta f - f_C$$

Exporters using no foreign inputs will have a profit function of:

$$\pi_x(\varphi) = \frac{Z(1 + \tau^{1-\sigma})r(\varphi)}{\sigma} - f - f_x - f_C$$

and exporters which import foreign inputs will have a profit function of:

$$\pi_{mx}(\varphi) = \frac{Z(1 + \tau^{1-\sigma})r_a(\varphi)}{\sigma} - \eta f - f_x - f_C$$

where τ is the variable trade cost, φ is the productivity level, f is the fixed cost to enter the market, and f_x is the fixed cost to export the products. $\eta > 1$ denotes the cost to operate with imported inputs, σ is the elasticity of substitution, and $r(\varphi)$ is the revenue function from Melitz (2003).

As Z increases, the profits earned by firms will increase but so will the fixed costs associated with the contractual agreement between the buyers and the sellers. Firms will be able to increase their productivity as they will be supplied by customized rather than standardized inputs and the price premium paid by firms can be significantly larger. On the other hand, firms will become more contract dependent on the supplier to ensure timely provisions of their supplies, hence increasing the costs to enter a contractual agreement with the suppliers.

With fixed costs attributing substantially to the costs of participating in international trade, the decision to export may increase the likelihood that the firms will import foreign inputs but an increase in the percentage sales of an exporter may not increase the likelihood that the firms will commit to fixed costs to import foreign inputs, particularly if trade frictions exist. The testable predictions of this model are that decision of firms to export should increase the likelihood that firms import foreign inputs. Their decision to pay up-front fixed costs related

to exporting activities may increase the possibility that the firms would undertake further payments of fixed costs associated to importing of foreign inputs. However, exporting firms that have a substantial presence in the export market without having to import foreign inputs may not have the desire to pay the upfront fixed costs of importing. In the case of two way traders, they may not have the desire to pay the higher variable costs associated with trade frictions to import a greater proportion of their inputs due to an increase in export revenue in proportion to total sales revenue. This analysis can confirm the significance of fixed costs associated with the participation into international trading activities. However, if trade frictions are low, two way traders may increase the percentage of foreign inputs with their ability to generate greater export revenue, as suggested in Yeaple (2005). Similarly, the contract intensity at the industry level influences the degree of heterogeneity of the product firms produce, hence varying the relationship of the extensive and the intensive margins of exporting of final product and importing of foreign inputs. Firms within high contract intensity industries may pay substantially greater price premium based on the quality of the product, with such firms more likely to pay the fixed costs to import foreign inputs.

2.3   The Data

The Enterprise Surveys, which provides the firm level data, is commonly known as The Business Environment and Enterprise Performance Survey (BEEPS) dataset in the Central and Eastern European and Central Asian countries and is created jointly by the World Bank and the European Bank for Reconstruction and De-

velopment[4]. There are 7,288 observations for 27 countries, with 3,600 surveys conducted in 2005 and 3,688 surveys conducted in 2009. The firms included in this study only pertain to the manufacturing sector (ISIC Rev 3.1 sectors 15 to 37). The sample includes mainly small and medium sized firms with less than 10,000 employees, with approximately 50 percent of the firms have less than 35 employees and 75 percent have less than 110 employees. It also includes firms that are located in large cities as well as rural areas. The data on domestic credit is collected from World Development Indicators by the World Bank[5].

In Appendix 2A, I list the countries, and the European Union (EU) membership status[6]. The sample is divided into subsamples of EU member and non-EU countries. It is appropriate to consider differences in market access between the membership status. The effect on market access by the membership status can be studied in terms of the implications of economic geography on income per capita levels between trading partners as suggested by Redding and Venables (2004). Considering a model that implements economic geography, Mayer (2009) regresses bilateral trade flows between countries using standard gravity equations which include contiguity, distance, along with colonial linkages, common language, membership in a regional trade agreement and WTO membership in order to study the export demand and supply access given the geographical location of

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[4]Enterprise Surveys by the World Bank are available at http://www.enterprisesurveys.org. As with every survey, some data collected was marked as being doubtful by the interviewers, as the accuracy of the data collected is ranked. I have eliminated any observations that have been marked as doubtful by the interviewer.

[5]The domestic credit provided by banking sector can be a useful indicator to split the membership status. Domestic credit provided by banks as a % of GDP in EU countries is 58% versus the 34% provided by banks in non-EU countries. Furthermore, the EU countries observe a significantly higher GDP per capita than the non-EU countries.

[6]Bulgaria and Romania joined the EU in 2007, hence have been listed as non-EU countries in 2004.

a country and its trading partners. After calculating the observed trade costs and fixed effects for each set of trading partners, the foreign market potential of a country can be determined for EU member countries and non-EU countries. This helps find the distance-weighted sum of market potential given the trading partners. With the values on foreign market potential suggested by Mayer (2009), I determine that the EU members have five times the foreign market potential than non-EU countries, expressing the larger market access EU member countries enjoy in comparison to the non-EU countries[7]. As this variable also takes into account regional trade agreements between trading partners it sums up the level of trade frictions that exist between trading partners. With EU member countries observing a higher foreign market potential, it is likely that they also experience lower trade friction for their bilateral trade between the more developed and advanced neighbors of Western Europe. Firms in EU member countries are likely to be exposed to lower fixed and variable costs of trading with the more developed markets of Western Europe than firms in non-EU countries. This can help to explain that firms more involved with exporting activities are also more likely to be more involved with importing activities as a result of the regional integration.

[Figure 2.1 about here]

In Figure 2.1, I show the percentage of firms that are either exporters or importers in EU member and non-EU countries. As expected, the percentage

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[7]The dataset can be downloaded from

http://www.cepii.fr/anglaisgraph/bdd/marketpotentials.htm

as is listed in Mayer (2009). Largest foreign market potential within EU member countries is Czech Republic, Poland and Slovakia. The largest foreign market potential within non-EU countries are Croatia, Macedonia and Albania (this could potentially be as they all share a border with either Greece (higher GDP per capita than any country in the dataset) or Slovenia (the highest GDP per capita of all countries in the dataset). The smallest foreign market potential is recorded by Uzbekistan and Tajikistan and do not share any border with a EU member country.

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is higher for both exporters and importers in EU member countries. There are 1,948 firms in the eight EU member countries and 4,624 firms in the 17 non-EU countries (This excludes 716 firms within Bulgaria and Romania).

[Figure 2.2 about here]

In Figure 2.2, I show the participation rates of each trading activity per EU membership status. In EU member countries, the number of firms that export only is significantly lower than the number of firms that import only, while firms that trade two way record the largest number of firms. In non-EU countries, the number of firms that export only is less than the number of firms that import only (similar to the trend observed for EU member countries) but the number of firms that trade two way lie in between. This suggests that firms in EU countries are likely to become two way traders, an indication that such firms are facing lower friction in terms of trade costs, fixed and variable. The percentage of domestic traders is approximately a quarter of all the firms but I observe a higher percentage in non-EU countries than in EU member countries.

In Figures 2.1 and 2.2, I present importing as the most prominent trading activity in both EU and non-EU countries, while exporting, even though less prominent, is more dominant in EU countries than non-EU countries. Furthermore, EU member countries have nearly majority of their firms as two way traders. The prominence of trading activities is skewed towards importers and two way traders and determines that the export status positively impacts the import status of firms. It also explains the presence of two way traders and the lack of firms that export only. This points to the hypothesis that export revenues can be generating the funds that allow firms to import foreign inputs. As it is the exporting firms in

both EU member countries and non-EU countries that are likely to be importers of foreign inputs, I predict in the following results that the decision of firms to export their final product will significantly impact their decision to import foreign inputs, in both EU member countries and non-EU countries.

[Figure 2.3 about here]

In Figure 2.3, I determine the percentage of export sales by exporters and percentage of imported inputs by importers. Once firms participate in international trading activities, the intensity at which trade occurs is similar in both EU member and non-EU countries. The percentage of export sales is a few percentage points lower in non-EU countries, indicating that if trade costs exist, they tend to limit the intensity of exports by exporting firms in non-EU countries. This is consistent with the discussion earlier in this section that non-EU countries may face greater trade friction than EU member countries. As EU member and non-EU countries face varying trade costs, the extensive and the intensive margins of exports may have a differing influence on the extensive and intensive margins of imports of foreign inputs in EU member and non-EU countries.

2.4   Results

2.4.1   Probit and OLS

The equation for the probit estimation is:

$$IMP^*_{ijct} = \beta_1 EXP_{ijct} + \beta_2 z_{ijct} + \alpha_i + \alpha_c + \eta_i + \varepsilon_{ijct}$$

where EXP_{ijct} is the extensive and intensive margin of exports respectively. IMP^*_{ijct} is the extensive margin of imports of foreign inputs. z_{ijct} is a vector of firm characteristics, α_i is the 3 digit industry dummy and α_c is the country level dummy and η_t is time dummies. ε_{ijct} is the error term. i denotes firm, j denotes 3 digit ISIC industry, c denotes country and t denotes year. The description of the variables is listed in Appendix 2B. IMP is binary, with two outcomes, 1 or 0. I assume that IMP takes the form $\Pr(IMP = 1|X) = \Phi(X'\beta)$. The $\varepsilon_{ijct} \sim N(0,1)$.

[Table 2.1 about here]

As expected, in Table 2.1, a positive and significant effect at the 1% level of the extensive margin of exports on the extensive margin of imports is shown[8]. All other variables are significant, most at the 1% level, except for productivity and age of firms. All firm characteristics except productivity and age play a role in determining whether or not firms import foreign inputs. In Columns 3 to 6, I reveal the relationship between the intensive margin of exports by exporters and its effect on the decision to import foreign inputs. The intensive margin of exports considers the percentage of export sales by firms that have paid the up-front fixed costs to export. I do not observe a significant effect for any of the columns, indicating that the percentage of export sales by an exporter does not influence the decision of firms to import foreign inputs. If the purpose of importing foreign inputs is to make the goods more competitive but requires up-front fixed costs, a larger percentage of export sales will not determine the decision of firms to import foreign inputs. The intensity of funds generated by export revenues may

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[8]All results, except under the instrumental variable section, are calculated as the marginal effects at the mean values of the independent variables.

not significantly influence firms to make payments of fixed costs to undertake import of foreign inputs.

In Table 2.1, EU member countries observe variables such as domestic firm, percentage of employees with a university degree, number of full-time employees and overdue payments to suppliers to significantly affect the decision of firms to import foreign inputs given that they are exporting firms. In non-EU countries, there is a slightly different pattern set by the independent variables in column (6). Number of full-time workers is the only common significant independent variable in both the sample of countries. Age of firms and formal training to employees significantly affect decision of firms to import foreign inputs in non-EU countries but not in EU countries. The differences in the behavior of independent variables, particularly once fixed costs to export their final product has been incurred by the firms, allow to determine the varying nature of firms that import foreign inputs in countries with different EU membership status in the region.

The regression used for Table 2.2 is:

$$IMP_{ijct}^{I} = \beta_1 EXP_{ijct}^{I} + \beta_2 z_{ijct} + \alpha_j + \alpha_c + \eta_t + \varepsilon_{ijct}$$

where IMP_{ijct}^{I} is the intensive margin of imports and EXP_{ijct}^{I} is the intensive margin of exports, while z_{ijct} is the vector of firm characteristics and α_j and α_c are industry and country dummies respectively, η_t is the time dummy and ε_{ijct} is the error term. The intensive margin is the percentage of inputs imported or sales exported by an importer or exporter respectively.

[Table 2.2 about here]

In Table 2.2, the intensive margin of exports is significantly correlated with the intensive margin of imports at the 5% level of significance for the pooled sample and EU member countries. As the intensive margin is considered for firms that trade two way, these firms have paid the fixed costs required to export their final product and import their inputs. This implies that in the EU member countries as exporters increase the share of their exports to their total sales, it will lead to an increase in the share of their imported inputs to total inputs. Capacity utilization is negative and significant at the 1% level for firms in EU countries implying that firms with lower demand for their final products are more likely to increase the percentage of inputs imported. In non-EU countries, I observe productivity and innovation to positively influence the percentage of inputs imported. This can be based on the fact that the non-EU countries are less advanced and developed within the region and the two way traders lack productivity and innovative capability to increase their percentage of inputs they import.

In Table 2.2, I show that once costs are paid to export and import in EU member countries, firms with greater export sales are also more likely to import foreign inputs. However, in non-EU countries, the insignificance of the variable on export sales can imply that an increase in export sales by firms that have made up-front payment of fixed costs to become two way traders does not necessarily relate to greater import of foreign inputs. This can be a result of relatively greater trade friction, as indicated by the smaller foreign market potential, faced by firms in non-EU countries which generate lower export revenues for the firm. The lower export revenues would imply that two way traders which have a larger percentage of export sales do not necessarily demand a greater percentage of imported inputs.

The export status impacts the decision of firms to import foreign inputs, how-

ever the percentage of export sales by an exporter does not influence the decision to import foreign inputs. On the other hand, the percentage of export sales does impact the percentage of inputs imported by two way traders in EU member countries. The observations in Tables 2.1 and 2.2 basically imply that firms which export are likely to import foreign inputs. Exporting firms that have already paid the up-front fixed costs to export will not import foreign inputs regardless of their intensity of export sales. The increase in export revenues by exporting firms does not significantly influence firms to undertake the fixed costs related to the import of foreign inputs. The intensity of export sales for two way traders influences the intensity of imported inputs in regions where trade costs are relatively lower, i.e EU member countries, indicating that firms are likely to expand their intensive margin of imports as they observe a greater intensive margin of export sales in regions where purchasing foreign inputs is relatively easier with lower trade friction. This reinforces Yeaple (2005) as I observe firms to import foreign inputs as they receive greater revenue from export sales, which is evident in EU member countries. Further, Lileeva and Trefler (2010) also suggest that exporters in Slovenia, an EU member country, are more likely to invest in activities that increase productivity levels as firms face improved access to the advanced European markets and join their production networks and supply chains. This difference in trading patterns between firms in EU member and non-EU countries also contribute towards the idea of production networks that exist in EU member countries and is discussed in detail in a later section.

2.4.2 Robustness Check –Instrumental Variable Estimation

I implement instrumental variables estimation as a robustness check to the above OLS and probit estimations and the results obtained using instrumental variable estimations are similar to the results for the OLS and the probit estimations.

The OLS and probit estimations can suffer from endogeneity and omitted variable bias, which can make the results inconsistent[9]. For instance, exporters are likely to import foreign inputs but the export variable can also have an endogenous effect, as importers are also likely to export their products, creating an upward bias. In order to remove such biasness, it is necessary to introduce a two-stage least square estimation using the instrumental variable estimation. The excluded instrument in this case is the 'exportability' of the firms within their 4 digit ISIC industry[10]. This instrumental variable captures the position of the extensive and intensive margins of the firm within the industry but does not necessarily increase the probability that the firm will import their intermediate inputs. Bratti and Felice (2009) use the idea of gravity equations to determine an instrument that would directly affect the decision of firms to export but not affect the decision of firms to innovate. Bratti and Felice (2009) use information on location of firms within each province and compute the distance between the firms and export destination based on the average distance to top trading partners using export weights specific to each sector. Although such a measure may not directly benefit

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[9]Reverse causality between the dependent variable and the explanatory variables can create potential problems in explaining causality. However, in this dataset, reverse causality is not a serious issue for certain variables, such as sales and level of employments, as these variables do not vary much over a three year period.

[10]The fixed effect industry dummy is at the 3 digit level as there is a potential problem of very few number of observations within certain 4 digit ISIC industries. As industry averages can still be calculated at the 4 digit industry level, I prefer to implement this level of disaggregation to calculate 'exportability'.

the study presented in this paper as it lacks firm level variation, I borrow the idea to determine a firm level characteristic that would be correlated to the export status and percentage of export sales. Considering the median firm to represent the typical firm within the industry, the excluded instrument is calculated as the median of the export status of all the firms within the 4 digit ISIC industry, sorted by country and year. This variable will be labeled as 'exportability'. For instance, if firms belong to an industry that has majority of firms exporting, the median firm within the industry will also be an exporter. Firms with a zero value of 'exportability' will themselves be exporters, while the firms with negative value, -1, will be non-exporters. Basically, this variable incorporates the deviation of the export status of firms from the export status of the median firm within their industry. The 'exportability' for the intensive margin of exports is calculated similarly. The median of the percentage of export sales at the 4 digit ISIC industry, sorted by country and year is subtracted from the percentage of export sales by firms.

Holmes and Stevens (2010) determine that half of the observed plant size and export relationship is based on the distance to the market. Plants or firms that export need to overcome two distinct frictions, one that pertains to distance to the market and the other that pertains to the border. The distance to the market and the border incur larger costs than firms that sell only within the national market. The 'exportability' of firms is based on the export pattern of all the firms within the industry and is exogenously determined. As the 'exportability' of the intensive margin is measured with respect to the median export sales within an industry, firms that have a positive value have greater 'exportability' than other firms within the industry and are more likely to have greater intensity to export

as their export sales contribute a greater proportion of total sales than the median firm. It is important to note that 'exportability' itself should not directly affect the decision of firms to import foreign inputs or increase the percentage of their inputs imported.

The Second Stage:

$$Y^*_{ijct} = \beta_1 EXP^*_{ijct} + \beta_2 z_{ijct} + \alpha_j + \alpha_c + \eta_t + \varepsilon_{ijct}$$

The First Stage:

$$EXP^*_{ijct} = \beta_1 EXPBILITY_{ijct} + \beta_2 z_{ijct} + \alpha_j + \alpha_c + \eta_t + \varepsilon_{ijct}$$

where $EXPBILITY_{ijct}$ measures the export decision of firms based on the difference between their export status or percentage of export sales and the median level of export status or percentage of export sales within the industry. The extensive margin of export status takes into account the former, while the intensive margin of export sales takes into account the latter. The other variables are the same as the ones listed for the OLS and probit estimations. The other variables have been defined in the earlier section.

[Table 2.3 about here]

In Table 2.3 above, I can reject the null hypothesis on underidentification, at the 1% level of significance. I can also reject the null hypothesis on weak identification as I obtain a large value for the F-statistic. I determine that the instrument is valid. However, I cannot reject exogeneity for all of the groups of

countries at the 10% level of significance. The results are similar to that observed in Table 2.1.

[Table 2.4 about here]

In Table 2.4 above, I can reject the null hypothesis on underidentification, at the 1% level of significance. I can also reject the null hypothesis on weak identification as I obtain a large value for the F-statistic. As is the case in the previous table, I determine that the instrument is valid. Similarly, I cannot reject exogeneity for all of the groups of countries at the 10% level of significance. The results reported are same as the probit estimation in Table 2.1.

[Table 2.5 about here]

In Table 2.5, I can reject the null hypothesis on underidentification, at the 1% level of significance. I can also reject the null hypothesis on weak identification as I obtain a large value for the F-statistic. As is the case in the previous tables on IV regressions, I determine that the instrument is valid. I cannot reject exogeneity of the endogenous regressor for the three groups of countries at the 10% level of significance. Therefore, this is similar to the result I observe in Table 2.2.

For the instrumental variable estimations above, I cannot reject exogeneity in all the regressions. This allows us to consider the OLS and probit estimations to be consistent and efficient. Hence, I can continue with the OLS and probit estimations in the remainder of the paper.

I test whether the decision of firms to export should increase the likelihood to import foreign inputs. However, given the large fixed costs to import, the increase in percentage export sales of firms that have already paid the up-front costs to

export should be less likely to import foreign inputs. The variable costs incurred with the increase in intensity of export sales by firms that already have access to an export market do not justify the payment of additional sunk costs to import foreign inputs in EU member as well as non-EU countries. Furthermore, firms that trade two way, should increase their use of foreign inputs, or intensity, when it experiences a rise in the percentage of their export sales if the foreign buyer demands imported inputs to be used in production. However, as is observed, such a scenario is more likely to hold in EU member countries as they benefit from greater foreign market potential and the smaller distance weighted cost of trade with their trading partners compared to non-EU countries. Hence, two way traders that have paid the up-front fixed costs to export their final product and import foreign inputs increase their intensive margin of exports, they can demand greater imports of foreign inputs.

2.4.3   Contract Intensity

Nunn (2007) introduces the concept of contract intensity and measures whether an input is either sold in an organized exchange, reference priced in a trade publication or is sold through an exchange of a contractual agreement between the parties that involves large legal costs. An input sold in an exchange lacks the need for a complex relationship between the buyer and the seller, while an input with a reference price generally has a large number of buyers or sellers. On the other hand, an input with neither of the two qualities is likely to induce a complex relationship between the buyers and the sellers. Industries listed by Nunn (2007) with the least contract intensity are corn milling, oilseed processing etc, while industries that require high relationship-specific investments are computer and

electronic manufacturing industries. Although there is priori no reason to believe that the decision of firms is based on their presence within an industry that has more inputs obtained from an organized exchange as the decision to trade is independent of contracts, the likelihood that exporting firms import foreign inputs can be influenced by contract intensity of the industry. It is likely that foreign buyers may require inputs to be of certain specifications and standards and prefer imported inputs. Bernard et al. (2010) use the "revealed" contractibility of products, the weighted average wholesale employment share of firms importing the product to measure the share of intermediation within a product. Based on the interpretation that product contractibility is higher when products are traded by intermediaries, Bernard et al (2010) determines that intermediation and share of intra-firm imports are negatively correlated. Nunn (2007) is more focused on considering the relationship-specificity between the buyers and the sellers rather than the degree of intermediation within the product. The measure of contract intensity is borrowed from Nunn (2007) and Manova et al (2011).

Firms that import foreign inputs source their intermediate inputs from other countries. However, such firms also need to strategize the extent of control that they may want to have on the production of the intermediate inputs, for example, set specific requirements and terms and conditions upon their suppliers. Acemoglu et al (2007) and Antras (2011) discuss the implications of a contracting relationship that may exist between the agents and the effect it would have on the profit of firms that produce goods. Such customization of inputs between firms and their suppliers or consumers would require firms to undertake contractual agreements that would guarantee the quality of the input. Gamberoni et al (2010) stress the importance of timely deliverance of inputs and the ability of

firms to enforce contractual agreements as an important determinant to trade in intermediary inputs. Hold-up problems between the suppliers and the customers can slow down the production process of firms and be costly to firms demanding the customized intermediate inputs. Agreements between suppliers and their customers require a payment of fixed costs, as they entail costs to provide legal cover and assistance and insurance against the reluctance or inability to uphold the contract between the parties. Considering the differences between trading activities and the contract intensive nature of the products traded, Altomonte and Bekes (2010) determine that firms which transfer from non-trading to importing activities are likely to be trading more contract intensive products than firms which switch from non-trading to exporting activities, while imports are likely to be of a more contract intensive nature than exports.

Firms are separated into industries characterized by high and low contract intensity. It will be interesting to determine whether contract intensity influences the various relationships between the extensive and the intensive margin of exports on the margins of imports of foreign inputs. Eckel et al (2010) observe a quality based preference on the price premium within differentiated or high contract intensive industries, while a cost-based preference on the price premium within non-differentiated industries. If EU membership lowers costs of trading, in terms of market access as well as distribution and legal costs with the more advanced trading partners of Western Europe, exporting firms are more likely to pay up-front fixed costs to import higher quality inputs within industries characterized by high contract intensity due to their quality based preference of purchasing inputs embedded with advanced technology. The lower costs associated with market access may induce firms to undertake contracts with foreign buyers and sellers. On

the other hand, lower trade costs can increase the percentage of inputs imported by two way traders as they increase their percentage of export sales due to their cost-based preference within industries characterized by low contract intensity.

[Figure 2.4 about here]

In Figure 2.4, I present a negative relationship at the country level between domestic credit and the median contract intensity. Such an observation can be attributed to the increase in relocation of low and medium contract intensive industries into certain Central and Eastern European EU member countries, such as Poland, from Western European countries as suggested by Heidenreich (2009), as these countries observe investments within industries that rely less on contractual agreements between the buyers and the suppliers. For example, Poland has the lowest median of contract intensity, even though its domestic credit as a percentage of GDP is higher than that of many non-EU countries within the sample. Poland has a large proportion of firms within the food and agriculture related industry, which is generally marked with low contract intensity as the firms are likely to purchase products from organized exchanges or at a referenced price. Furthermore, the EU member countries in my sample are the less developed and advanced countries in the EU and can experience concentration in production within the less contract-intensive industries than their more developed neighbors. As Nunn (2007) and Levchenko (2004) state that the production of complex goods rely on better institutions, therefore the lesser advanced and lower income members of the European Union (the member countries in our sample) would produce less complex goods.

[Figure 2.5 about here]

[Figure 2.6 about here]

In Figure 2.6, I observe that firms within the more contract intensive industries are likely to participate in international trading activities than within the less contract intensive industries, the differences in the participation rate between low and high contract intensity is subtle. In Appendix 2E, I sort the number of observations within both, low and high contract intensity industries for the pooled set of countries, the EU member countries and the non-EU countries.

[Figure 2.7 about here]

The percentage of export sales by exporters is very similar between low and high contract-intensive industries, but the differences in percentage of inputs imported by importers is less subtle between high contract industries and low contract industries. Contract intensive industries observe greater participation rates of exporters and importers, along with generally similar percentage of contribution by export sales and imported inputs by exporters and importers respectively.

In Table 2.6, I divide the sample into different contract intensity at the industry level. It will be interesting to study whether firms belonging within a low or a high contract intensive industry will determine the likelihood of firms becoming importers as either the export status or the percentage of export sales of exporters vary. Furthermore, as contract intensity determines the complexity of the relationship between the suppliers and the buyers, it will be interesting to determine whether firms that have paid the fixed costs to trade two way are likely to have their percentage inputs supplied by foreign sources to be influenced by the percentage of export sales.

[Table 2.6 about here]

In Table 2.6, I show that the decision to import is positively and significantly associated at the 1% level with the decision to export, regardless of the contract intensity of the industries and in both EU member and non-EU countries. Therefore, firms that have paid the up-front fixed costs to export will increase the likelihood that they will also pay the up-front fixed costs related to importing, regardless of the intensity of the contract between the buyers and the sellers. In EU countries, I observe that innovation, number of full-time employees and percentage of employees with a university degree positively impacts the probability that firms are importers within industries with low contract intensity, while only export status and number of full-time employees affect the probability that firms will import within high contract intensity industries. However, in non-EU countries I observe a greater set of significant variables within both the industries than for in EU countries. For instance, number of full-time employees is only significant, at either the 1% level or the 5% level, within both types of industries in EU countries. However, domestic ownership, formal training and overdue payments are all significant at the 1% level within both types of industries in non-EU countries.

[Table 2.7 about here]

In Table 2.7, I observe a negative effect between intensive margin of exports by exporting firms and the extensive margin of imports in non-EU countries within low contract intensity industries, although insignificant. The same holds for the pooled regression. However, in EU member countries, the intensive margin of exports has a significant effect at the 10% level within industries characterized by high contract intensity only. This can imply that exporting firms with higher

percentage of export sales are likely to import foreign inputs within industries that have high contract intensity. With goods less likely to be homogeneous and production more likely to be bound by a contract, this can imply that exporting firms may import high quality goods as demanded by their customers in a foreign country. The conditions of a contract may require the firms to pay the fixed costs necessary to import inputs. Payment of fixed costs related to import of inputs and establishment of contractual agreements can be financed by the export revenues generated. It is interesting to note that the intensity of exports is the only variable that is significant, indicating that firm level constraints do not have a major impact on the decision of firms to import foreign technology within high contract intensity industries. I also observe the number of significant variables to diminish in non-EU countries as well from the previous Table 2.6, indicating that exporting firms may now be less constrained to import foreign technology.

[Table 2.8 about here]

In Table 2.8, I observe two way traders are likely to increase the percentage of their inputs imported as they increase the percentage of their export sales, particularly if the two way traders belong to a production network with firms located in other countries. I observe that the percentage of export sales significantly influences the percentage of inputs imported by two traders at the 10% level within industries characterized by low contract intensity. Two way traders face a negative effect from innovation and a positive effect from productivity on their intensity of imports, at the 10% level and at the 1% level of significance respectively. The positive effect on productivity indicates that two way traders are likely to observe greater intensity of imports if the value-added per full-time

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production worker is higher within industries where the firms are buying or selling homogeneous goods. With a negative coefficient on innovation but a positive coefficient on productivity, firms are likely to purchase foreign inputs as they generate greater revenue through increases in their productivity-level and substitute inputs developed in-house for inputs purchased in the foreign market. Although, the EU member countries are more developed than their counterparts within the sample of countries in the dataset, such countries may have less developed markets and contracting institutions than their Western European counterparts. Even though the level of significance in Table 2.7 and Table 2.8 is only significant at 10% level, with none of the variables measuring the intensity of exports as negative, the existence of production networks is more likely for EU member countries than non-EU countries.

Acemoglu et al (2007) asserts that the differences in the contracting institutions can create possible differences in comparative advantages between countries, which may allow production networks to be established. Martinez-Zarzoso et al (2011) describes the existence of such production networks related to the integration of the CEECs into the EU. Curran and Zignago (2012) have indicated the importance of producers in the CEEC countries within the supply-chain between the newer members and the more advanced members of the EU, particularly in the more high-technology industries. As such industries tend to have higher contract intensities than other industries, it is likely that the increase in exports sales by exporters will induce the firm to pay fixed costs necessary to become importers as observed in Table 2.7. However, it may not necessarily indicate that two way traders will increase their percentage of inputs imported as they increase their export sales. Furthermore, domestic ownership and capacity utilization negatively

affect the intensity of imports of two way traders at the 1% level of significance within high contract intensive industries in EU member countries.

In Table 2.8, firms in the non-EU member countries do not observe any significant effect between percentage of inputs supplied by foreign sources and percentage of export sales within both industries. As observed in Table 2.2, the percentage of the export sales do not increase the percentage of inputs imported by two way traders within both the industries but other firm level characteristics significantly influence the decision of firms to increase their percentage of imported inputs after firms have paid sunk costs to participate as international traders. Therefore, firms with high export sales are not likely to import a greater percentage of foreign inputs within both types of industries, indicating that I do not observe a likelihood of a production network that can be observed in EU countries.

In Table 2.7, I observe the probability for exporting firms to import foreign inputs to be significant at the 10% level as they increase their percentage of export sales within industries with high contract intensity. Such firms are more likely to pay a fixed cost associated with the import of foreign inputs as they generate greater export revenue to purchase high technology goods which may require more complex relationships, similar to the result observed by Bustos (2011). This is also supported by Eckel (2010), as it suggests that firms are likely to have a quality-based preference within industries characterized by high contract intensity. With lower fixed costs to import foreign inputs in comparison to non-EU countries, I observe firms in EU countries to import foreign inputs as the percentage of export sales increases. In Table 2.8, I observe a significance of only 10% level for two way traders to increase the percentage of inputs imported as they increase their percentage of export sales and obtain greater sales revenue within industries

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that are likely to be characterized by homogeneous products. With fixed costs already sunk by two way traders, the lower trade friction may promote imports within industries where prices between domestic goods and imported substitutes are more likely to be similar. Similar to Eckel et al (2010), two way traders exposed to lower trade costs can now increase the percentage of inputs imported as they increase the percentage of export sales.

This implies that the extensive margin of export revenue plays a much more significant role in determining the extensive margin of imports of foreign inputs within both types of industries, low contract and high contract intensive. If EU member countries exhibit a presence of a production network between home firms and firms located in the more developed and advanced countries of Western Europe, exporting firms are likely to import inputs within the differentiated industries while two way traders are likely to increase the percentage of inputs imported as their percentage of export sales increases within non-differentiated sectors. Within industries characterized by differentiated products or high contract intensity, the importance of quality-based preference of firms imply their willingness to pay fixed costs associated with imports as it increases their intensity of export sales. On the other hand, within industries characterized by non-differentiated or low contract intensity, the importance of cost-based preference of firms imply their willingness to import a greater percentage of foreign inputs due to lower trade costs as they increase their intensity of export sales. However, in non-EU countries, I do not observe any influence of the percentage of export sales to increase neither the likelihood that exporting firms import nor increase the percentage of imported inputs of two way traders. The differences observed between EU member countries and non-EU countries is important as

they signify the importance of lower trade costs that promote the extensive and the intensive margin of imports by exporting firms and two way traders.

2.5   Conclusion

It is important to note that firms in EU member countries are likely to face lower fixed and variable trade costs due to greater foreign market potential when trading with the advanced and developed EU member countries than firms in non-EU countries. At the extensive margin, exports significantly influence the decision of firms to import foreign inputs in both EU member and non-EU countries. However, I do not observe the intensive margin of export sales to influence positively the extensive margin of imports by exporting firms in both EU member and non-member countries. The intensive margin of export sales significantly influences the percentage of inputs imported by two way traders within EU member countries but not in non-EU countries. This can suggest that firms in EU member countries belong to either production networks that originate in the more developed and advanced Western European countries. This indicates that firms in non-EU countries are not necessarily using a greater proportion of their inputs from foreign origins as their export revenue increases in proportion to total revenue even if the firms have paid substantial fixed costs to either export or trade two ways. Similar result is obtained when industry level differences in terms of contract intensity levels are considered.

When dividing the subsamples into low and high contract-intensive industries, the extensive margin of exports seems to have the same positive and significant effect on the extensive margin of imports within industries and countries with varying EU membership status. The intensive margin of exports by exporters

does not generally impact the import status within industries with high and low contract intensity and countries with varying EU membership status. Although, there is a significant impact at only 10% level of the intensive margin of exports on the extensive margin of exports for firms in EU countries within industries characterized by high contract intensity. This may indicate that firms which are likely to pay greater fixed costs to establish a relationship with their trading partners are also likely to pay fixed costs to trade internationally, indicating the importance of quality-based preference of firms operating within an industry where products are likely to be differentiated. However, in EU member countries and within industries that are characterized with low contract-intensity, I observe that the percentage of export sales by exporters increases the percentage of inputs supplied by foreign sources, albeit by a significance of 10% level. This can imply that lower trading costs increase the incentive of firms to import a greater percentage of inputs as the percentage export sales increases. This signifies that within industries characterized by homogeneous goods where firms are likely to have cost-based preferences, firms are likely to increase the intensity of their imports as the intensity of exports increases when exposed to lower trading costs between trading partners.

The channel of cost complementarities between trading activities as suggested earlier is more evident in firms in EU member countries than firms in non-EU countries as firms in EU member countries are likely to expand the extensive and the intensive margins of imports as they experience an increase in the extensive and the intensive margins of imports respectively. However, such a relationship is not obvious in non-EU countries. If I hold the theory that imported intermediates are likely to be of better quality than domestic substitutes and allow penetration into export markets, I can determine that two way traders in non-EU countries

that record greater export sales as a percentage of total sales may not be importing a larger percentage of their total inputs. Such a case does not necessarily hold for firms within EU countries. I also determine that there are indeed vast differences in the decision by firms to participate in international trading activities within industries and countries in the Central and Eastern European and Central Asian region, which may dictate future production and trading networks. Therefore, these results can be interesting not only to researchers who study the effects of regional integration but also to policymakers whose goal is to implement optimal policies that would allow for greater trade integration between firms within this region. For instance, it is important for policymakers to provide access to complementary assets for firms which seek to import foreign inputs in addition to easier access to the foreign markets. If the dataset allowed, it will be interesting to determine the effect on import varieties and study the origins of imports as firms expanded their exporting activities.

2.6   Tables

	(1) Pooled	(2) EU Member	(3) Non EU	(4) Pooled	(5) EU Member	(6) Non EU
Dep Var: Importer (Extensive)						
Exporter (Extensive)	0.177***	0.130***	0.166***			
	(0.020)	(0.040)	(0.024)			
Exporter (Intensive)				-0.000	0.000	-0.000
				(0.000)	(0.000)	(0.001)
Domestic Firm	-0.159***	-0.114***	-0.167***	-0.050***	-0.024*	-0.044
	(0.018)	(0.038)	(0.024)	(0.015)	(0.014)	(0.029)
Innovation	0.119***	0.127***	0.114***	0.049**	0.015	0.077
	(0.019)	(0.042)	(0.024)	(0.023)	(0.016)	(0.051)
Productivity	0.001	0.000	0.001	-0.001	-0.001	-0.002
	(0.002)	(0.009)	(0.001)	(0.001)	(0.004)	(0.001)
Perc. of Empl.	0.002***	0.003***	0.002***	0.001***	0.001**	0.001
w/ Univ. Degree	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
No. of FT Employees (t-3)	0.0002***	0.001***	0.0001**	0.0002***	0.0002***	0.0002***
	(0.0001)	(0.000)	(0.0001)	(0.000)	(0.0001)	(0.000)
Age of Firm	0.000	0.000	0.000	0.000	0.001	0.0001**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
Capacity Util.	-0.001**	-0.001*	-0.001	-0.000	-0.000	-0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Overdue	0.087***	0.125***	0.080***	0.062**	0.077*	0.026
	(0.016)	(0.039)	(0.019)	(0.026)	(0.042)	(0.039)
Formal Training	0.134***	0.074***	0.147***	0.055***	-0.004	0.081***
	(0.015)	(0.024)	(0.019)	(0.015)	(0.010)	(0.029)
Skill Intensity	-0.093***	-0.016	-0.078**	0.010	0.001	0.065
	(0.028)	(0.041)	(0.040)	(0.030)	(0.019)	(0.054)
Observations	4,408	1,195	2,640	1,365	499	580

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

Table 2.1: Probit Estimation on the Extensive Margin of Imports of Foreign Inputs

	(1)	(2)	(3)
	Pooled	EU Member	Non EU
Dep Var: Importer (Intensive)			
Exporter (Intensive)	0.080**	0.126**	0.059
	(0.035)	(0.059)	(0.059)
Domestic Firm	-8.833***	-6.651**	-7.215**
	(1.978)	(3.192)	(3.381)
Innovation	5.300**	2.595	13.159***
	(2.659)	(3.788)	(4.587)
Productivity	0.060	0.226	0.151**
	(0.076)	(0.531)	(0.072)
Perc. of Empl. w/ Univ. Degree	0.079	0.106	0.051
	(0.054)	(0.076)	(0.084)
No. of FT Employees (t-3)	-0.003*	-0.005	-0.001
	(0.002)	(0.005)	(0.002)
Age of Firm	-0.007	-0.036	-0.004
	(0.007)	(0.063)	(0.006)
Capacity Util.	-0.083*	-0.283***	0.021
	(0.047)	(0.079)	(0.058)
Overdue	2.063	2.231	3.154
	(2.635)	(4.402)	(3.907)
Formal Training	0.468	0.817	-0.380
	(1.744)	(3.398)	(2.633)
Skill Intensity	-0.935	-0.501	-3.289
	(3.629)	(5.065)	(6.420)
Constant	35.727***	43.836***	18.623
	(9.945)	(11.661)	(11.554)
Observations	1,365	601	647
R-squared	0.311	0.331	0.380

Robust clustered standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Includes 3 digit industry, country and year dummies

Table 2.2: OLS Estimation on Intensive Margin of Imports of Foreign Inputs

	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled		EU Member		Non EU	
Dep Var: Importer (Extensive)	Sec Stage	First Stage	Sec Stage	First Stage	Sec Stage	First Stage
Exporter (Extensive)	0.595***		0.524***		0.563***	
	(0.096)		(0.156)		(0.131)	
Domestic Firm	-0.541***	-0.941***	-0.502**	-1.481***	-0.538***	-0.880***
	(0.083)	(0.089)	(0.217)	(0.227)	(0.104)	(0.121)
Innovation	0.338***	0.278***	0.435***	0.424***	0.311***	0.338***
	(0.052)	(0.069)	(0.134)	(0.138)	(0.066)	(0.094)
Productivity	0.003	-0.009*	0.000	0.112***	0.002	-0.013**
	(0.004)	(0.005)	(0.035)	(0.039)	(0.004)	(0.006)
Perc. of Empl.	0.006***	0.005***	0.010***	0.006	0.004***	0.006***
w/ Univ. Degree	(0.001)	(0.002)	(0.003)	(0.004)	(0.001)	(0.002)
No. of FT Employees (t-3)	0.001**	0.001***	0.005***	0.001	0.0004**	0.001***
	(0.000)	(0.000)	(0.002)	(0.001)	(0.0002)	(0.0002)
Age of Firm	0.000	0.000	0.001	0.013***	0.000	0.000
	(0.000)	(0.000)	(0.003)	(0.004)	(0.000)	(0.000)
Capacity. Util	-0.003**	0.001	-0.005*	0.001	-0.002	0.002
	(0.001)	(0.002)	(0.003)	(0.003)	(0.001)	(0.002)
Overdue	0.255***	0.098	0.418***	0.297*	0.228***	0.071
	(0.047)	(0.070)	(0.119)	(0.161)	(0.054)	(0.104)
Formal Training	0.410***	0.243***	0.275***	-0.001	0.436***	0.222***
	(0.050)	(0.064)	(0.087)	(0.122)	(0.060)	(0.083)
Skill Intensity	-0.275***	-0.249***	-0.058	-0.132	-0.224**	-0.139
	(0.083)	(0.094)	(0.156)	(0.189)	(0.114)	(0.133)
Exportability		16.711***		27.846***		25.112***
		(0.544)		(1.187)		(1.052)
Constant	0.300	-1.326***	-0.706	-1.247**	0.199	-1.123**
	(0.205)	(0.428)	(0.495)	(0.487)	(0.213)	(0.523)
Underident Test (p-value)	0		0		0	
Weak Indent Test (F-stat)	707		217		765	
Wald test of rho=0 (p-value)	0.611		0.737		0.568	
Observations	4,497	4,497	1,337	1,337	2,695	2,695

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

Table 2.3: Bi Probit Estimation of Extensive Margin of Imports of Foreign Inputs

Dep Var: Importer (Extensive)	(1) Sec Stage	(2) First Stage	(3) Sec Stage	(4) First Stage	(5) Sec Stage	(6) First Stage
	Pooled		EU Member		Non EU	
Exporter (Intensive)	0.002		0.006		-0.001	
	(0.002)		(0.005)		(0.004)	
Domestic Firm	-0.326**	-10.634***	-0.550	-12.226***	-0.230	-7.505***
	(0.127)	(1.516)	(0.341)	(2.844)	(0.182)	(2.247)
Innovation	0.285**	-0.226	0.238	1.792	0.347*	1.701
	(0.118)	(1.614)	(0.223)	(2.472)	(0.206)	(2.920)
Productivity	-0.008	0.224***	-0.012	-0.278	-0.008	0.249***
	(0.005)	(0.056)	(0.063)	(0.354)	(0.006)	(0.057)
Perc. of Empl.	0.009***	0.002	0.021***	-0.075	0.005	0.040
w/ Univ. Degree	(0.003)	(0.038)	(0.006)	(0.054)	(0.004)	(0.062)
No. of FT Employees (t-3)	0.001***	0.002	0.005**	0.004	0.001***	0.002
	(0.000)	(0.002)	(0.002)	(0.003)	(0.000)	(0.002)
Age of Firm	0.001	0.000	0.009	-0.014	0.001**	-0.003
	(0.002)	(0.005)	(0.009)	(0.053)	(0.000)	(0.005)
Capacity Util.	-0.001	0.016	-0.004	0.079	-0.000	-0.010
	(0.002)	(0.035)	(0.005)	(0.054)	(0.003)	(0.044)
Overdue	0.354***	-3.012	0.781***	3.401	0.141	-6.609**
	(0.135)	(2.000)	(0.267)	(3.120)	(0.196)	(2.884)
Formal Training	0.345***	-2.473**	-0.099	-1.359	0.424***	-4.169*
	(0.091)	(1.250)	(0.195)	(2.201)	(0.153)	(2.160)
Skill Intensity	0.077	-4.672*	0.062	-4.472	0.333	-0.871
	(0.186)	(2.498)	(0.386)	(4.813)	(0.275)	(3.867)
Exportability		0.715***		0.763***		0.712***
		(0.031)		(0.036)		(0.046)
Constant	0.768*	42.094***	5.527	18.718**	0.409	45.157***
	(0.403)	(6.804)	(133.906)	(9.073)	(0.476)	(7.709)
Underident Test (p-value)	0		0		0	
Weak Ident Test (F-stat)	623		435		225	
Wald Test of Exogeneity (p-value)	0.285		0.602		0.698	
Observations	1,365	1,365	499	499	580	580

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

Table 2.4: IV Probit Estimation of Extensive Margin of Imports of Foreign Inputs

	(1)	(2)	(3)
	Pooled	EU Member	Non EU
Dep Var: Importer (Intensive)			
Exporter (Intensive)	0.119**	0.152*	0.038
	(0.058)	(0.080)	(0.104)
Domestic Firm	-8.152***	-6.111**	-7.446**
	(2.093)	(3.035)	(3.176)
Innovation	5.476**	2.561	12.930***
	(2.500)	(3.488)	(4.088)
Productivity	0.053	0.232	0.154**
	(0.072)	(0.480)	(0.067)
Perc. of Empl. w/ Univ. Degree	0.081	0.109	0.051
	(0.051)	(0.069)	(0.076)
No. of FT Employees (t-3)	-0.003**	-0.005	-0.001
	(0.002)	(0.004)	(0.002)
Age of Firm	-0.007	-0.033	-0.004
	(0.007)	(0.059)	(0.006)
Cap. Util	-0.083*	-0.286***	0.020
	(0.045)	(0.074)	(0.052)
Overdue	2.242	2.321	3.083
	(2.437)	(4.017)	(3.524)
Formal Training	0.460	0.696	-0.454
	(1.664)	(3.140)	(2.423)
Skill Intensity	-0.631	-0.150	-3.252
	(3.457)	(4.776)	(5.816)
Constant	33.195***	39.806***	19.832*
	(9.344)	(11.370)	(10.677)
Underident Test (p-value)	0	0	0
Weak Ident Test (F-stat)	619	354	205
DWH Chi sq Test of Endogeneity (p-value)	0.258	0.559	0.721
Observations	1,365	601	647
R-squared	0.310	0.330	0.380

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

Table 2.5: IV Regression of Intensive Margin of Imports of Foreign Inputs

	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled		EU Member		Non EU	
Contract Intensity	Low	High	Low	High	Low	High
Dep Var: Importer (Extensive)						
Exporter (Extensive)	0.197***	0.160***	0.205***	0.125***	0.160***	0.123***
	(0.027)	(0.034)	(0.066)	(0.043)	(0.033)	(0.043)
Domestic Firm	-0.176***	-0.123***	-0.061	-0.022	-0.210***	-0.154***
	(0.029)	(0.026)	(0.071)	(0.029)	(0.030)	(0.031)
Innovation	0.196***	0.044	0.241***	-0.003	0.177***	0.057
	(0.037)	(0.028)	(0.086)	(0.038)	(0.049)	(0.037)
Productivity	0.001	0.003	0.014	-0.001	0.000	0.004
	(0.001)	(0.003)	(0.016)	(0.005)	(0.001)	(0.004)
Perc. of Empl.	0.003***	0.001***	0.007*	0.000	0.002***	0.002***
w/ Univ. Degree	(0.001)	(0.000)	(0.004)	(0.001)	(0.001)	(0.001)
No. of FT Employees (t-3)	0.000	0.000	0.001**	0.001***	0.000	0.000
	(0.000)	(0.000)	(0.0004)	(0.0002)	(0.000)	(0.000)
Age of Firm	0.000	0.000	-0.001	0.000	0.000	0.000
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)
Capacity Util.	-0.001	-0.000	-0.001	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Overdue	0.048*	0.072***	0.070	0.130	0.052*	0.065**
	(0.026)	(0.026)	(0.070)	(0.091)	(0.029)	(0.032)
Formal Training	0.118***	0.078***	0.054	0.014	0.117***	0.095***
	(0.028)	(0.029)	(0.047)	(0.026)	(0.026)	(0.029)
Skill Intensity	-0.028	-0.055	0.051	0.022	-0.021	-0.055
	(0.053)	(0.049)	(0.083)	(0.038)	(0.061)	(0.064)
Observations	1,640	1,214	395	307	1,061	821

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes country and year dummies

Table 2.6: Probit Estimation of Extensive Margin of Imports of Foreign Inputs per Contract Intensity of Industry (Regressing on Extensive Margin of Export Sales)

	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled		EU Member		Non EU	
Contract Intensity	Low	High	Low	High	Low	High
Dep Var: Importer (Extensive)						
Exporter (Intensive)	-0.0003	0.001	0.000	0.0005*	-0.001	0.0001
	(0.0004)	(0.001)	(0.000)	(0.0002)	(0.001)	(0.001)
Domestic Firm	-0.026	-0.011	-0.022	-0.010	-0.032	0.005
	(0.026)	(0.027)	(0.036)	(0.012)	(0.037)	(0.040)
Innovation	0.110*	0.056	0.053	0.001	0.139	0.088
	(0.058)	(0.054)	(0.072)	(0.015)	(0.092)	(0.089)
Productivity	-0.001	0.003	0.010	0.001	-0.000	0.009
	(0.001)	(0.004)	(0.008)	(0.001)	(0.001)	(0.020)
Perc. of Empl.	0.003**	0.001*	0.005*	0.000	0.001	0.001
w/ Univ. Degree	(0.001)	(0.001)	(0.003)	(0.000)	(0.001)	(0.001)
No. of FT Employees (t-3)	0.0004***	0.0002***	0.0004**	0.000	0.0002***	0.0003***
	(0.0001)	(0.0001)	(0.0002)	(0.000)	(0.0001)	(0.0001)
Age of Firm	0.001	0.0001**	-0.001	0.001	0.002**	-0.001
	(0.001)	(0.0001)	(0.001)	(0.001)	(0.001)	(0.001)
Capacity Util.	0.000	0.001*	0.000	0.000	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Overdue	0.007	0.056	-0.045	0.109	0.015	0.016
	(0.036)	(0.037)	(0.033)	(0.102)	(0.048)	(0.048)
Formal Training	0.057*	0.073***	0.009	-0.008	0.066	0.124***
	(0.031)	(0.027)	(0.033)	(0.010)	(0.043)	(0.039)
Skill Intensity	0.062	0.085	0.078	0.016	0.059	0.133
	(0.038)	(0.054)	(0.061)	(0.016)	(0.061)	(0.101)
Observations	428	388	174	140	207	235

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes country and year dummies

Table 2.7: Probit Estimation of Extensive Margin of Import of Foreign Inputs per Contract Intensity of Industry (Regressing on Intensive Margin of Export Sales by Exporters)

	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled		EU Member		Non EU	
Contract Intensity	Low	High	Low	High	Low	High
Dep Var: Importer (Intensive)						
Exporter (Intensive)	0.119	0.072	0.175*	0.105	0.088	0.038
	(0.076)	(0.053)	(0.088)	(0.081)	(0.105)	(0.079)
Domestic Firm	-10.031**	-13.660***	-3.133	-19.580***	-12.805**	-8.461*
	(4.413)	(3.403)	(6.871)	(5.339)	(6.286)	(4.929)
Innovation	-2.445	6.976*	-10.761*	1.469	5.849	24.943***
	(5.886)	(4.061)	(5.421)	(4.951)	(10.305)	(8.673)
Productivity	-0.137	-0.311	1.235***	-0.193	-0.169*	-0.198
	(0.094)	(0.389)	(0.392)	(0.417)	(0.096)	(1.652)
Perc. of Empl.	0.138	0.075	0.177	0.182	0.104	0.062
w/ Univ. Degree	(0.112)	(0.079)	(0.208)	(0.128)	(0.164)	(0.111)
No. of FT Employees (t-3)	-0.003	-0.002	-0.010	-0.008	-0.001	-0.002
	(0.003)	(0.003)	(0.007)	(0.010)	(0.003)	(0.003)
Age of Firm	-0.009	0.007	-0.101	-0.135	0.006	0.009
	(0.013)	(0.008)	(0.121)	(0.104)	(0.008)	(0.008)
Cap. Util	0.000	-0.030	-0.103	-0.410***	0.046	0.103
	(0.114)	(0.071)	(0.242)	(0.122)	(0.111)	(0.081)
Overdue	-6.136	5.790	-8.282	0.784	-9.739*	2.762
	(4.760)	(4.851)	(7.733)	(7.736)	(5.584)	(6.948)
Formal Training	-3.900	-0.022	-6.503	2.384	-3.289	-2.992
	(3.294)	(2.844)	(6.239)	(5.283)	(4.994)	(4.368)
Skill Intensity	1.958	6.542	13.066	-13.543	-6.140	15.943*
	(8.048)	(6.463)	(9.020)	(9.891)	(12.428)	(8.786)
Constant	52.726**	65.325***	53.855*	108.961***	53.996**	40.535**
	(21.154)	(17.055)	(27.515)	(23.082)	(21.170)	(20.226)
Observations	443	460	171	181	231	252
R-squared	0.173	0.202	0.233	0.298	0.188	0.225

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes country and year dummies

Table 2.8: OLS Estimation of Intensive Margin of Imports of Foreign Inputs per Contract Intensity of Industry

2.7   Figures
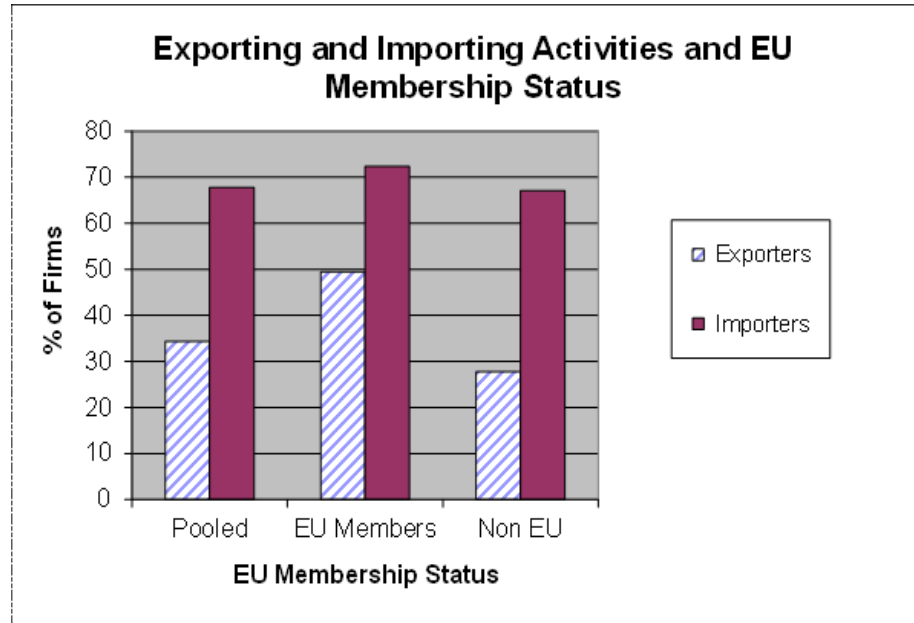
Figure 2.1: Distribution of Firms Investing in Exporting and Importing Activities per EU Membership Status
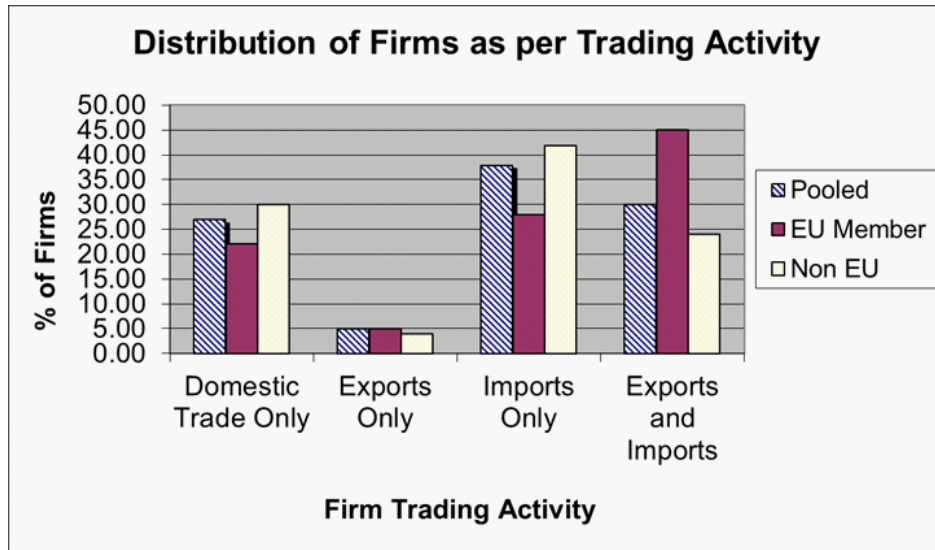
Figure 2.2: Distribution of Firms Investing in Trading Activity per EU Membership Status
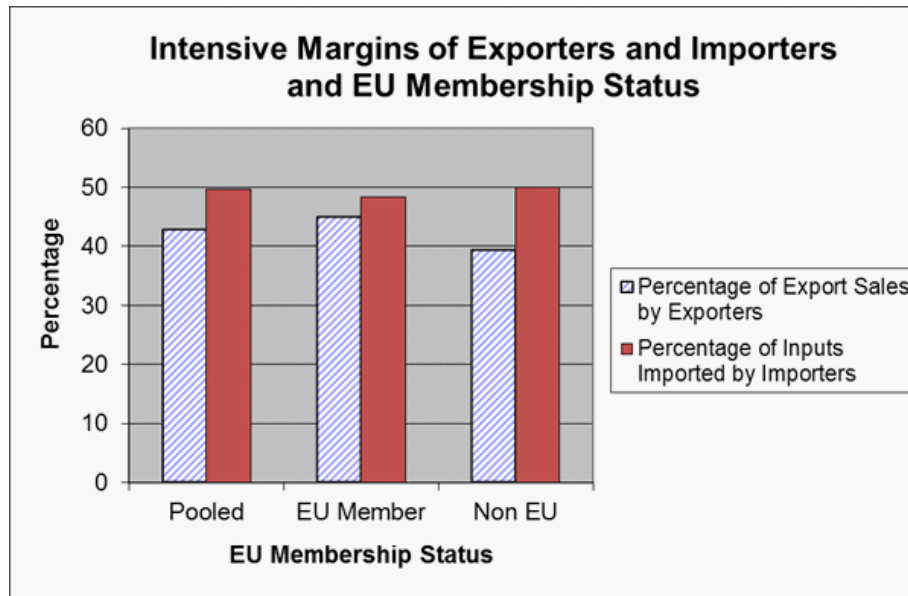
Figure 2.3: Intensive Margins of Exporting and Importing Activties per EU Membership Status
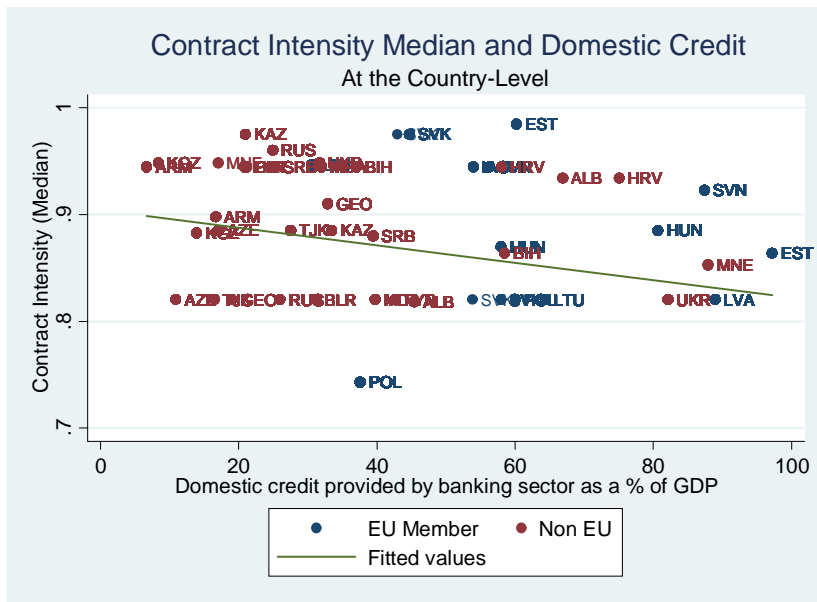
Figure 2.4: Contract Intensity Median and Domestic Credit at the Country Level
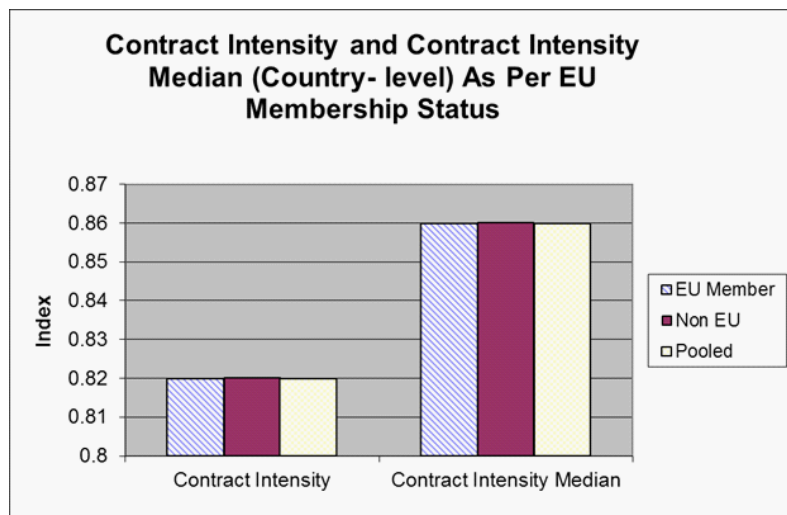
Figure 2.5: Distribution of Average and Median Contract Intensity per EU Membership Status

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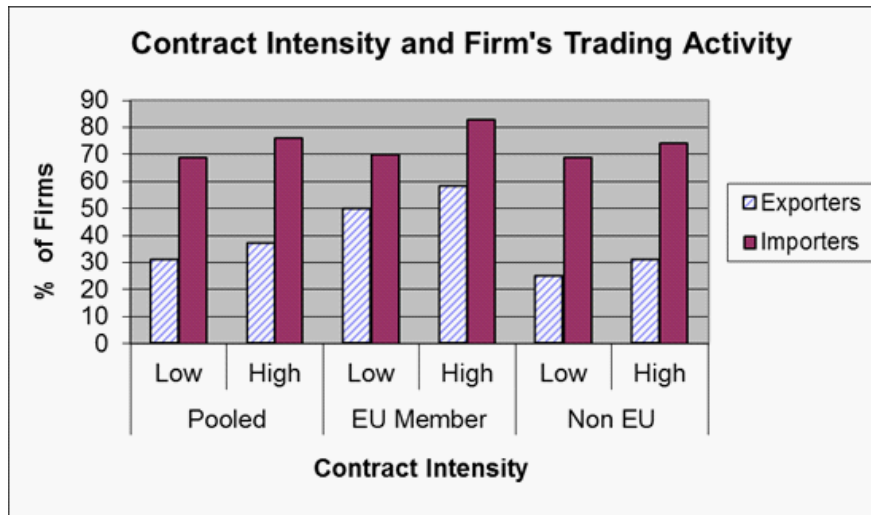
Figure 2.6: Extensive Margins of Exporting and Importing Activities and Contract Intensity of Industries
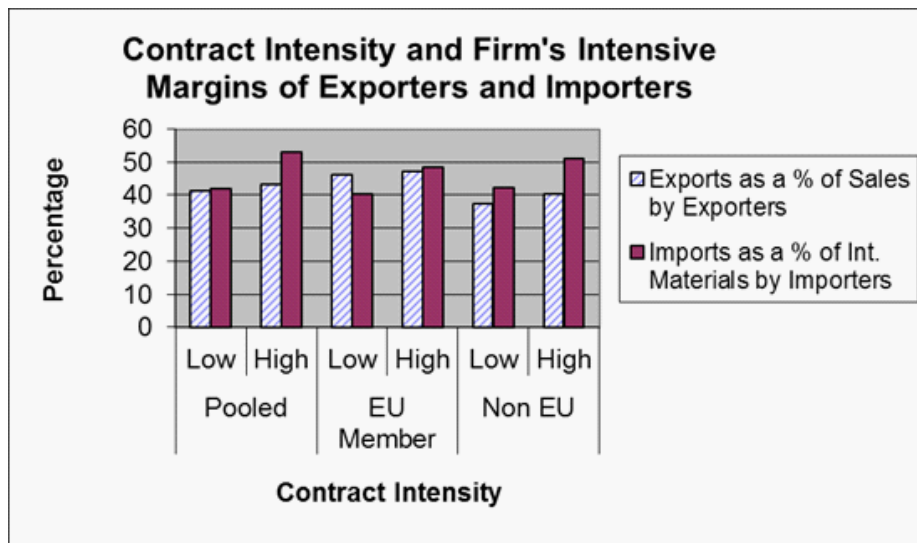
Figure 2.7: Intensive Margins of Exporting and Importing Activities and Contract Intensity of Industries

2.8   Appendix

EU Members		Non EU			
CZE	Czech Republic	ALB	Albania		
EST	Estonia	ARM	Armenia		
HUN	Hungary	AZE	Azerbaijan		
LTU	Latvia	BLR	Belarus		
LVA	Lithuania	BIH	Bosnia and Herzegovina		
POL	Poland	BGR	Bulgaria		
SVK	Slovak Republic	HRV	Croatia		
SVK	Slovenia	GEO	Georgia		
		KAZ	Kazakhstan		
		KGZ	Kyrgyz Republic		
		MKD	Macedonia, FYR		
		MDA	Moldova		
		MNE	Montenegro		
		ROM	Romania		
		RUS	Russian Federation		
		SRB	Serbia		
		TJK	Tajikistan		
		UKR	Ukraine		
		UZB	Uzbekistan		

Appendix 2A: List of Countries and their EU Membership Status in 2004

Variable	Description
Exports (Extensive)	Directly exported as the immediate recepient is outside the border of the country (1 if exporter) [Dummy Variable]
Exports (Intensive)	Percentage of establishment sales as export sales
Innovation	Introduced new products or services or upgrade existing production facilities in last 3 years. [Dummy Variable]
Domestic Firm	Less than 10% of the firm owned by a foreign entity [Dummy Variable]
Productivity	Sales less cost of production (sum of material and labor costs) divided by number of full-time production workers. [Value added/ number of full-time production workers]
Capacity Utilization	The percentage of the maximum level of production this firm can attain by fully utilizing the machinery, equipment and its employees
Overdue	Purchases of materials and services paid for after delivery [Dummy Variable]
Age of Firm	Number of years establishment has existed
# of Full Time Employees	Paid employees that are contracted for a term of one or more fiscal years and work up to 8 or more hours per day [t-3 has been considered]
Formal Training	Has structured and defined curriculum. Includes classwork, seminar, audio visual presentations, lectures, workshop and demonstrations. [Dummy Variable]
Percentage of Employees with University Degree	Self Explanatory
Skill Intensity	Fraction of workers that have special knowledge or ability (acquired) in work. Excludes workers above the working-supervisor level. Skill worker may have attended college, university or technical school or may have learned the skills on the job.
	Note: Descriptions borrowed from the 'Questionnaire Note' at http://www.enterprisesurveys.org. Source of all variables listed above is Enterprise Surveys (http://www.enterprisesurveys.org), The Word Bank.

Appendix 2B: Description of Variables

Note: Productivity has been calculated as ratio to industry average for a given country in a given year. For instance, a dairy producer in industry code (ISIC Rev 3.1) 1520 in Russia producing in the year 2008, will have its productivity calculated to the ratio of all dairy producers within industry code 1520 within Russia in year 2008.
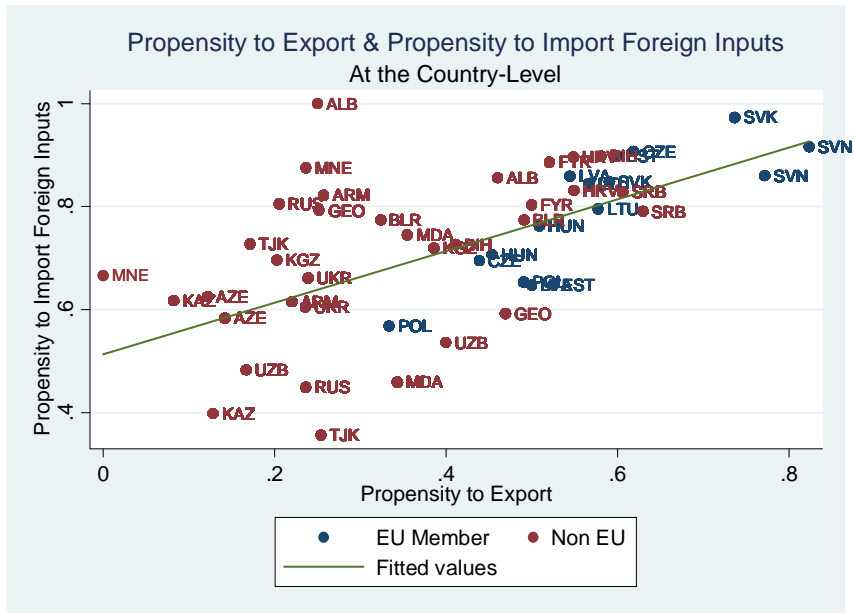
Appendix 2C1: Propensity to Export & Propensity to Import Foreign Inputs (at the Country Level)
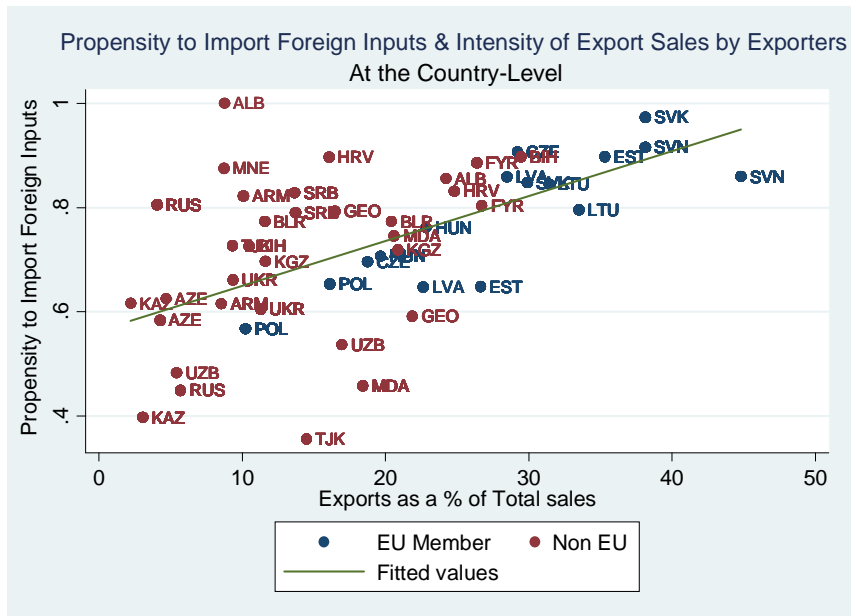
Appendix 2C2: Intensity of Exports Sales by Exporters & Propensity to Import Foreign Inputs (at the Country Level)
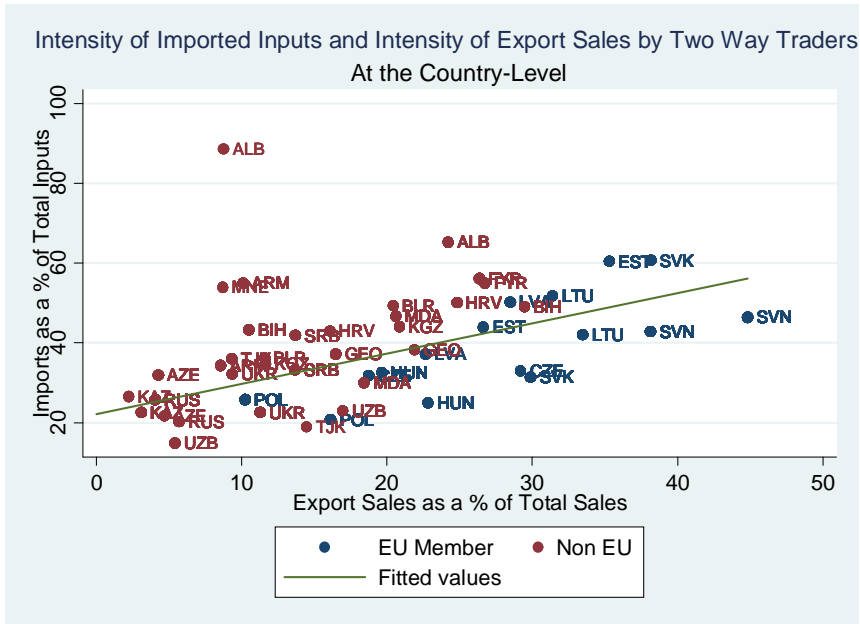
Appendix 2C3: Percentage of Inputs Imported & Exports as a % of Total Sales

by Two Way Traders (at the Country Level)
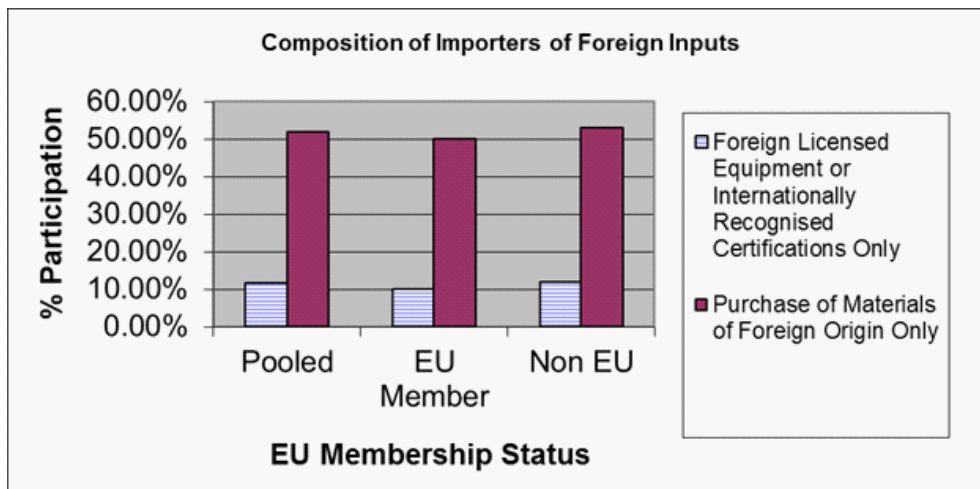
Appendix 2D1: Composition of Importers of Foreign Inputs
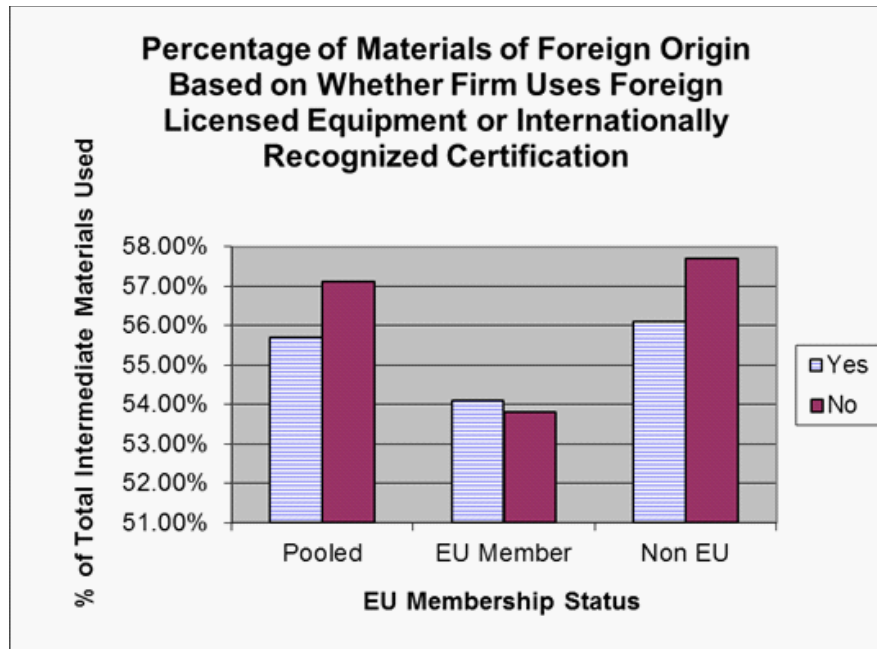
Appendix 2D2: Percentage of Materials of Foreign Origin Based on Whether

Firm Uses Foreign Licensed Equipments or Internationally Recognized

Certificiations

			Contract Intensity				
	Pooled		EU Member		Non EU		
	High	Low	High	Low	High	Low	
Importers	1442	1735	389	500	936	1152	
Exporters	781	833	285	372	445	452	
Non Importers	453	786	78	99	336	519	
Non Exporters	1307	1846	204	260	987	1343	
Note:	Number of observation across EU member and Non EU countries						
	will not add up to pooled observations because Bulgaria and Romania						
	are excluded from EU member and Non EU countries as they switch						
	membership status in 2007						

Appendix 2E: Number of Observations per International Trading Activity within

High and Low Contract Intensity Industries

3 The Influence of Financial Leverage of Firms on Their International Trading Activities

3.1 Introduction

Exporters, importers and two-way traders pay varying up-front fixed costs to participate in their respective trading activities. To pay the large up-front fixed costs associated with each mode of trading activity, firms may have to borrow from banks in order to finance the purchase of their assets, or financially leverage their assets[11,12]. As the costs associated with trading activities can differ significantly between each mode, firms participating in various trading activities can be influenced by the varying intensity of financial leverage. For instance, firms that export their final product and import inputs, two-way traders, can incur greater fixed costs than firms that export only and import only as is discussed by Muuls and Pisu (2008), Haller (2010) and Castellani et al. (2010). Financial leverage can influence the decision of firms to participate in various trading activities as is contended in Greenaway et al(2007), Bellone et al. (2010), Manova (2010a), Manova (2010b) and Chor and Manova (2011).

With each particular trading activity requiring different levels of fixed costs to participate, the effect of financial leverage can vary between firms that either

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[11]For the purpose of this paper, firms can import foreign inputs by either importing intermediate materials of foreign origin, or purchasing foreign licensed equipment or obtaining internationally recognized quality certifications such as ISO 9002. A greater detailed discussion on this variable has been undertaken in Nakhoda (2012a).

[12]Ahn, Khandewal et al (2011) discuss the issue of exporting through intermediaries, or indirect exporters, which may lower the necessary fixed costs for firms and hence the need for financial leverage. I consider exporters as those firms that export their products directly to foreign markets. Hence, direct exporters pay greater fixed costs than indirect exporters and direct exporters have greater control of their customers in the destination market.

export only, or import only, or participate as two way traders. Firms that have high existing financial leverage can find it difficult to borrow from banks in order to finance the purchases of their assets needed to expand their trading activities. Financial leverage can inhibit firms that either trade in one direction (export only or import only) or operate only within the national market to become two way traders. An increase in financial leverage can negatively impact firms from expanding their trading activities. So far, the papers that have studied this relationship between financial leverage and international trading activities have considered the decision of firms to export or to import rather than be non-traders. In this paper, I contribute to the literature in investigating more specifically the relationship between the extensive and intensive margins of financial leverage of firms and the decision of firms to become two way traders rather than participate as firms that export only, import only, and trade only within the national market.

I employ the World Bank's Business Environment and Enterprise Performance Surveys (BEEPS), which is a firm level panel data set from 27 countries across Central and Eastern Europe and Central Asia. A total of 7,288 small and medium enterprises were surveyed in either 2005 or 2009, with 3,600 firms surveyed in 2005 and 3,688 surveyed in 2009 on an extensive number of topics such as financial leverage, firm size, capacity constraints, sales, and employment characteristics. The survey also provides variables on the decision of firms to participate in a particular trading activity, such as exporting and importing[13]. These variables can be constructed to determine whether firms trade two way, that is export and

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[13]Out of the 7,288 observations, 6,628 were unique firms in either 2005 or 2009. The rest of the firms were interviewed in both 2005 and 2009. A total of 3,600 firms were surveyed in 2005 and 3,688 firms were surveyed in 2009. The results perceived inaccurate by the interviewers are dropped.

import concurrently.

I conduct probit estimations of the effect of the extensive and intensive margins of financial leverage on the various dummy variables that account for the different trading activities (export only, import only and trade only within the national market) against two way traders. I determine that the influence of financial leverage between two way traders and firms that participate in other trading activities vary across each trading activity. For instance, firms that either import only or trade only within the national market are likely to be constrained by the financial leverage as they seek to expand their trading activities to become two way traders than firms that export only. As the variable on financial leverage can suffer from potential endogeneity and omitted variable bias, I implement an instrumental variable estimation with the help of an excluded instrument that accounts for a negative liquidity shock through determining whether firms have overdue payments to their suppliers and apply for a loan or a line of credit.

In addition to the instrumental variable estimation, I use an empirical study that bases the demand for external funds on exogenous variations that cannot be controlled by firms but may influence the degree of their financial leverage. For instance, firms may belong to an industry in which they are likely to be externally dependent and are characterized by a high degree of collateralizable tangible assets that makes them attractive to lenders. I augment the model introduced by Gorodnichenko and Schnitzer (2010) as I consider the relation between the external dependence and asset tangibility of the industries and the preference of firms for the internal and external sources of funding. In order to start production, firms need to purchase assets and invest in fixed and sunk costs associated with their trading activities by allocating their internal and external sources of funds.

This allocation of funds may vary between industries that exhibit different levels of external dependence or financial vulnerability and asset tangibility. I divide the sample into different subgroups based on industry characteristics such as external dependence and asset tangibility. For example, industry attributes on the dependence of external funds and proportion of assets constituted by tangible assets, such as plant, property and equipment can determine whether firms will seek financial leverage to finance their investments. This is an important contribution of this paper as it determines whether firms that either export only, or import only, or operate only within the national market are likely to be financially leveraged within industries that have an inherent nature to demand greater external funds and possess collateralizable assets. This will help to explain whether the influence of the extensive and the intensive margins of financial leverage on the investment of firms in two way trading activities rather than the other trading activities is either mitigated or magnified for firms that belong to certain industries.

3.1.1   Relevant Literature

Since the seminal paper of Melitz (2003), the fixed costs related to exporting has been examined extensively. Kasahara and Lapham (2008) focus on some of the fixed costs related to importing due to learning and the acquisition of foreign procedures firms may have to undertake[14]. In order to compare the need for complementary assets required by importers that may not be necessary for exporters, Martins and Opromolla (2011) assert that even though wage premiums tend to be higher for firms that participate in international trade than non-traders, the

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[14]Wagner (2011) is an excellent survey of literature on the empirical studies related to international trade, exporting as well as importing, and firm performance.

firm and worker characteristics differ between firms that export only and firms that import (import only and trade two way). The former pay higher wages only because they are bigger and can sell more than the non-exporters, while the latter pay higher wages not only because they are bigger in size and can sell more than the non-importers but employ workers that are more productive than the average workers. This exhibits greater 'absorptive' capacity of importers as they need to supplement production with more knowledge-intensive inputs. Furthermore, Altomonte and Bekes (2010) describe the need of importers to use their inputs in the 'right proportion', where firms have to deal with trade complexity between themselves and the suppliers, imperfect substitutability between domestic and foreign inputs and more importantly, the associated sunk costs to search for the right inputs available in the international markets. The influence of financial leverage on the various international trading activities will help to determine whether firms that either import only or export only are likely to be more constrained than two way traders.

Castellani et al (2010) and Kugler and Verhoogen (2009) suggest that importers purchase relevant inputs to produce high quality output, which in turn is likely to be exported. Haller (2010) asserts that firms which import only pay similar average wages to firms that trade two way, while firms that export only do not pay significantly higher wages than firms that do not participate in international trading activities. With investments in complementary assets needed for firms to become importers, this can create a financial wedge that can be estimated by the intensity of the financial leverage.

The relationship between trade activities of firms and their ability to obtain external finance has been a focus of many recent papers, such as Chaney (2005),

Greenaway et al (2007), Muuls et al. (2008), Manova (2010), Chor and Manova (2011), Gorodnichenko and Schnitzer (2010) and Bellone et al (2010). International trading activities demand greater financing by banks as there is time lag between disbursement of goods and receipt of payments. Short-term financing by banks is critical for the day to day activities of firms, regardless of the fact whether they participate in international trade or not. However, firms that are involved in international trade activities also need to make substantial investments which involve up-front payments in terms of fixed costs related to international trade and require long-term commitment to international trade. When firms decide to enter production of particular goods, it is necessary to take into account the specifications of the good required by the consumers in the destination markets. Firms build plants and production facilities that are required to meet certain parameters set by the clients in the foreign markets. Such costs require firms to make substantial payments, in many cases up to a few million dollars. Therefore, the aforementioned literature does mention the role of financial leverage and constraints on firms that participate in international trading activities but does not determine whether firms participating in different trading activities rather than trade two way are influenced by the extensive and intensive margins of financial leverage. With this paper, I aim to fill this void in the literature.

Muuls (2008) determines that fixed costs of trading internationally can be financed by firms through financial markets[15]. Such firms must pledge assets as collateral. Debt is borrowed against fixed assets, which can free up internal funds for investments in activities that cannot be easily collateralizable, such as research

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[15] Another method firms can adopt is to seek new equity. As per the hypothesis of the 'pecking order' in Myers (1984) and subsequent literature, bank loans are a preferred source than seeking new equity.

and development activities and payment of up-front costs related to international trade as is considered in Himmelberg and Petersen (1994) and Gorodnichenko and Schnitzer (2010). Bustos (2011) discusses the gains in export revenue by exporting firms that allow such firms to purchase inputs embedded with higher technology as they face liberalized trade regimes. In addition, Chaney (2005) considers the reliance of internal liquidity as a method to finance international trading activities as information asymmetries between foreign markets can make it difficult to find potential domestic lenders. The accumulation of debt as firms finance their purchases of assets increases the financial leverage of firms and subsequently reduces their financial health. Although, firms may need to rely on their internal funds to finance the fixed costs associated with international trading activities, they may also be required to borrow extensively in order to purchase the tangible assets associated with such activities. The percentage of assets financed by bank loans can as a result influence the decision of firms to participate in a relevant international trading activity as it may determine whether firms can borrow in order to expand their international trading activities.

Rajan and Zingales (1998) introduce the notion that industry level decomposition of dependence of firms on external finance becomes critical to the study relating firm growth and investment opportunities. The degree of financial leverage indicates the solvency of firms and their ability to seek bank loans[16]. Further, Braun (2003) and Braun and Larrain (2005) study the relationship between firm growth and asset tangibility, defined as the percentage of total assets composed

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[16]Firm that are highly financially leveraged have a high percentage of their assets backed by debt or bank loans. Firms are in a risk of being insolvent if their creditors demand repayment of the debt. Therefore, higher the financial leverage greater the risk of bankruptcy. However, if firms face a positive exogenous shock that provides easier access to capital markets, firms are willing to increase their financial leverage.

by net plant, property and equipment with the latter considering the relationship under economic recessionary conditions. As is explained in Besedes et al. (2011), firms that belong to more tangible industries are also more likely to have lower survival rates as banks will be able to recover a greater amount from such firms in case of default of loans. In countries with poor financial contracts and lower financial development, firms that trade are forced to provide a greater amount of assets as collateral. Industries with lower financial dependence are likely to contain a larger number of firms due to the increasing costs associated with financial vulnerability in such countries.

Production requires purchase of fixed assets. I analyze whether firms that tend to be more leveraged than others are likely to be two way traders as I employ a similar strategy to Gorodnichenko and Schnitzer (2010). However, instead of using a subjective variable based on the opinion of firms on their access to finance and cost of finance as an indicator to financial constraint, I use financial leverage as a proxy for financial constraint, similar to Greenaway et al (2007). Claessens and Tzioumis (2006) discuss the problems of biasness that may arise with subjective questions, as better performing firms are less prone to complain about their financial constraints.

Melitz (2003) documents the relationship between productivity and the decision of firms to export. However, the literature on export hysteresis claims that the decision of firms to export is "history-dependent". Dixit (1989) and Baldwin and Krugman (1989) highlight that firms which have already paid the sunk and fixed costs to export are more likely to do so in the future, even if they face a negative productivity shock and the reaction to exogenous shocks is generally slow . This explains the existence of exporters with a varying degree of productivity

levels. Negative productivity shocks to firms may not influence their decision to participate in trade if the participation of firms is 'history-dependent'. Firms that face negative liquidity shocks which result in delayed payments to suppliers due to decrease in productivity levels may not necessary change their trade status, particularly if their status is 'history-dependent'.

I extend this strand of literature as I examine the influence of the extensive and intensive margins of financial leverage on two way traders relative to firms that are not two way traders. To the best of my knowledge, this is the first study that focuses on the relationship between financial leverage of firms and their decision to trade two ways rather than undertake other trading activities. Furthermore, I consider whether the presence of firms in a low financial vulnerable industry or in an industry characterized by high asset tangibility has a varying impact on the aforementioned effects related to their financial leverage as firms choose to participate in two way trade rather than other international trading activities.

3.2 Theoretical Background

The theoretical model is borrowed from Gorodnichenko and Schnitzer (2010) and Muuls (2008). Firms can use internal finance or external finance in order to purchase fixed assets used for production but sunk costs paid related to the exports of the final product and the import of foreign inputs, including raw materials, must be financed from their internal resources. Muuls (2008) mentions the different ways firms may finance the fixed costs to participate in international trading activities. First, it may use internal funds generated by profits from domestic sales to pay for fixed and sunk costs related to trading activities. Second, firms may receive a positive exogenous shock due to gains in productivity levels that

may allow them to use the extra funds towards investment activities. This is also similar to the idea suggested by Bustos (2011) as trade liberalization procedures may create incentive for exporting firms to generate greater export revenues and subsequently purchase inputs embedded with higher technology. Third, firms may borrow externally in the financial markets but in order to do so must pledge their assets as collateral.

Supported by the 'pecking order' in Myers and Majluf (1984), the majority of the external financing obtained by firms is debt. I consider the significance of the ratio of debt to assets on the decision of firms to trade internationally. The productivity levels under perfect capital markets may determine whether firms are able to export or import foreign inputs, but their financial leverage ratio under imperfect capital markets will determine whether firms are able to increase debt against their assets and hence borrow to participate in international trade.

As firms can pledge collateral to pay for their fixed costs, they are more likely to borrow externally to fund their purchase of fixed assets and use internal funds to pay for the fixed costs. Depending upon the characteristics of the industry firms belong, such as high external dependence or high collateralizable assets, they can borrow funds to finance their investment projects and subsequently use internal funds to finance international trading activities. I augment the model introduced by Gorodnichenko and Schnitzer (2010) by adding industry level indicators on external dependence and asset tangibility as is considered in Manova (2010a), Manova (2010b) and Chor and Manova(2011).

The following is the sequence of shocks and decision making processes similar to that laid out by Gorodnichenko and Schnitzer (2010) for firms to expand production.

- Stage 0: Firms face an exogenous shock to liquidity (through a decrease in productivity levels) which can influence their needs for financing the purchase of fixed assets through bank loans. Firms that are more sensitive to negative productivity shock are likely to be more financially leveraged.

- Stage 1: Firms will decide whether to export and/or import, or operate only within the national market, based on their financial leverage. Firms that have high percentage of their fixed assets financed by bank loans may prefer to use their internal funds to lower the leverage ratio instead of paying the associated fixed and sunk costs to participate in trade. Hence, such firms are less likely to expand their international trading activities.

- Stage 2: Firms purchase fixed assets in order to expand production and demand financial assistance from banks in terms of loans. Firms that seek financial leverage of fixed assets can use the internal funds to participate in international trading activities. Financial leverage indicates the financial health of firms and lower the financial leverage more financially healthier are the firms, as they tie up a lower percentage of assets to their debt. A negative relationship between the intensity of financial leverage and international trading activity determines the importance of financial health to their international trading activities, as firms with lower financial leverage are more likely invest in international trading activities.

Firms face an exogenous shock such as overdue payments to suppliers, which can influence the availability of liquidity. Gorodnichenko and Schnitzer (2010) assert that firms do not have any control over late payments made by suppliers. This shock can be characterized as $\delta_L \in (0, \bar{\delta}_L)$, where δ_L is the likelihood that the

firms will face a negative liquidity shock. Firms that receive a negative liquidity shock will likely increase their demand for financial leverage by applying for loans from lenders as they may need to substitute the lack of liquid assets in order to finance their production. Khawaja and Mian (2008) determine that majority of firms in emerging markets exposed to negative liquidity shocks are likely to face financial distress as they may not successfully hedge against the negative liquidity shocks. Such financial distress can have long term effect on the investment strategy of firms as it can impact their financial leverage. I assume the probability that firms will have sufficient internal funds to finance production is q and the probability that firms will not have sufficient funds is $1 - q$. Therefore, accounting for the likelihood that firms receive a liquidity shock, I get $q - \delta_L$ and $1 - q + \delta_L$ respectively. As negative liquidity shocks should affect the cashflow of firms, it will have similar effect on the probability that internal sources are utilized to fund production regardless of the direction of trade.

If firms do not incur any fixed costs related to export of their final products or import of foreign inputs, π_f is the profit where $f = 0$. If firms do undertake international trading activities, the likelihood of having internal funds will decrease by δ_T. π_γ indicates the profits accumulated through externally financing of the assets through bank loans.

If firms do export or import, their profits should be greater than non-exporters or non-importers respectively, in order to make the payment of fixed costs related to international trading activities viable. If they externally finance their production process, the profits should be less than if they trade by utilizing internal sources of finance.

If firms do not export nor import, the profit function can be expressed as:

$$E(\pi) = (q - \delta_L)\pi_0 + (1 - q + \delta_L)\pi_\gamma$$

The probability that firms can use internal cashflow to finance production and their trade activities is reduced by the exogenous shock. Subsequently, their need for financial leverage is increased by the exogenous shock. We also assume $\pi_0 > \pi_\gamma$ due to the presence of information asymmetries between the lenders and the borrowers that entail deadweight losses, which Bernanke and Gertler (1989) define as 'agency costs'.

Suppose that firms are likely to spend the internal funds (δ_T) to participate in international trading activities (T) (pay the fixed costs associated with it) in stage 1. The expected profit will be:

$$E(\pi|T) = (q - \delta_L - \delta_T)\pi_0^T + (1 - q + \delta_L + \delta_T)\pi_\gamma^T - TC_T$$

where TC_T is the fixed cost to participate in international trade. I also assume that $\pi_0^T > \pi_\gamma^T$ due to the presence of agency costs.

Manova (2010a), Manova (2010b) and Chor and Manova(2011) study the effects of financial tangibility and external dependence at the industry level on the extensive and intensive margins of exports and are the basis for the augmentation of this model. As potential profits for firms vary with their productivity levels, the firms above a certain productivity cutoff will be able to obtain outside financing and produce for the foreign market if they are exporters and purchase from the foreign market if they are importers. This cutoff will be higher within industries that need greater external financing and within industries that have fewer tangible assets (with c_s defined as the fraction of production costs used to purchase tangi-

ble or 'hard' assets and d_s defined as the fraction of production costs externally financed to purchase fixed assets)[17]. δ_P captures negative shocks to productivity (along with negative liquidity shocks, δ_P can also include rising production costs, falling profit margins etc), while d_s and c_s capture the exposure of firms to shocks on their financial leverage. Given the amount of debt borrowed from banks and holding financial development constant across countries, firms that belong to more financially vulnerable industries will pay greater financial costs associated with the loan. On the other hand, if tangible assets constitute a larger proportion of total assets, the financial costs will be lower but a counter-argument by Besedes et al. (2011) states the probability of failure of firms will be higher for a given interest rate as more assets can be seized from the borrowers. This indicates higher risk to the borrowers. However, development of financial institutions within a country increases investments in more financially vulnerable industries and industries characterized with lower asset tangibility as development of financial institutions allows to reduce asymmetric information between lenders and borrowers, hence lowering the costs of borrowing.

Introducing external dependence and asset tangibility into the model, the equations can be stated as[18] :

$$E(\pi) = (q - \delta_P)(1 - c_s)(1 - d_s)\pi_0 + (1 - q + \delta_P)(c_s)d_s\pi_\gamma$$

and

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[17] $0 < d_s, c_s < 1$.

[18] Whether firms participate in international trade or not, the fraction of fixed costs externally financed will be similar in both types of industries, high and low.

$$E(\pi|T) = (q - \delta_P - \delta_T)(1 - c_s)(1 - d_s)\pi_0^T + (1 - q + \delta_P + \delta_T)(c_s)d_s\pi_\gamma^T - TC_T$$

As c_s converges to 1, the supply of financial leverage by the investor is likely to increase. Similar is the case if d_s converges to 1. The greater the proportion of leverage spent on collateral, financial leverage can be obtained at a more favorable price but at higher risks. The greater the external dependence, the larger the need for financial leverage and higher the costs of borrowing. On the other hand, collateral of firms can make financial leverage more favorable, due to lower costs and subsequently increase the profits from financial leverage. Firms with 'soft' assets are predicted to perform worse than firms with more tangible assets as they exhibit lower growth rates. High external dependency can be costly to firms as it increases financial vulnerability to negative liquidity shocks, but it is within these industries that firms are more likely to borrow to finance investment projects. Basically, as Rajan and Zingales (1998), Hur et al (2006), Manova (2010a), Manova (2010b) and Chor and Manova (2011) assert that financial development in countries allows firm growth within industries highly dependent on external financing and characterized by low asset tangibility.

If exporters and importers are similar in their investment patterns, I will observe them to have similar demand for financial leverage within both industries. However, the investment patterns of exporters and importers can be different. Importers rely on greater input quality and demand absorptive capacity related to their inputs, which may expose firms to greater needs of external funds. The following empirical study will determine the pattern of investments undertaken by

firms that either export only, or import only or operate only within the national market, as I consider the desire of firms to become two way traders rather than the aforementioned strategies of trading activities.

The testable implication of this model is that the financial leverage influences the international trading activities of firms. As firms undertake certain trading activities due to the variation in their financial leverage, I will test the impact of financial leverage on the decision of firms to expand their international trading activities. The model above states that the external dependence and asset tangibility of industries dictate the demand for financial leverage by firms. I will further determine whether firms that exist within industries characterized by different levels of external dependence and asset tangibility are restricted to particular trading activities dependent upon the extensive and the intensive margins of their financial leverage.

I predict that within externally dependent industries, firms that undertake larger financial leverage and possess a large proportion of intangible assets will less likely obtain additional finance for investments required to become two way traders due to the lack of collateralizable assets. On the other hand, firms that belong to industries where internal cashflow constitutes a large proportion towards the funding of their investments will have their trading activities inhibited by their financial leverage as firms may not be willing to obtain credit from the lender to invest in the expansion of their production process. Furthermore, firms within industries with high asset tangibility may not invest in trading activities if they prefer to limit the exposure of their collateralizable assets to the investors in case of default. Hence, the intensity of financial leverage would lower their likelihood of expanding their trading activities. In addition, firms belonging to industries

characterized by a smaller proportion of collateralizable assets may find it difficult to invest in the expansion of their trading activities through increase of financial leverage as they may own fewer tangible assets and their investments in knowledge intensive intangible assets account for a significant proportion of their total assets.

3.3   The Data

The Enterprise Surveys, which provides firm level data, is commonly known as The Business Environment and Enterprise Performance Survey (BEEPS) dataset in the Central and Eastern European and Central Asian countries and is created jointly by the World Bank and the European Bank for Reconstruction and Development [19]. There are 6,628 firms in a panel of 7,288 observations, with many firms only surveyed once. In Appendix 3A, I define the variables. In Appendix 3B, I list the names of the countries considered in the sample, with the number of observations for each country. I only consider firms that belong to manufacturing industries, ISIC Revision 3.1 sectors 15 to 37, and eliminate all firms that have been surveyed in years other than 2005 and 2009. The sample includes mainly small and medium sized firms with less than 10,000 employees, with approximately 50 percent of the firms record less than 35 employees and 75 percent record less than 110 employees. It also includes firms that are located in large cities as well as rural areas. The data on domestic credit provided by banking sector is collected from World Development Indicators by the World Bank.

The industry level data on external dependence and asset tangibility has been

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[19]Enterprise surveys are available at http://www.enterprisesurveys.org. As with every survey, some data collected was marked as being doubtful by the interviewers, as the accuracy of the data collected is ranked. I have eliminated any observations that have been marked as doubtful by the interviewers.

borrowed from Manova et al (2011).

[Figure 3.1 about here]

In Figure 3.1, I show the financial leverage of firms engaging in various trading activities. Two way traders are most likely to be financially leveraged while domestic firms are least likely.

Using domestic credit provided by banking sector (percentage of GDP) as a proxy for the amount of credit available within the country, I graph the relationships between two way traders against various trading activities and the proxy for country level domestic credit in Appendix 3C. In Appendix 3D, I graph the relationship between the extensive margin of financial leverage and the intensive margin of financial leverage and domestic credit. I observe a positive relationship across the board indicating that two way traders are likely to be more prominent in countries with greater financial development, where firms are also likely to be more financially leveraged.

3.4   Results

3.4.1   Probit Estimation

The purpose of this paper is to analyze whether firms which are financially leveraged are more likely to be two way traders than firms that export only, import only and trade only within the national market. A dummy variable, which is also our dependent variable for each regression, accounts for the decision of firms to trade two way against the other trading activities, international or only within the national market. Two way traders are assigned a value of 1 and firms that either export only, or import only or trade only within the national market are

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assigned a value of 0. The independent dummy variable accounting for fixed assets financed by bank loans is assigned a value of 1 if firms do have any of their assets purchased via bank loans (not leveraged) and 0 if they have none of their fixed assets financed by bank loans.

The regression equation is:

$$Y^*_{ijet} = \beta_1 EXTFIN_{ijet} + \beta_2 z_{ijet} + \eta_t + \zeta_j + \alpha_e + \varepsilon_{ijet}$$

where Y^*_{ijet} is the dependent variable for firm i, which makes a decision to export, import or undertake both activities at time t, j is the 3 digit ISIC Rev 3.1 industry, and e is the EU membership status. $EXTFIN_{ijet}$ accounts for the decision of firms to seek bank loans to purchase their fixed assets. Y is binary, with two outcomes ,1 or 0. I assume that Y takes the form $\Pr(Y = 1|X) = \Phi(X'\beta)$. The $\varepsilon_{ijet} \sim N(0,1)$, where $Y = 1$ if $Y^* > 0$[20].The standard errors are clustered at the industry level. Depending on the particular regression, $EXTFIN_{ijet}$ either indicates the extensive margin, which determines whether the firms have financed the purchase of their fixed assets from bank loans, or the intensive margin, which is calculated as the percentage of assets financed by bank loans. The intensive margin is only considered for firms that have at least one percent of their assets financed by bank loans. z_{ijet} is a vector of firm characteristics. Productivity, firm size, skill intensity, workforce composition in terms of educated workers and in-house formal training, along with innovative strategies of firms, age of firm and their capacity utilization have been used as control variables. The variable on productivity is calculated as value-added (sales less cost of labor and materials)

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[20]All results, except under the instrumental variable section, are calculated as the marginal effects at the mean values of the independent variables.

divided by the number of total production workers. It is considered as a ratio to the average value of productivity for all firms within the industry, in a given country for a given year. Wagner (2002) uses a similar technique for average wage per employee in order to calculate the deviation of firm productivity from the industry average. Productivity effects may be interdependent upon other firms in the industry through spillover effects[21]. α_e accounts for the time-invariant fixed effect dummies at the regional (EU membership) and ζ_j accounts for 3 digit industry level in order to observe industry characteristics that are otherwise not captured, while η_t accounts for time dummies. ε_{ijet} is the error term.

The variable accounting for the intensity of financial leverage is considered as two separate proxies. Proxy 1 considers the intensity of financial leverage as the ratio to the industry level average of financial leverage. Proxy 2 considers the intensity of financial leverage as a variable accounting the distance between the respective firms and the firms with the least financial leverage within their industry[22]. With the existence of asymmetric information between firms and the lenders, a hierarchy of preferences on various sources of financing, internal sources and bank loans, can be established between firms[23]. Firms may seek financial leverage given the amount of financial leverage sought by other firms within the industry in order to counter the costs of asymmetric information.

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[21] Another reason is that the collection of monetary values in the BEEPS dataset vary across periods as they may have been recorded in local currencies in 2005 and US dollars in 2009. As I do not use country fixed effects, due to the small number of observations, I can run into the problem of reporting wrong monetary values. Using the ratios for the variables with monetary values allows to avoid this issue.

[22] The fixed effect industry dummy is at the 3 digit level as there is a potential problem of very few number of observations within certain 4 digit ISIC industries. As industry averages can still be calculated at the 4 digit industry level, I prefer to implement this level of disaggregation to calculate the various proxies of the intensity of financial leverage.

[23] Kumar (2007) is a critical review of articles that use various measures of financial leverage. Various frameworks are discussed in the paper.

Joint dependence of other firms regarding financial strategies within the industry can lead to variation in financial structure even after controlling for industry fixed effects. MacKay (2005) stresses that it is important to note the variation in financial structure of firms that can be as a result of jointly determined financial decisions. One of the characteristics of a proxy suggested by MacKay (2005) is that it incorporates financial leverage adjusted for typical firms within their industry in a given year. In lieu of this strategy, I include a variable that has been adjusted to the average firm within the industry in a given year, and state it as Proxy 1. Proxy 2 accounts for the difference between the respective firms and the firms with the minimum financial leverage recorded within the industry in a given country for a given year. As I control for characteristics of firms such as productivity, capacity utilization and number of full-time employees, the firms with the least financial leverage can be considered more financially healthier firms. If decisions are indeed jointly determined, the optimal amount of leverage for firms will be based on the financial leverage sought by other firms. Assuming that costs of financial leverage increase as greater percentage of assets are financed by bank loans, the firms with the least percentage of their assets financed by bank loans will be paying the lowest cost. A lower value for both proxies will indicate better financial health.

[Table 3.1 about here]

There are 2,056 two way traders, 311 exporters only, 2,616 importers only and 1,905 firms that trade only within the national market within the sample[24]. In Table 3.1, I show that two way traders are more likely to be financially leveraged

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[24]In the regression tables, a firm that operates only within the national market is labeled as "No Int. Trade".

than all other types of firms. The coefficient on the extensive margin of financial leverage is positive and significant at the 1% level for two way traders against firms that import only or trade only within the national market and at the 5% level against firms that export only. The coefficient for domestic firms (foreign ownership less than 10%) is significant and negative across the sample, implying that firms which participate as two way traders are more likely to be foreign firms. Number of full-time employees and the dummy variable on formal training significantly influences two way traders across all the other trading activities, while innovation and age of firm significantly influences two way traders against firms that import only and firms that trade only within the national market. However, two way traders are more likely to be more productive and have less skill intensity than firms that operate only within the national market. The percentage of employees with a university degree is positive and significant for firms that trade two ways against those firms that trade only within the national market. It is not significant for firms that trade two ways against firms that export only and import only. This implies that the percentage of employees with a university degree is not significantly different for firms that trade internationally, as such firms may require to undertake investments in complementary knowledge-intensive assets.

[Table 3.2 about here]

In Table 3.2, I show that Proxy 1 negatively impacts the probability that firms are two way traders rather than firms that import only and trade only within the national market, at the 1% level and at the 5% level of significance respectively. Proxy 2 indicates that two way traders are more likely to be financially healthier than firms that trade only within the national market and the effect is significant at

the 5% level. Such firms are more likely to have financial leverage equal to that of the least financially leveraged firms within the industry. There is a lower number of observations than in Table 3.2 as only those firms that are financially leveraged are considered. The fact that Proxy 1 is significant at the 1% level but Proxy 2 is not significant indicates that firms which import only will be less financially healthier than two way traders in terms of the ratio to the average financial leverage within their industry but their financial leverage itself will not necessarily be significantly greater than the least financially leveraged (most financially healthy) within their industry. Further, the extensive margin positively influences two way trading activities, while the proxies on intensive margins negatively influence two way traders. This implies that although two way traders are likely to have borrowed from banks to finance their assets, the degree of financial leverage amongst firms that have borrowed will be the least intense for two way traders.

In Table 3.2, I show that firms which export only are not different than two way traders in terms of the intensity of financial leverage as neither the first proxy nor the second proxy significantly influences the decision of such firms to become two way traders. The lack of significance on the impact of the proxies on the intensity of financial leverage for firms that export only can indicate that such firms may have the ability to generate internal funds through export revenues to finance investments as two way traders. I also find that firms which trade only within the national market are likely to face more severe constraints in terms of financial leverage as they are likely to be less financially healthy in terms of both proxies. Firms that trade only within the national market are likely to have financial leverage greater than the average firm within their industry and are also likely to be significantly more leveraged than the least leveraged firm within their

industry.

Furthermore, innovation, formal training and number of employees are positive and significant for two way traders against firms that operate only within the national market. The variable on innovation only influences the firms that trade only within the national market. The significance of the coefficient on formal training influences the decision of firms to become two way traders against their decision to trade only within the national market and import only. An interesting finding in the Tables 3.1 and 3.2 is that once firms that export only have access to financial leverage, the variables that remain significant are domestic firm and number of employees. Firms that import only are likely to be domestic firms, younger, have fewer employees and are less likely to provide formal training than two way traders. Apart from being financially leveraged, firms that trade only within the national market are also less likely to innovate, less likely to provide formal training to employees, are more likely to be skill-intensive and employee fewer workers. The level of significance for all the variables that are significant varies between the 5% and 1% level, with majority of the variables at the latter level. The probit estimation has helped us determine the constraints that each firm undertaking a particular trading activity faces, with firms that trade only within the national market generally facing the greatest constraints in terms of the variables used in this paper, followed by firms that import only. This implies that given the distribution of financial leverage, the firms that export only are likely to be more similar to two way traders than firms undertaking other trading activities.

3.4.2 Robustness Check–Instrumental Variable Estimation

One of the major concerns with the results in the probit estimations above is the endogeneity bias. Firms participating in international trading activities are likely to obtain financial leverage and bias the results of the extensive margin of financial leverage upwards. On the other hand, firms participating in international trading activities can earn greater profits and improve their financial health as they reduce their financial leverage. This can bias the results of the intensive margin downwards. In order to account for the endogeneity bias, I introduce instrumental variable estimation, which can be considered a robustness check to the probit estimation[25].

The excluded instrumental variable is a combination of two variables, overdue payments to suppliers or trade credit, similar to one of the instrumental variables used in Gorodnichenko and Schnitzer (2010), and an indicator on whether firms have started or renewed their relationship with lenders by submitting an application for a loan or a line of credit[26,27]. De Bonis et al. (2010) assert that although activities such as internationalization of firms increases the opaqueness of the banking relationship due to larger payments of sunk costs, rising intangibility

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[25]Variables such as the level of employment can face an issue of reverse causality, as the dependent variable can also influence the explanatory variables. However, in this dataset, reverse causality is not a serious issue as such variables do not vary much over a three year period. For instance, the correlation between current level of employment and level of employment three years ago is 0.90.

[26]Ideally I would have separated the two variables when conducting the instrumental variable estimation. Although not reported, the results are very similar to those that I obtain in this section by combining the variables. However, the two variables when separated reject the overidentifications tests through Sargan statistics for some of the regressions.

[27]The correlation between various trading activities and the excluded instrument variable ranges from 5% to 26%, while the correlation between the excluded instrument and the extensive and the intensive margins of financial leverage ranges from 25% to 61%. This shows that the excluded instruments are correlated with the endogenous variables but not necessarily with the dependent variables.

ratio and shifting of the collateral abroad, the length of the relationship between the bank and the decision of firms to participate in trade does not have any significant correlation. The relationship between the firms and the banks should define the access to capital by firms and the financial leverage ratio of the firms, which in turn should determine the decision of firms to participate in international trading activities. Furthermore, the decision to trade should not be influenced directly by the excluded instrumental variable. As is mentioned in Cunat (2007), Fabri and Klapper (2009) and Hydman and Serio (2010), firms may be able to seek overdue payments from their suppliers if they have an overall market advantage compared to the suppliers as they can then dictate their terms and conditions. One way to determine that trade credit does not directly affect exports or imports is to test the effect of the changes in the interbank rate on trade weighted credit contraction at the industry level as is done by Levchenko et al. (2010). They find that although various industries are affected differently by credit contractions, the average effect is zero. Therefore, this variable can provide us with an exogenous variation to cash receipts based on the market conditions and the macroeconomic environment. Combining it with an indicator for the establishment of a relationship with lenders allow us to consider those firms that seek trade credit or a loan. Firms that face negative liquidity shocks and have attempted to establish a relationship with their lenders are more likely to be financially constrained, indicating a positive relationship between the financial leverage of firms and the excluded instrumental variable.

Minetti and Zhu (2011) account for the local supply of banking services available to firms as one of their instrumental variables in order to control for endogeneity issues related to exporting and credit constraints. The local supply

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of banking services will influence the relationship between firms and their creditors, hence their decision to apply for a loan or a line of credit. Firms that do not seek to establish or renew their relationship with lenders, through a line of credit or applying for loans, will be less likely to influence their financial leverage through negative shocks to their liquidity as they will not face complications of holdup problems and information asymmetries between the borrower and the lender[28]. As per Bolton and Freixas (2000) firms can be segmented as i) riskiest firms which cannot obtain any loans, ii) safer firms which are able to take out bank loans and iii) safest firms which prefer to use their own internal resources and avoid intermediation costs. Furthermore, as Hashi and Toci (2010) consider a variable which affects the decision of firms to participate in the financial market but does not have an impact on the decision of banks to lend, I use a similar technique by employing a variable that accounts for the decision of firms to establish or renew its relationship with a lender[29].

The second stage regression equation is:

$$Y_{ijet}^* = \beta_1 EXTFIN_{ijet} + \beta_2 z_{ijet} + \zeta_j + \alpha_e + \eta_t + \varepsilon_{ijet}$$

and the first stage regression equation is:

$$EXTFIN_{ijet} = \gamma_1 OVERDUE_{ijet} + \gamma_2 z_{ijet} + \zeta_j + \alpha_e + \eta_t + \nu_{ijet}$$

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[28] Application for a loan does not necessarily imply that the firms are seeking to leverage their financial assets. As firms can borrow from non-financial institutions, a firm can obtain line of credit or a loan from non-financial institutions. Financial leverage is the percentage of assets financed by bank loans. Therefore, this variable accounting for the relationship with the lender does not necessarily have a one to one relationship with the variable on the financial leverage.

[29] Although Hashi and Toci (2010) do assert that firm size does affect the decision of firms to apply for a loan, the effect is more likely to be determined by the amount of financial leverage. Small firms are less likely to apply for a loan because a) they may lack collateral and b) their capacity to borrow is much lower. Highly indebted large firms can face the same challenges.

where $OVERDUE_{ijet}$ accounts for firms owing payments to suppliers and have attempted to establish a relationship with lenders by applying for a loan or a line of credit. z_{ijet} are the other firm level characteristics, ν_{ijet} is the error term, ζ_j and ζ_e are the fixed effects dummies such as EU membership dummy and 3 digit ISIC Rev 3.1 industry code respectively and η_t is the time dummy variable.

[Table 3.3 about here]

The results in Table 3.3 are quite similar to the probit estimation results in Table 3.1. However, the p-value for the Wald test of rho=0 is greater than the 10% level for most of the regressions (except in column 6), which indicates it is statistically insignificant. Therefore, our initial probit estimation is consistent. Even though, I reject exogeneity for firms that trade only within the national market, the results are very similar to that of the probit estimations. Furthermore, the underidentification test and the weak identification tests reject the null hypothesis that the instruments are either underidentified or weakly identified[30]. The larger coefficients recorded in the instrumental variable estimation are a result of the positive effect of the excluded instrument. Firms that are overdue to their suppliers and have applied for a loan are more likely to be financially leveraged. Subsequently, it increases the likelihood that the firms are two way traders.

In Tables 3.4 and 3.5, I analyze the intensive margin of financial leverage on the likelihood that firms are two way traders rather than exporters only, importers only and firms that trade only within the national market. To be consistent with the proxies for the intensive margin, the excluded variables have been calculated

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[30]The excluded instrument is viable also because firm level characteristics, such as productivity and capacity utilization, included in the regression do not significantly alter the power of these tests. Similar result is obtained by Gorodnichenko and Schnitzer (2010).

as the ratio to industry average of the $OVERDUE$ variable and as a difference to the industry minimum of the $OVERDUE$ variable respectively for Proxy 1 and Proxy 2 on the intensity of financial leverage. The F-statistics indicate that the excluded instruments do not suffer from any weak instrument problems in any of the regression in Tables 3.3, 3.4 and 3.5.

[Table 3.4 about here]

[Table 3.5 about here]

Similar to the results for the extensive margin of financial leverage in Table 3.3, I cannot reject exogeneity in Table 3.4 and Table 3.5. Again, the probit estimations can be considered as consistent across all regressions. I obtain similar results to the reported probit estimation on the intensity of financial leverage and their effect on trading activities. As predicted, the coefficients under the instrumental variable estimation are larger and indicate the positive effect of the excluded instrument on the endogenous variable. This implies that the firms will increase the percentage of their assets financed by bank loans as they apply for loans and establish or renew their relationship with lenders. With the assumption that the instruments are not weak and that the exogeneity of the variables on financial leverage cannot be rejected, I can conclude that the probit estimations in the previous are consistent and efficient. I will use the probit estimations in the next section.

3.4.3 External Dependence and Asset Tangibility

In order to control for the endogeneity of the variables on the extensive and intensive margins of financial leverage, I use an industry level indicator that character-

izes the financial vulnerability and the asset tangibility of the respective industries. With the assumption that industry level indicators are exogenous to firm characteristics, this is another robustness test for the probit estimations above. This method is similar to that used by Berman and Hericourt (2010), Manova (2010), Chor and Manova (2010), Manova et al. (2011) and Braun and Larrain (2005) as they implement a proxy for financial dependence by Rajan and Zingales (1998). This approach helps to exploit differences in credit availability across industries that may prevent firms from undertaking international trading activities. I divide the industries into two subsamples, industries with low and high external dependence and low and high asset tangibility respectively. The effects of financial leverage on international trading activities will be strongly evident within certain industries. As defined in Rajan and Zingales (1998), external dependence of firms is calculated as the amount of desired investment that cannot be financed through internal funds generated within the business, while asset tangibility is calculated by Braun (2003) as the amount of percentage contributed by net plant, property and equipment over total assets.

Berman and Hericourt (2010) suggest that there is priori no reason for endogeneity bias between participation in international trade and financial leverage to be distributed across industries with different levels of external dependence or asset tangibility. This can be explained by the fact that financial leverage is firm level and external dependence and asset tangibility are industry level and uncorrelated by design, while the correlation itself between financial leverage and the two industry level indicators are low. The correlation between external dependence and financial leverage (extensive) is 0.06%, while correlation between asset tangibility and financial leverage (extensive) is 7%. The correlation between

external dependence and the two measures of the intensity of financial leverage is -3% and -0.04% respectively, while correlation between asset tangibility and the two measures of the intensity of financial leverage is -10% and -0.04% respectively. In addition, financial leverage at the firm level should not be correlated either to the industry level of external dependence and asset tangibility as the data for the industry level is derived from US data and averaged for the period from 1980-1999. The purpose behind using US data on external dependence and asset tangibility from Manova et al (2011) is that it characterizes one of the most advanced and sophisticated financial markets and thus reflects the true demand by firms for external dependence and determines the optimal presence of tangible assets in each industry. Further, it eliminates the possibility of external dependence and asset tangibility to endogenously respond to the level of financial development within a country.

The figures and tables in this section show the relationship between external dependence and asset tangibility within each industry and the percentage of firms that are either exporters only, or importers only or two way traders within high and low external dependent and asset tangibility industries. In Figure 3.2, I observe a negative relationship (albiet at -3% level) between the medians of external dependence and asset tangibility, as is predicted in Manova (2011). This indicates that in countries which tend to have their median industry more externally dependent are also likely to have their median industry characterized by lower asset tangibility. This is consistent with the prediction that as countries develop their financial markets, investments will tend to flow into industries characterized by higher external dependence and lower asset tangibility. As I consider lesser developed financial markets in this paper, asset tangibility can be positively related to

domestic credit, as countries with less domestic credit may exhibit poor business environments with weak legal protections for the lender as well as the borrower, undermining the ability of tangible assets to reduce informational asymmetries.

[Figure 3.2 about here]

In Figures 3.3 and 3.4, I show a pattern of investments in trading activities within industries characterized by the level of external dependence and asset tangibility. The firms that trade only within the national market are not reported in the figures below.

[Figure 3.3 about here]

[Figure 3.4 about here]

Although, the pattern of investments may differ as there are a fewer percentage of firms that trade two way within less externally dependent industries than within the more externally dependent industries, the rankings across trading activities does not change as firms that import only outnumber other international traders within both high and low external dependence and asset tangibility. The percentage of two way traders fall within the low externally dependent and high asset tangibility industries, compared to their counterpart industries. The lower percentage of two way traders within an industry can indicate the preference of trading activities, as firms that have access to external funds and firms that possess lower tangible assets are more likely to be two way traders. Firms can be constrained to expand trading activities within industries where external funds are required to produce and undertake their existing trading activity. On the other hand, firms can also be constrained to expand their trading activities within industries characterized by less tangible assets.

The ranking of the trade activity between the asset tangibility of the industries remains more or less consistent, as I observe all types of international traders to have a smaller percentage of participation within industries characterized by higher asset tangibility. Therefore, this can relate to the discussion that firms which belong to industries characterized by high asset tangibility tend to be more restrictive in expanding their international trading activities. Although these figures show us a certain relationship between trading activities and industry level external dependence and asset tangibility, the analysis in the next section will show whether firms that obtain financial leverage are more likely to participate as two way traders than other international trading activities under varying industry level characteristics.

In Appendix 3C, I show that two way trading is positively associated with the financial development within a country. Even though the industry level data is derived from the US, one of the most financial developed countries, the ranking of the external dependence and asset tangibility should remain fairly stable across countries. It is unlikely that firms in poorer developed financial markets will reverse the ranking of the industries. In Appendix 3D, I graph the different financial proxies with respect to the domestic credit, and I observe that countries with greater domestic credit will have firms that are generally more financially leveraged.

In Appendix 3E, I correlate the country level medians of industry external dependence and asset tangibility with domestic credit provided by the private sector as a percentage of GDP. The positive relationship between external dependence and domestic credit is as predicted because higher domestic credit available in the economy would generate growth within industries that require higher external de-

pendence. However, on the other hand, I observe a positive relationship between domestic credit and asset tangibility. This is different from the pattern observed in many developed countries. One explanation, as provided by Hass and Peeters (2004), is that the poorer business environments as a result of weaker legal rights within many of the transition economies, asset tangibility does not necessarily reduce the negative consequences lenders face due to informational asymmetries between the borrowers and the lenders[31]. On the other hand, as discussed in an earlier section, firms that belong to an industry characterized by high asset tangibility would neither borrow as that would increase the probability that a large proportion of their assets are seized by influential lenders (such as large or state owned banks) in case of a loan default[32]. Although, it is likely that countries with less domestic credit will record a lower median value for asset tangibility across industries, this does not necessarily change the ranking of asset tangibility across the industries.

The following analysis will determine the preference of firms to become two way traders against their decision to export only, import only, and operate only within the national market given the different industry level environments of external dependence and asset tangibility. In Appendix 3F, I list the number of observations per industry level characterization, with a low number of observa-

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[31]The positive relationship between the median of asset tangibility and domestic credit is evident for countries that are less developed within the sample(i.e. non-EU countries), while a negative relationship is evident for countries that are more developed (EU countries). The lack of domestic credit in non-EU countries could be lowering the incentive for industries characterized by high asset tangibility to grow. However, we do observe trading patterns within industries to be more consistently distributed between low and high asset tangibility industries. Though, this could be because there are a greater number of surveys conducted in the more developed financial markets.

[32]It is observed that firms are less likely to make investments in trading activities within industries with lower asset tangibility.

tions in some cases. However, this weakness does not have a significant impact on the quality of results as I do observe a pattern similar to our predictions.

External Dependence The industries are divided into subsamples according to their level of financial vulnerability or external dependence. Firms that belong to the more externally dependent industries are likely to borrow loans from banks to finance the purchase of their fixed assets and less likely to utilize their internal sources of funds. If the expansion of trading activities requires investments in the purchase of complementary assets, firms are likely to seek external financing for such investments. On the other hand, firms that belong to less externally dependent industries utilize their internal sources of funds to purchase fixed assets and in turn, may have lower amount of internal sources of funds available to expand their international trading activities.

[Table 3.6 about here]

In Table 3.6, I observe that the extensive margin of financial leverage does significantly impact the probability, at the 5% level, that firms which export only will rather trade two way within industries characterized by low external dependence. None of the other variables on firm level characteristics are significant. However, within industries characterized by high external dependence, I do not observe a significant impact on the extensive margin of financial leverage. The only variables that are significant are number of employees, formal training and skill intensity, all at the 5% level, implying that within industries where firms are likely to be financially vulnerable or high externally dependent, firms that increase the number of employees, invest in formal training and skill intensity are likely to be two way traders rather exporters only. On the other hand, firms that are

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financially leveraged will be more likely to be two way traders than firms that import only and operate only within the national market across both types of industries, with level of significance of the probability between the 5% and 1% level.

Kugler and Verhoogen (2009) discuss the exceptional performance of importers, stating that they pay higher prices for inputs as they are more likely to purchase higher quality inputs to complement their higher quality ouputs. Amiti and Koeining (2007) discuss the gains in labor productivity as firms import by purchasing inputs of higher quality. Firms that import are likely to purchase high quality inputs with complementary machinery and equipment which may be priced higher than domestic inputs. In effect, importers are more likely to finance their purchases of assets through bank loans as they demand investments in complementary assets. Variables such as domestic firm, age of firm and number of full-time employees significantly impact the probability that a firms are two way traders rather than importers within both types of industries.

[Table 3.7 about here]

[Table 3.8 about here]

Considering firms are financially leveraged, the proxies for the intensity of financial leverage in Tables 3.7 and 3.8 suggest that firms which export only are not significantly impacted by the intensity of their financial leverage. Apart from skill intensity and number of full-time employees, no other variable significantly impacts the probability of firms that export only in financially vulnerable industries indicating that their dependence on external funds will allow it to expand their trading activities. However, within low externally dependent industries, variables

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on innovation and domestic firm are significant at the 5% level, while skill intensity is significant at the 10% level. The intensity of financial leverage negatively impacts the probability of firms that import only to become two way traders within industries with high financial vulnerability and firms that operate only within the national market to become two way traders within industries with low financial vulnerability. The significance of financial leverage is recorded at the 5% level. For firms that undertake importing activities, the access to external funds may require it to finance investments in complementary assets, hence increasing their intensity of financial leverage as they borrow funds against the assets owned. Ahn, Amiti et al (2011) and Haddad et al (2011) suggest that import prices increased as the import values fell in financially vulnerable industries due to a supply contraction faced by the importers, especially during the recent credit crisis of 2008-2009. This theory can suggest that importing firms may be borrowing from banks to finance the purchase of the more costly inputs or complementary assets in the more financially vulnerable industries, constraining firms that import only from becoming two way traders.

Asset Tangibility Braun (2003) incorporates asset tangibility of firms into the model of Rajan and Zingales (1998). Asset tangibility indicates the proportion of assets constituted by 'hard assets' such as plant, property and equipment rather than 'soft assets' such as human capital and goodwill invested by the firm. Chor and Manova (2011), Manova (2010a) and Manova (2010b) predict that investment activities of firms should be focused within industries that are externally dependent and have low asset tangibility as countries becomes more financially developed. As firms that import only are more likely to be characterized by a

greater intensity of financial leverage within industries that are financially vulnerable, as shown in Tables 3.7 and 3.8, the intensity of financial leverage should significantly inhibit such firms from becoming two way traders within industries that require lower asset tangibility. On the other hand, the intensity of financial leverage is significant for firms that operate only within the national market within less financially vulnerable industries, as shown in Tables 3.7 and 3.8. This implies that financial leverage should be significantly lower for two way traders rather than firms that operate only within the national market within industries characterized by high asset tangibility. Therefore, as firms belonging to more externally dependent industries invest in expanding their trade activities, it also indicates their ability to invest in expanding their trade activities within industries that require lower asset tangibility and vice versa.

[Table 3.9 about here]

In Table 3.9, there is no significant effect on two way trade against firms that export only within either industries. Other variables such as domestic firm and formal training are likely to impact the probability of exporters only to become a two way traders, at the 5% and 1% level, within industries characterized by high asset tangibility. The number of full-time employees is significant at the 10% level within industries characterized by lower asset tangibility. High asset tangibility can also indicate that firms which export only are not able to invest in formal training of employees that may be required to become two way traders. On the other hand, the impact of the extensive margin of financial leverage is positive for two way traders against firms that import only within industries characterized by low asset tangibility at the 1% level of significance. Two way traders are positively

impacted by the extensive margin of financial leverage within both industries against firms that trade only within the national market. It is at the 1% level of significance within industries characterized by high asset tangibility and at the 5% level within industries characterized by low asset tangibility. An interesting aspect is that the percentage of employees with a university degree is positive and significant in industries characterized by high asset tangibility for two way traders against firms that import only and trade only within the national market at the 5% level. This implies that it is only those firms that invest in knowledge intensive complementary assets such as highly educated workers are likely to be two way traders within industries characterized by high asset tangibility. As more variables significantly affect the decision of firms to trade two way against their decision to trade only within the national market within industries characterized by high asset tangibility, firms that are less likely to fail (for instance, those that observe greater productivity-levels) are also more likely to expand their trading activities.

Besedes et al (2011) suggests that firms within industries characterized by high asset tangibility are more likely to risk a greater proportion of their collateralizable assets as they seek to finance their investments through bank loans. Such firms would reduce their probability of undertaking investments that involve large fixed costs as their decision to expand their trading activities may become constrained by their financial health. They may lack the willingness to risk their tangible assets as they invest in expansion of their trading activities. On the other hand, as importers only are likely to possess a greater proportion of knowledge-intensive intangible investments, I observe such firms to be more financially constrained within industries characterized by low asset tangibility. The presence of high

asset tangibility within industries can lower the risks of information asymmetry for the lender but can also lead to potentially greater proportion of the assets seized in terms of collateral in terms of default by the borrower.

[Table 3.10 about here]

[Table 3.11 about here]

As predicted, in Tables 3.10 and 3.11, I show results that are mainly asymmetric to the results in Tables 3.7 and 3.8. For instance, in Tables 3.7 and 3.8, I observe that financial health is significant for firms that import only within industries characterized by high external dependence. As external dependence and asset tangibility are negatively correlated, I observe a similar pattern for firms within industries characterized by low asset tangibility in Tables 3.10 and 3.11. Similarly, the two proxies on financial health are negative and significant at the 1% level for firms that operate within the national market only within industries characterized by high asset tangibility[33].

Information asymmetry between lenders and borrowers suggests that the presence of tangible assets which investors can seize upon failure of repayment of loan provides firms the ability to borrow. Castellani et al (2010) state the significance of the complementary investments in assets required by importers in order to integrate imported inputs into their production process. Knowledge intensive assets can contribute a large proportion of their investments and as the nature of such investments tend to be less tangible, financial leverage within industries that are

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[33]In Tables, 3.10 and 3.11, I do observe one of the proxies on the intensive margin of financial leverage to influence firms that trade only within the national market within industries characterized by low asset tangibility and firms that import only within industries characterized by high asset tangibility, but only at the 10% level of significance. I assume firms to be more sensitive to the intensity of financial leverage within industries where the level of significance of the financial leverage is observed to be greater and the coefficients larger.

characterized by lower proportion of tangible assets can significantly affect the probability that firms are two way traders rather than importers only. Within an industry that lacks tangible assets, it may indicate that firms are not able to back up their investments with collateralizable assets, and their decision to become two way traders can be adversely affected with their intensity of financial leverage. The lack of collateralizable assets observed within the industry and the decision of importers to invest in non-collateralizable knowledge intensive intangible assets can make it less attractive for investors to provide firms with external financing. Within industries characterized by high tangibility, age and domestic ownership significantly impacts the probability that firms are likely to be two way traders, indicating that they are likely to be foreign owned and well established firms. Two way traders and firms that import only are mainly similar in firm characteristics within industries characterized by high asset tangibility.

In Table 3.10, Proxy 1 on the intensity of financial leverage negatively impacts the probability at the 1% level that firms are two way traders rather than exporters only within industries characterized by high asset tangibility. However, in Table 3.11, I do not see such an effect for Proxy 2. This indicates that firms which export only are likely to be less financially healthier than the average firm but not necessarily more financially leveraged than the firms with the lowest percentage of their assets funded by bank loans within industries characterized by high asset tangibility. Firms that export only are not constrained by any of their firm characteristics within industries that exhibit low asset tangibility.

3.5 Conclusion

I determine that firms which participate in various trading activities also face different financial constraints that inhibit their ability to expand their international trading activities, given the financial vulnerability and asset tangibility of their industry. The extensive margin of financial leverage positively influences the probability that firms which have assets funded by bank loans are likely to expand their trading activities from exporting only, importing only and trading only within the national market to two way trading. However, the impact of the extensive margin of financial leverage on the probability that firms which export only are likely to become two way traders is more subtle than for the firms that undertake other trading activities.

The intensive margin of financial leverage does not inhibit firms that export only from becoming two way traders, but it does inhibit firms that import only and operate only within the national market to become two way traders. The effect is stronger for firms that operate only within the national market than firms that import only. Furthermore, the instrumental variable estimation further establishes the results obtained from the probit estimations. The significance of this relationship differs as financial vulnerability and asset tangibility between industries vary. Although, the extensive margin of financial leverage is significant within both industries for firms that import only and firms that operate only within the national market, it is the significance on the intensive margin which differs as financial vulnerability and asset tangibility varies between industries. I determine that within financially vulnerable industries, firms that import only are less likely to become two way traders as their financial leverage rises due to greater borrowing from the banks. Greater the dependence of the firms on external

funds, high financial leverage of firms that import only will lower their ability to expand their trading activities. On the other hand, the impact of financial leverage is similar within industries characterized by low asset tangibility for firms that import only.

Firms that operate only within the national market are less likely to become two way traders as their intensity of financial leverage increases within industries that observe low financial vulnerability. This relation asserts that such firms are inhibited within industries where firms are less likely to borrow from banks to purchase fixed assets and where internal cash resources are likely to contribute to majority of its investments. Firms that operate only within the national market are also less likely to become two way traders as the financial leverage increases within industries that exhibit high levels of asset tangibility. Exposure of greater collateralizable assets can indeed lower the survival rate of firms as their collateralizable assets are seizable.

In this paper, I raise some interesting questions regarding the effects of financial constraints on the decision of firms to participate in a particular direction of trade and in turn the role of capital markets in determining the trade position of countries. Hence, in the macroeconomic sense, the contraction of domestic credit within the economy can limit firms to a particular direction in their trading activity and reduce the ability of economies to expand their international trading activities. In the light of the current global financial crisis, this contributes to the studies on the microeconomic as well the macroeconomic impact of the recent fall in credit availability within several economies. Furthermore, the extension of this empirical study into a detailed theoretical model that explains financial constraints and the investment behavior of firms given the above mentioned industry and

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country characteristics will contribute further to this study.

3.6 Tables

Dep Var: Two Way vs	(1) Exp Only	(2) Imp Only	(3) No Int. Trade
Financial Leverage (Extensive)	0.037**	0.151***	0.206***
	(0.018)	(0.021)	(0.027)
Productivity	0.007	0.013*	0.023*
	(0.010)	(0.007)	(0.012)
Percentage of Empl.	0.000	-0.000	0.002**
with Univ. Degrees	(0.001)	(0.001)	(0.001)
Innovation	0.037	0.067*	0.264***
	(0.028)	(0.035)	(0.043)
Domestic Firm	-0.039**	-0.252***	-0.297***
	(0.018)	(0.026)	(0.033)
Number of FT employees	0.0002***	0.0003***	0.001***
	(0.0001)	(0.0001)	(0.0002)
Age of Firm	0.000	0.004***	0.003***
	(0.000)	(0.001)	(0.001)
Capacity Utilization	-0.000	0.001	-0.000
	(0.000)	(0.001)	(0.001)
Formal Training	0.045**	0.047*	0.155***
	(0.018)	(0.025)	(0.032)
Skill Intensity	-0.018	-0.056	-0.205***
	(0.043)	(0.045)	(0.061)
Observations	1,066	2,269	1,821

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Table 3.1: Probit Estimation on the Extensive Margin of Financial Leverage

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var: Two Way vs	Exp Only	Imp Only	No Int. Trade	Exp Only	Imp Only	No Int. Trade
Financial Leverage	-0.009	-0.037***	-0.033**			
(Ratio to Indus Avg)	(0.008)	(0.013)	(0.013)			
Financial Leverage				-0.0002	-0.001	-0.001**
(Diff from Least Fin Lev)				(0.0003)	(0.001)	(0.001)
Productivity	0.003	0.010	-0.002	0.002	0.011	-0.003
	(0.012)	(0.008)	(0.012)	(0.012)	(0.009)	(0.012)
Percentage of Empl.	-0.000	0.001	0.001	-0.000	0.001	0.001
with Univ. Degrees	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Innovation	0.065	0.063	0.223***	0.065	0.072	0.227***
	(0.056)	(0.076)	(0.082)	(0.057)	(0.075)	(0.084)
Domestic Firm	-0.057***	-0.227***	-0.205***	-0.057***	-0.228***	-0.208***
	(0.019)	(0.048)	(0.036)	(0.020)	(0.049)	(0.036)
Number of FT employees	0.0001**	0.001***	0.001**	0.0001**	0.001***	0.001**
	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
Age of Firm	-0.000	0.004***	0.001	-0.000	0.004***	0.001
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Capacity Utilization	-0.000	0.001	-0.001	-0.000	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Formal Training	0.005	0.099**	0.164***	0.005	0.098**	0.164***
	(0.017)	(0.039)	(0.047)	(0.018)	(0.039)	(0.048)
Skill Intensity	-0.036	-0.073	-0.198***	-0.036	-0.076	-0.203***
	(0.037)	(0.075)	(0.064)	(0.038)	(0.075)	(0.064)
Observations	336	825	596	336	825	596

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Financial Leverage Proxy 1: Ratio to Industry Average

Financial Leverage Proxy 2: Difference from Least Financially Leveraged

Table 3.2: Probit Estimation on the Intensive Margin of Financial Leverage

	(1)	(2)	(3)	(4)	(5)	(6)
	Sec Stage	First Stage	Sec Stage	First Stage	Sec Stage	First Stage
Dep Var: Two Way vs	Export Only		Import Only		No Int. Trade	
Financial Leverage (Extensive)	0.185		0.484***		0.857***	
	(0.222)		(0.108)		(0.132)	
Productivity	0.040	0.000	0.031*	-0.018	0.058*	0.002
	(0.062)	(0.046)	(0.017)	(0.022)	(0.031)	(0.037)
Percentage of Empl.	0.001	-0.004*	-0.000	-0.004**	0.006**	-0.003
with Univ. Degrees	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Innovation	0.203	0.325***	0.157*	0.156*	0.639***	0.237***
	(0.135)	(0.125)	(0.090)	(0.093)	(0.106)	(0.083)
Domestic Firm	-0.243**	0.160*	-0.650***	0.101	-0.947***	0.048
	(0.116)	(0.095)	(0.071)	(0.080)	(0.112)	(0.097)
Number of FT employees	0.001***	0.000	0.001***	0.000	0.002***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Age of Firm	0.002	-0.004**	0.009***	-0.004***	0.007***	-0.002
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Capacity Utilization	-0.001	0.004*	0.001	0.001	-0.001	0.002
	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Formal Training	0.257**	0.242**	0.115*	0.132**	0.399***	0.178*
	(0.100)	(0.108)	(0.062)	(0.065)	(0.089)	(0.093)
Skill Intensity	-0.109	-0.329**	-0.135	-0.111	-0.543***	-0.275**
	(0.257)	(0.167)	(0.113)	(0.114)	(0.167)	(0.129)
Overdue and Relation w/ Lender		1.890***		1.817***		1.929***
		(0.133)		(0.117)		(0.120)
Constant	0.737*	-1.687***	-0.965***	-1.005***	-1.200***	-1.303***
	(0.380)	(0.299)	(0.345)	(0.202)	(0.274)	(0.249)
Underident test (p-value)	0		0		0	
Weak Ident. test (F-stat)	329		400		442	
Wald test of rho=0:	0.843		0.206		0.016	
Observations	1,272	1,272	2,296	2,296	1,890	1,890

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Table 3.3: Bi Probit Estimation on the Extensive Margin of Financial Leverage

	(1)	(2)	(3)	(4)	(5)	(6)
	Sec Stage	First Stage	Sec Stage	First Stage	Sec Stage	First Stage
Dep Var: Two Way Trader vs	Export Only		Import Only		No Int. Trade	
Financial Leverage	-0.025		-0.152		-0.147*	
(Ratio to Indus Avg)	(0.155)		(0.104)		(0.088)	
Productivity	0.032	0.046	0.015	-0.018	0.041	0.063
	(0.108)	(0.063)	(0.018)	(0.047)	(0.087)	(0.059)
Percentage of Empl.	-0.003	0.000	0.002	0.007**	0.004	0.006*
with Univ. Degrees	(0.005)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)
Innovation	0.495	-0.064	0.070	-0.446**	0.582**	-0.514**
	(0.316)	(0.263)	(0.191)	(0.207)	(0.235)	(0.228)
Domestic Firm	-0.590**	0.264**	-0.613***	0.129	-0.936***	0.092
	(0.273)	(0.131)	(0.149)	(0.108)	(0.188)	(0.137)
Number of FT employees	0.001**	0.000	0.001***	-0.000	0.002*	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Age of Firm	-0.004	-0.001	0.009**	-0.005***	0.003	-0.005***
	(0.004)	(0.001)	(0.004)	(0.002)	(0.004)	(0.002)
Capacity Utilization	-0.001	0.001	0.001	0.002	-0.002	-0.002
	(0.006)	(0.004)	(0.003)	(0.002)	(0.004)	(0.003)
Formal Training	-0.153	0.017	0.217*	-0.026	0.460***	0.056
	(0.170)	(0.135)	(0.112)	(0.108)	(0.176)	(0.097)
Skill Intensity	-0.491	0.085	-0.056	0.188	-0.617***	0.185
	(0.389)	(0.237)	(0.206)	(0.150)	(0.234)	(0.179)
Overdue and Relation w/		0.471***		0.362***		0.416***
Lender		(0.070)		(0.064)		(0.042)
Constant	6.538***	0.528	-0.524	1.447***	0.117	1.696***
	(0.759)	(0.528)	(0.482)	(0.276)	(0.480)	(0.493)
Underident Test (p-value)	0.001		0		0.006	
Weak Ident (F- stat)	32		28		88	
Wald test of exogeneity (p-value)	0.896		0.442		0.760	
Observations	303	303	736	736	524	524

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Financial Leverage Proxy 1: Ratio to Industry Average

Table 3.4: IV Probit Estimation of the Intensive Margin of Financial Leverage (Ratio to Industry Average as a Proxy)

	(1)	(2)	(3)	(4)	(5)	(6)
	Sec Stage	First Stage	Sec Stage	First Stage	Sec Stage	First Stage
Dep Var: Two Way Trader vs	Export Only		Import Only		No Int. Trade	
Financial Leverage	-0.007		-0.006		-0.005	
(Diff from Least Fin Lev)	(0.011)		(0.005)		(0.006)	
Productivity	0.015	-0.248	0.028	-0.016	-0.014	-0.595
	(0.108)	(1.797)	(0.023)	(0.587)	(0.045)	(1.363)
Percentage of Empl.	-0.001	-0.157*	0.002	0.048	0.005	-0.079
with Univ. Degrees	(0.006)	(0.089)	(0.003)	(0.074)	(0.005)	(0.092)
Innovation	0.384	-9.701	0.145	-9.195*	0.674***	-15.871***
	(0.366)	(8.352)	(0.203)	(4.713)	(0.247)	(5.165)
Domestic Firm	-0.630**	3.660	-0.607***	1.275	-0.975***	-2.624
	(0.270)	(3.450)	(0.140)	(2.687)	(0.184)	(3.558)
Number of FT employees	0.001**	0.001	0.001***	-0.001	0.002**	-0.001
	(0.001)	(0.003)	(0.000)	(0.002)	(0.001)	(0.005)
Age of Firm	-0.001	-0.036	0.010***	-0.036	0.002	-0.068
	(0.003)	(0.047)	(0.003)	(0.045)	(0.004)	(0.048)
Capacity Utilization	-0.002	-0.096	0.001	-0.026	-0.003	-0.111
	(0.005)	(0.103)	(0.003)	(0.060)	(0.004)	(0.070)
Formal Training	0.062	3.676	0.247**	-1.811	0.586***	2.313
	(0.157)	(4.077)	(0.102)	(2.917)	(0.165)	(2.826)
Skill Intensity	-0.321	2.249	-0.157	6.257	-0.735***	6.505
	(0.362)	(6.767)	(0.194)	(4.273)	(0.228)	(4.722)
Overdue and Relation w/		18.729***		19.753***		22.396***
Lender		(4.349)		(2.635)		(3.683)
Constant	6.796***	35.547***	-0.617	37.552***	0.049	53.392***
	(0.431)	(13.689)	(0.506)	(8.413)	(0.503)	(10.967)
Underident Test (p-value)	0		0		0	
Weak Ident (F- stat)	33		56		38	
Wald test of exogeneity (p-value)	0.652		0.452		0.995	
Observations	334	334	823	823	593	593

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Financial Leverage Proxy 2: Difference from Least Financially Leveraged

Table 3.5: IV Probit Estimation on the Intensive Margin of Financial Leverage (Difference From Least Financially Leveraged Firm as a Proxy)

	(1)	(2)	(3)	(4)	(5)	(6)
External Dependence	Low	High	Low	High	Low	High
Dep Var: Two Way vs	Export Only		Import Only		No Int. Trade	
Financial Leverage (Extensive)	0.056**	-0.024	0.076**	0.154***	0.153***	0.114***
	(0.024)	(0.028)	(0.035)	(0.041)	(0.038)	(0.040)
Productivity	0.005	0.001	0.010	0.007	0.019*	0.010
	(0.005)	(0.003)	(0.011)	(0.005)	(0.011)	(0.018)
Percentage of Empl.	0.000	0.000	-0.000	0.000	0.002	0.002*
with Univ. Dergee	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Innovation	0.041	0.005	0.073	0.049	0.246***	0.200***
	(0.053)	(0.031)	(0.062)	(0.065)	(0.064)	(0.065)
Domestic Firm	-0.036	0.015	-0.281***	-0.206***	-0.302***	-0.173***
	(0.022)	(0.025)	(0.045)	(0.045)	(0.065)	(0.039)
Number of FT employees	0.000	0.0001**	0.000	0.001***	0.001**	0.000
	(0.000)	(0.0001)	(0.000)	(0.000)	(0.000)	(0.000)
Age of Firm	0.001	0.000	0.004***	0.004***	0.002**	0.003*
	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Capacity Utilization	0.001	-0.000	0.000	0.000	-0.001	0.000
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Formal Training	0.038	0.055**	0.104***	0.056	0.147***	0.088**
	(0.027)	(0.026)	(0.035)	(0.042)	(0.048)	(0.039)
Skill Intensity	-0.021	0.104**	-0.037	0.137	-0.047	-0.055
	(0.048)	(0.047)	(0.058)	(0.118)	(0.086)	(0.113)
Observations	434	383	850	645	642	478

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Table 3.6: Probit Estimation on the Extensive Margin of Financial Leverage as per External Dependence of Industry

	(1)	(2)	(3)	(4)	(5)	(6)
External Dependence	Low	High	Low	High	Low	High
Dep Var: Two Way vs	Export Only		Import Only		No Int. Trade	
Financial Leverage	-0.004	-0.003	-0.009	-0.059**	-0.058**	-0.018
(Ratio to Indus Avg)	(0.009)	(0.009)	(0.022)	(0.025)	(0.026)	(0.014)
Productivity	0.001	-0.000	0.011	0.010	-0.003	0.010
	(0.005)	(0.003)	(0.021)	(0.006)	(0.012)	(0.015)
Percentage of Empl.	-0.000	-0.000	0.002	-0.001	0.002	-0.000
with Univ. Degree	(0.000)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Innovation	0.299**	-0.017	0.122	0.020	0.195**	0.256
	(0.150)	(0.029)	(0.115)	(0.111)	(0.095)	(0.165)
Domestic Firm	-0.039**	0.007	-0.261***	-0.060	-0.214***	-0.075**
	(0.017)	(0.036)	(0.063)	(0.065)	(0.070)	(0.038)
Number of FT employees	0.000	0.0002***	0.000	0.001***	0.000	0.0003***
	(0.000)	(0.0001)	(0.000)	(0.000)	(0.000)	(0.0001)
Age of Firm	0.000	-0.001	0.004**	0.003	0.001	-0.000
	(0.000)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Capacity Utilization	0.000	-0.001	0.000	0.001	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Formal Training	-0.001	0.048	0.110*	0.089	0.129**	0.074
	(0.022)	(0.036)	(0.063)	(0.058)	(0.061)	(0.049)
Skill Intensity	-0.054*	0.114*	-0.103	0.168	-0.144*	-0.007
	(0.031)	(0.065)	(0.094)	(0.120)	(0.078)	(0.053)
Observations	193	173	357	251	247	191

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Financial Leverage Proxy 1: Ratio to Industry Average

Table 3.7: Probit Estimation on the Intensive Margin of Financial Leverage as per External Dependence of Industry (Ratio to Industry Average as a Proxy)

	(1)	(2)	(3)	(4)	(5)	(6)
External Dependence	Low	High	Low	High	Low	High
Dep Var: Two Way vs	Export Only		Import Only		No Int. Trade	
Financial Leverage	-0.0002	-0.0000	-0.001	-0.001**	-0.002**	-0.0007*
(Diff from Least Fin Lev)	(0.0003)	(0.0003)	(0.001)	(0.001)	(0.001)	(0.0004)
Productivity	0.000	-0.001	0.010	0.010*	-0.004	0.008
	(0.005)	(0.003)	(0.022)	(0.005)	(0.012)	(0.016)
Percentage of Empl.	-0.000	-0.000	0.002	-0.001	0.002	-0.000
with Univ. Degrees	(0.000)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Innovation	0.306**	-0.017	0.123	0.028	0.219**	0.278*
	(0.151)	(0.029)	(0.115)	(0.115)	(0.097)	(0.166)
Domestic Firm	-0.038**	0.006	-0.260***	-0.069	-0.218***	-0.076**
	(0.015)	(0.037)	(0.063)	(0.068)	(0.069)	(0.038)
Number of FT employees	0.000	0.0002***	0.000	0.001***	0.000	0.0003***
	(0.000)	(0.0001)	(0.000)	(0.000)	(0.000)	(0.0001)
Age of Firm	0.000	-0.001	0.004**	0.003	0.002	-0.000
	(0.000)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Capacity Utilization	0.000	-0.001	0.000	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Formal Training	0.000	0.049	0.109*	0.098*	0.126**	0.073
	(0.023)	(0.034)	(0.062)	(0.059)	(0.061)	(0.049)
Skill Intensity	-0.056*	0.115*	-0.096	0.130	-0.145*	-0.034
	(0.030)	(0.063)	(0.095)	(0.125)	(0.077)	(0.059)
Observations	193	173	357	251	247	191

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Financial Leverage Proxy 2: Difference from Least Financially Leveraged

Table 3.8: Probit Estimation on the Intensive Margin of Financial Leverage as per External Dependence of Industry (Difference From Least Financially Leveraged Firm as a Proxy)

	(1)	(2)	(3)	(4)	(5)	(6)
Asset Tangibility	Low	High	Low	High	Low	High
Dep Var: Two Way vs	Export Only		Import Only		No Int. Trade	
Financial Leverage (Extensive)	0.014	0.029	0.129***	0.074	0.149***	0.140**
	(0.020)	(0.034)	(0.032)	(0.047)	(0.033)	(0.055)
Productivity	0.003	-0.001	0.005	0.016	0.004	0.069**
	(0.004)	(0.010)	(0.005)	(0.016)	(0.008)	(0.029)
Percentage of Empl.	0.000	0.002	-0.001	0.003**	0.001	0.004**
with Univ. Degrees	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Innovation	0.018	0.054	0.092*	0.006	0.228***	0.199***
	(0.033)	(0.069)	(0.055)	(0.070)	(0.061)	(0.062)
Domestic Firm	0.002	-0.059**	-0.220***	-0.295***	-0.203***	-0.322***
	(0.024)	(0.028)	(0.043)	(0.053)	(0.047)	(0.064)
Number of FT employees	0.0001*	0.000	0.001***	0.000	0.001	0.0004*
	(0.0001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.0002)
Age of Firm	0.000	0.000	0.002**	0.007***	0.003***	0.002
	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Capacity Utilization	0.001	-0.000	0.000	0.001	0.000	-0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Formal Training	0.010	0.133***	0.085**	0.072	0.094***	0.174***
	(0.019)	(0.041)	(0.037)	(0.045)	(0.035)	(0.057)
Skill Intensity	0.027	0.063	-0.001	0.038	-0.051	-0.092
	(0.039)	(0.054)	(0.085)	(0.086)	(0.083)	(0.091)
Observations	527	290	940	555	712	408

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Table 3.9: Probit Estimation on the External Margin of Financial Leverage as per Asset Tangibility of Industry

	(1)	(2)	(3)	(4)	(5)	(6)
Asset Tangibility	Low	High	Low	High	Low	High
Dep Var: Two Way vs	Export Only		Import Only		No Int. Trade	
Financial Leverage	0.015	-0.043***	-0.042**	-0.071*	-0.016	-0.122***
(Ratio to Indus Avg)	(0.010)	(0.015)	(0.020)	(0.041)	(0.011)	(0.039)
Productivity	-0.001	-0.003	0.008	0.036	0.001	0.026
	(0.007)	(0.011)	(0.007)	(0.037)	(0.004)	(0.034)
Percentage of Empl.	-0.000	0.000	0.000	0.003*	0.000	0.005**
with Univ. Degrees	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Innovation	0.076	0.369*	0.072	0.137	0.191	0.448***
	(0.078)	(0.212)	(0.094)	(0.164)	(0.128)	(0.155)
Domestic Firm	-0.033	-0.005	-0.182***	-0.184**	-0.086*	-0.184**
	(0.033)	(0.023)	(0.063)	(0.085)	(0.050)	(0.072)
Number of FT employees	0.000	0.0001*	0.001***	0.000	0.001***	0.000
	(0.000)	(0.0001)	(0.0003)	(0.000)	(0.0001)	(0.000)
Age of Firm	0.000	-0.001	0.002	0.005**	0.001	-0.001
	(0.001)	(0.000)	(0.002)	(0.003)	(0.001)	(0.001)
Capacity Utilization	0.000	-0.002**	0.002	-0.001	0.000	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.002)
Formal Training	-0.017	0.047	0.129*	0.081	0.033	0.131**
	(0.022)	(0.043)	(0.067)	(0.063)	(0.030)	(0.066)
Skill Intensity	0.028	0.021	-0.036	0.025	-0.057	-0.074
	(0.033)	(0.039)	(0.105)	(0.123)	(0.051)	(0.085)
Observations	233	133	355	253	273	165

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Financial Leverage Proxy 1: Ratio to Industry Average

Table 3.10: Probit Estimation on the Intensive Margin of Financial Leverage as per Asset Tangibility of Industry (Ratio to Industry Average as a Proxy)

	(1)	(2)	(3)	(4)	(5)	(6)
Asset Tangibility	Low	High	Low	Hgh	Low	High
Dep Var: Two Way vs	Export Only		Import Only		No Int. Trade	
Financial Leverage	-0.0001	-0.0002	-0.001**	-0.001	-0.001*	-0.002***
(Diff from Least Fin Lev)	(0.0003)	(0.0004)	(0.001)	(0.001)	(0.000)	(0.001)
Productivity	0.000	-0.018	0.008	0.035	-0.001	0.035
	(0.004)	(0.016)	(0.006)	(0.031)	(0.004)	(0.032)
Percentage of Empl.	-0.000	0.000	-0.000	0.003	0.000	0.003*
with Univ. Degrees	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Innovation	0.081	0.279	0.083	0.122	0.217	0.402**
	(0.076)	(0.218)	(0.097)	(0.163)	(0.133)	(0.158)
Domestic Firm	-0.035	-0.036	-0.180***	-0.195**	-0.084*	-0.207***
	(0.032)	(0.031)	(0.066)	(0.080)	(0.050)	(0.067)
Number of FT employees	0.000	0.0001*	0.001***	0.000	0.001***	0.000
	(0.000)	(0.0000)	(0.000)	(0.000)	(0.000)	(0.000)
Age of Firm	0.000	-0.001	0.002	0.005**	0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Capacity Utilization	-0.000	-0.002**	0.002	-0.001	0.000	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.002)
Formal Training	-0.017	0.099**	0.136**	0.073	0.030	0.132**
	(0.024)	(0.050)	(0.068)	(0.064)	(0.031)	(0.067)
Skill Intensity	0.025	0.064	-0.049	0.028	-0.066	-0.091
	(0.034)	(0.044)	(0.109)	(0.121)	(0.057)	(0.080)
Observations	233	133	355	253	273	165

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes EU membership and year dummies

Dependent Variable are dummy variables with two way traders assigned a value of 1.

Financial Leverage Proxy 2: Difference from Least Financially Leveraged

Table 3.11: Probit Estimation on the Intensive Margin of Financial Leverage as per Asset Tangibility of Industry (Difference From Least Financially Leveraged Firm as a Proxy)

3.7 Figures

Distribution of Firms as per Trade Activity and Financial Leverage		
	2004	2008
Percentage of Firms Participating in Trade		
Domestic Trade Only	34	21
Exports Only	5	3
Imports Only	32	44
Exports and Imports	28	32
Distribution of Firms as per Financial Leverage		
% of Firms Financially Leveraged	29	39
Financial Leverage		
% of Domestic Traders Only with Financial Leverage	20	27
% of Firms that Export Only with Financial Leverage	34	45
% of Firms that Import Only with Financial Leverage	28	36
% of Two way traders with Financial Leverage	38	47
Intensity of Financial Leverage (Assets financed by Bank Loans)		
% of Domestic Traders Only	57	67
% of Firms that Export Only	61	55
% of Firms that Import Only	54	59
% of Two way traders	57	57

Figure 3.1: Distribution of Firms as per Trading Activities and Financial Leverage
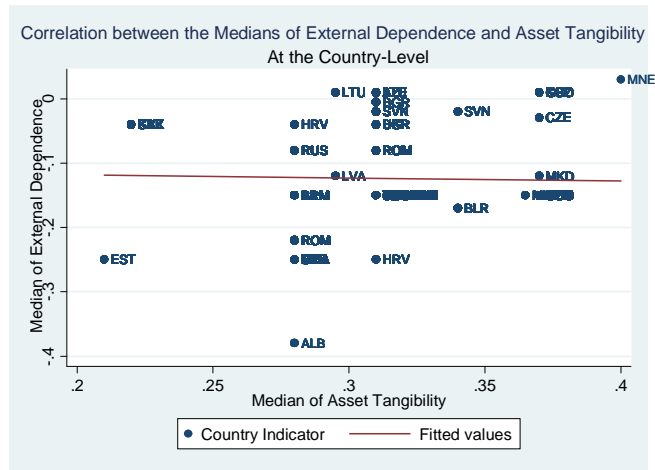

Figure 3.2: Correlation Between the Medians of External Dependence and Asset Tangibility at the Country Level
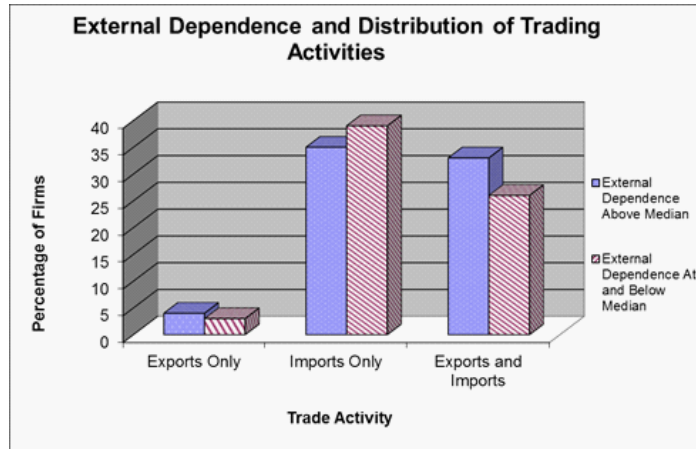
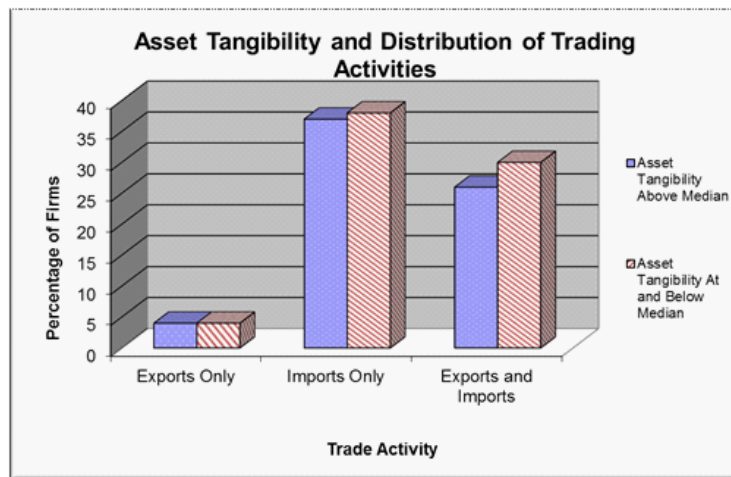Figure 3.3: Distribution of Trading Activties of Firms per Industry Level
External Dependence

Figure 3.4: Distribution of Trading Activties of Firms per Industry Level Asset
Tangibility

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3.8   Appendix

Variable	Description
Financial Leverage (Extensive)	Dummy variable (1 if fixed assets funded by private or state owned banks)
Financial Leverage (Intensive)	% of fixed assets funded by private or state owned banks. *Proxy 1* is the ratio to 4 digit industry average for given country in a given year. *Proxy 2* is the difference between the firm and the least financially leveraged firm within 4 digit industry industry for a given country in a given year.
Percentage of Employees with a University Degree	Self -explanatory
Innovation	Introduced new products or services or upgraded existing product line in last 3 years [Dummy Variable]
Domestic Firm	Less than 10% of the firm owned by a foreign entity [Dummy Variable]
Productivity	Sales less cost of production (sum of material and labor costs) divided by number of full-time production workers. [Value added/ number of full-time production workers]
Capacity Utilization	The percentage of the maximum level of production this firm can attain by fully utilizing the machinery, equipment and its employees
Age of Firm	Number of years the firm has been in operation in the country
# of Full Time Employees	Paid employees that are contracted for a term of one or more fiscal years and work up to 8 or more hours per day
Formal Training	Has structured and defined curriculum. Includes classwork, seminar, audio visual presentations, lectures, workshop and demonstrations. [Dummy Variable]
Skill Intensity	Fraction of workers that have special knowledge or ability (acquired) in work. Excludes workers above the working-supervisor level. Skill worker may have attended college, university or technical school or may have learned the skills on the job.
	Note: Descriptions borrowed from the 'Questionnaire Note' at http://www.enterprisesurveys.org. Source of all variables listed above is Enterprise Surveys (http://www.enterprisesurveys.org), The Word Bank.

Appendix 3A: Description of Control Variables

Note: Productivity is listed as ratio to the average of the productivity measure across firms at 4 digit ISIC industry level for a given country at a given year. For instance, the productivity for Firm A in industry code ISIC 1511 in Russia in 2008 is calculated as the productivity of Firm A divided by the average of the productivity of all firms within ISIC 1511 in Russia in 2008.

Country Code	Name of Country	EU Member in 2004	No of Observations
ALB	Albania	No	96
ARM	Armenia	No	329
AZE	Azerbaijan	No	326
BLR	Belarus	No	157
BIH	Bosnia and Herzegovina	No	178
BGR	Bulgaria	No	153
HRV	Croatia	No	103
CZE	Czech Republic	Yes	167
EST	Estonia	Yes	131
GEO	Georgia	No	161
HUN	Hungary	Yes	473
KAZ	Kazakhstan	No	520
KGZ	Kyrgyz Republic	No	141
LTU	Latvia	Yes	124
LVA	Lithuania	Yes	142
MKD	Macedonia, FYR	No	152
MDA	Moldova	No	314
MNE	Montenegro	No	41
POL	Poland	Yes	631
ROM	Romania	No	563
RUS	Russian Federation	No	807
SRB	Serbia	No	213
SVK	Slovak Republic	Yes	121
SVK	Slovenia	Yes	159
TJK	Tajikistan	No	164
UKR	Ukraine	No	732
UZB	Uzbekistan	No	190

Appendix 3B: List of Countries, EU Membership Status and Number of Observations.
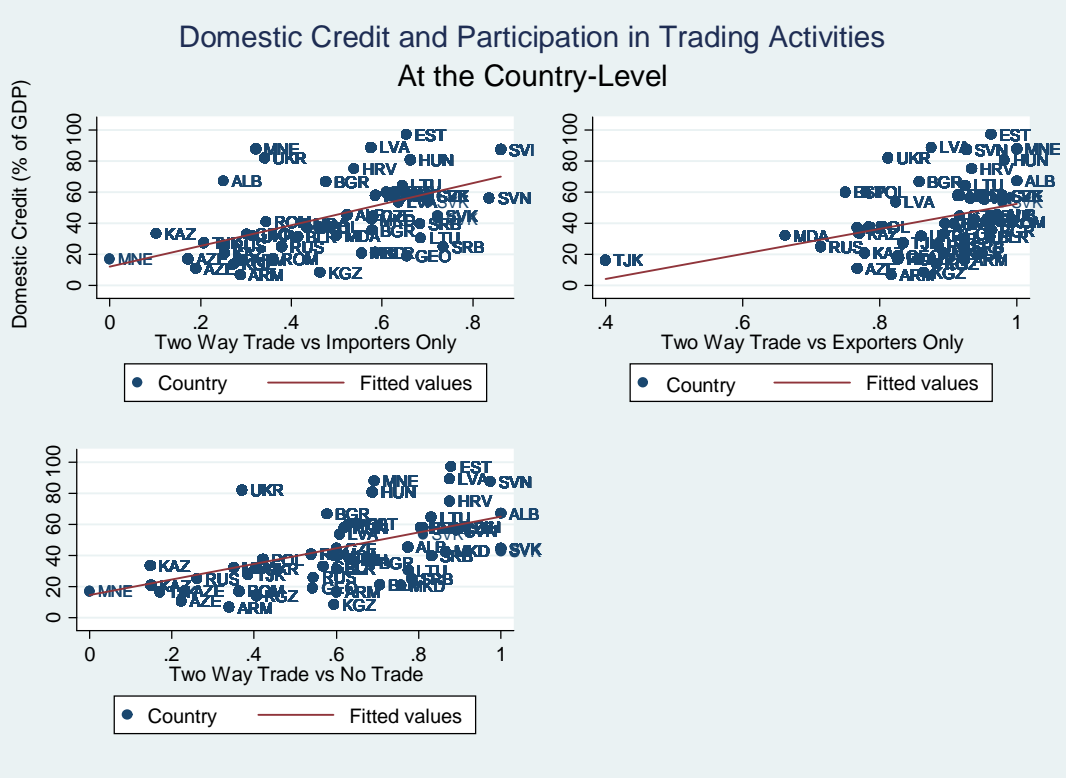
Appendix 3C: Domestic Credit and Firm Trading Activities at the Country Level
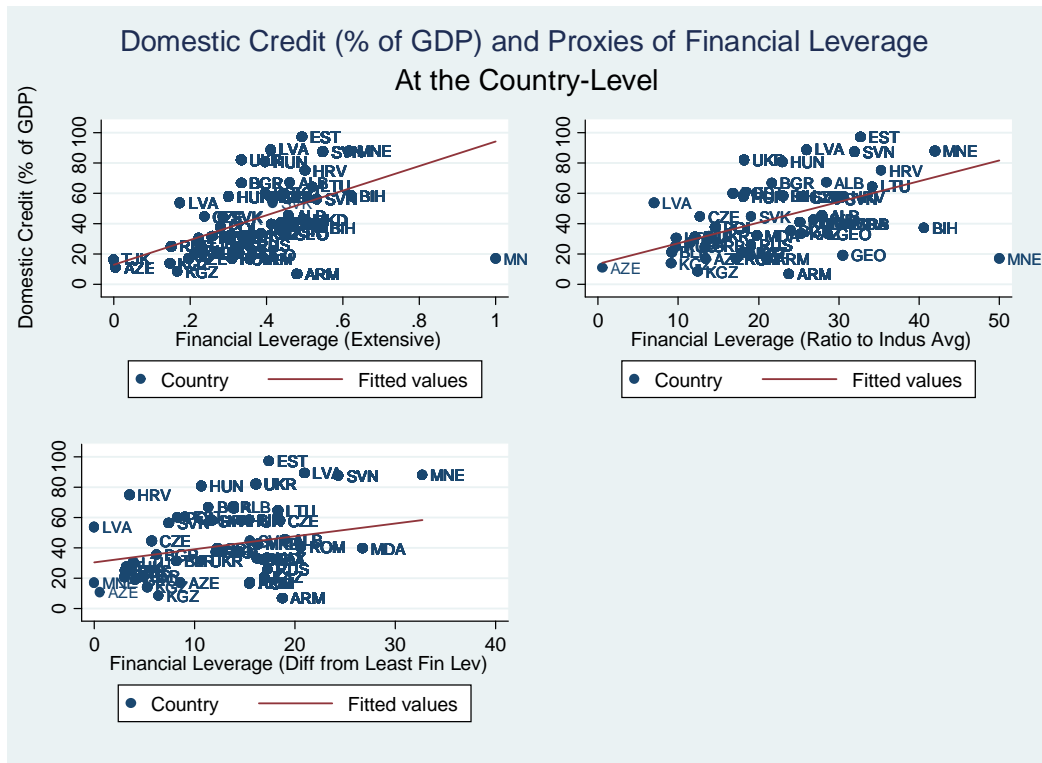
Appendix 3D: Correlation of Domestic Credit and Proxies of Financial Leverage
at the Country Level.

Domestic Credit (% of GDP) and Median of External Dependence and Asset Tangibility
At the Country-Level
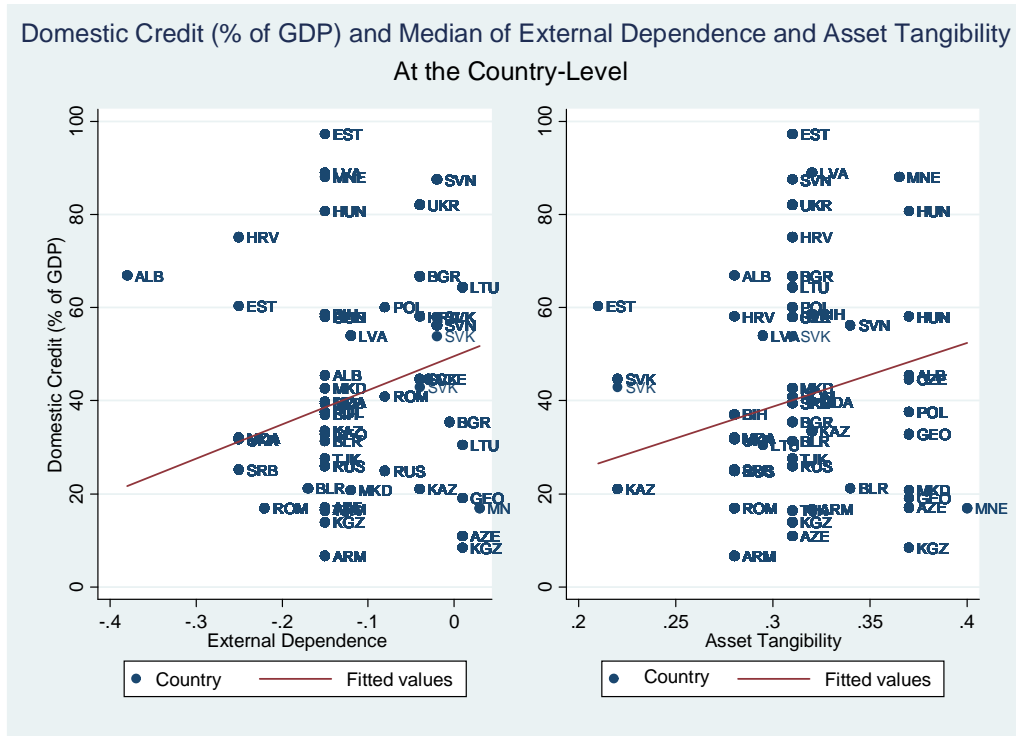
Appendix 3E: Correlation of Domestic Credit and Median of External
Dependence and Asset Tangibility at the Country Level.

| | External Dependence | | Asset Tangibility | |
	Above Median	Below Median	Above Median	Below Median
Neither	387	678	462	603
Exports Only	87	87	68	106
Imports Only	713	1081	676	1118
Two Way Traders	665	708	485	888

Appendix 3F: Number of Observations per Industry Characteristics

4 The Effect of Foreign Competition on Product Switching Activities: A Firm Level Analysis

4.1 Introduction

Firms face an important challenge to allocate their resources so that they can produce a range of products that provides the greatest value to their customers at the maximum amount of profit. To achieve this objective, firms may require to add or drop products as they undertake activities related to the switching of their product range[34]. Firms can undertake product switching activities if they either add new products that provide customers with greater value in terms of quality or produce at a lower marginal cost than other firms. Similarly, firms can undertake product switching activities if they drop old products that lack quality, or are produced inefficiently, or become obsolete. They can also switch products if they add and drop products concurrently, an activity defined as 'product churning' by Bernard et al (2010) and Iacovone and Javorcik (2010). Trade liberalization episodes are commonly undertaken by several trading partners. They not only allow the home country firms to expand their sales in foreign countries but also increase the presence of foreign goods within the home country. The exposure to foreign markets and goods can pressure firms to either produce a product range that incurs the lowest marginal cost or produce at a higher standard of quality.

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[34]Firms add products by introducing new products to their product range. Firms can drop products by i) discontinuing selling the product ii) outsourcing the production to another producer. However, as all firms considered are manufacturing firms, we remove the possibility that firms would purchase from other suppliers only to resell the products. The product range includes all products produced within the firm. An outsourced product is considered as a product dropped from internal production. Approximately 48% of the firms that drop products from internal production are outsourcing their products.

The effect of pressure from foreign competition can generate incentives for firms to improve their productivity levels through either investments in research and development (henceforth R & D) activities, or higher quality inputs, or more educated and skilled workforce. These improvements can consequently allow firms to switch products.

Dhingra (2010) points out that the effect of pressure from foreign competition influences the decision of firms to introduce new products and reduce their production costs through product and process innovations that can promote substantial improvements in the productivity of firms. For instance, firms exposed to foreign competition may rely on their investments in R & D activities that may dictate the rate at which firms can add or drop their products and eventually be able to churn their products. Switching products can involve payment of fixed costs related to addition of new products as this may require purchase of new equipment and facilities[35]. Further, 'cannibalization' or dropping old products may entail equipment, facilities and certain employees to become redundant and the costs related to lost knowledge of production associated with the dropped product. Several firms may prefer to produce a more effective product range but may only be able to afford the fixed costs needed to add new products only or drop old products only rather than churn products, a product switching activity that may require payments related to fixed costs of both addition of new products and dropping of old products. I test the main hypothesis that the effect of the pressure from foreign competition on the decision to (i) introduce new products and (ii) on production costs influences firms to churn products rather than undertake other

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[35]Switching products is defined as: i) churning products (adding and dropping of products), ii) adding products only, iii) dropping products only. The excluded group of firms undertakes no product switching activities.

product switching activities.

Bernard et al (2010) is the seminal paper that extends the basic Melitz (2003) model as they relate firm characteristics of multi-product firms to their strategy of product switching. Using the data collected in the Census of Manufactures by the US Census Bureau, they analyze product switching activities within firms by dividing the firms into mutually exclusive groups based on the strategy of product switching. The four groups are similar to the ones that are listed in this paper, namely (i) firms that do not undertake any product switching activities, ii) firms that add products only, iii) firms that drop products only iv) firms that churn products. Bernard et al (2010) focus on the effects of firm characteristics on product switching activities as they determine that firm characteristics such as firm size, age and productivity favor the decision of firms to add products, while they negatively influence the decision of firms to drop products. In addition, they also consider product characteristics such as scale and age dependence of products. I add to Bernard et al (2010) as I consider the effect of foreign competition on the decision to introduce new products and on the production costs on firms that switch their products.

The exposure to foreign competition and its effect on multi-product firms has been a focus of a few recent studies as they consider the relationship between the volume of exports and the number of goods exported due to trade liberalization episodes between trading countries. Bas and Bombarda (2011) consider the effects of market access expansion and foreign competitive pressures using data on French firms that export to China as they study the effect of trade liberalization experienced in relation to China's process of joining the WTO. With the Herfindahl index computed over all products exported by firms as a proxy for

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foreign competition, Bas and Bombarda (2011) find that the increase in foreign competition reduces the volume and the number of products exported by firms. Similarly, Abraham and Van Hove (2010) consider the effect of competition on Belgian products from Asian producers in foreign markets. They determine that Belgian firms have expanded the sales of higher quality products as a result of competition, particularly from Chinese firms. On the other hand, Iavocone and Javorcik (2010) determine that Mexican firms which exported newer products are less likely to survive in the market and that new exporters begin with limited varieties, expand their product scope of exported goods over the number of years. As firms expand their product varieties exported over time, it can imply that firms are likely to generate export revenue that allows them to improve productivity levels and in turn pay the related fixed costs to undertake product switching activities.

Mayer et al (2011) show the effect of differences in competition across export markets on the skewness of the products exported by firms. Tougher competition increases the relative share of products that perform better or are located closer to the core competency level of firms. Mayer et al (2011) suggest that competition increases the price elasticity of the demand curve, which can subsequently lead to a relatively higher demand of the product closer to core competency at constant relative prices. Firms are likely to allocate their production towards core competency as they add products that are better performing, while they drop products that are likely to be further away from core competency. Mayer et al (2011) determine that French exporters are likely to skew their exports towards their best performing products. However, Iavocone and Javorcik (2010) suggest that the volatility to introduce and discontinue products associated with firm en-

try and exit from export markets by firms in developing countries, such as Mexico, is greater relative to the volatility faced in developed and advanced countries by firms that churn product.

Trade liberalization exposes firms to the pressure of foreign competitors as it allows the presence of foreign goods within a home market as well as allows exporters to compete in a foreign market. Feenstra and Ma (2008) discuss the effects of trade liberalization on the product scope of firms. As trade liberalization occurs it can cause an effect on the variety of products produced by firms as they become more exposed to competition. With the 'cannibalization effect' and homogeneous marginal costs across products, the market size is increased through liberalization, which can lead to the number of firms to fall and an expansion of the product range by the firms. However, with marginal costs varying between products, the number of firms that survive may be insensitive to market size, the products introduced by firms may increase on average for each firms. Eckel and Neary (2010) use the concept of core competency for the product that is produced the most effectively by firms, with firms producing less of each product that is further away from their core competency. With globalization, competition increases the productivity level within firms, which may cause firms to drop products away from the core competency, while add products closer to their core competency.

Eckel et al (2010) introduce the concept of quality-based competence and cost-based competence as firms choose a configuration of their product range that maximizes their profits. They suggest that firms either invest in a product range that exhibits core competency with high marginal costs and high quality or low marginal costs aimed to provide consumers with cheaper products. If firms concentrate on quality-based competence, they are likely to invest in generating higher

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markups as a result of quality differentiation of the products. Aw and Lee (2009) show that the Taiwanese electronic firms drop products that are farthest from the core competency and improvements of the market performance of the plants is linked to the readjustments by firms to the production of their core competent products. As foreign competition influences the product range of firms, I incorporate a similar idea as I determine whether firms that are exposed to pressure from foreign competition churn products rather than add new products only, drop old products only, and do not undertake any product switching activities. I take into account whether firms move towards core competency as they adjust their product range. The influence from the effect of pressure from foreign competition on the decision to introduce new product or on production costs will either increase the number of products as firms add products or drop a number of products. In addition, firms can also churn products. Firms that churn products are likely to move closer to their core competency but the effect of the pressure from foreign competition on quality-based competence and cost-based competence can have varying effects on the type of competency firms may achieve.

Business Environment and Enterprise Performance Surveys (BEEPS) conducted surveys on firms in 27 CEEC and Central Asian countries[36]. This dataset, by the World Bank, is borrowed to study the impact of the effect of the pressure from foreign competition on the decision to introduce new products and on production costs on the different activities related to product switching. Ayyagari et al (2011), using a similar dataset, find that the pressure of foreign competi-

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[36]There are a total of 7288 observations recorded, with 3,600 firms surveyed in 2005 and 3,688 firms surveyed in 2009. There are 6,628 unique firms surveyed in either 2005 or 2009. Some firms were surveyed in 2005 as well as 2009. I only consider surveys for firms in manufacturing industries within ISIC Rev 3.1 15 to 37. Observations believed to be inaccurate by the interviewers are dropped.

tion on production costs rather than that of domestic competition and customers positively affect the decision of firms to introduce a new product line, which is similar to the result I present in this paper. Gorodnichenko et al (2008) use the same dataset as in this paper, but for a separate set of years, to determine whether globalization induces pressure on domestic firms to introduce new products within the same sample of countries. Gorodnichenko et al (2008) use various characteristics to define particular types of firms on the basis of their productivity-level differences between firms, differences in the age of firms and their exposure to different levels of corruption to determine whether foreign competition drives innovation within firms. The major difference between Gorodnichenko et al (2008) and my study is that the former consider addition or upgrade of product lines, new production technology and new accreditation rather than the possibility to switch products as they add products, drop products or churn products within their product range as a source of innovation by the firms.

Atkeson and Burstein (2007), Aw et al (2008), Constantini and Melitz (2008) and Aw et al (2009) consider the role of investments in R & D activities and export participation to increase the productivity levels of firms. In addition, Bustos (2011) and Lileeva and Trefler (2010) consider the role of export revenue generated by exporters to invest in higher technology, which subsequently increases productivity levels of firms. This suggests the complementarity nature of investing in advanced inputs, by either importing high technology inputs or investing in R & D activities, and export participation activities. Such investments increase the productivity levels of firms and consequently allow such firms to invest in subsequent improvements of their product range to achieve greater competency levels. Similarly, investments to increase the knowledge base of firms in terms of hiring

educated or skillful workforce can subsequently increase the productivity levels of firms. Different activities of product switching require firms to pay fixed costs related to investments undertaken or forgone (in terms of dropping products), such as R & D and creation of blueprint or replacing redundant equipment and labor, with firms that churn products likely to undertake the greatest payment of fixed costs[37]. The intensity of contractual agreements between the buyers and the sellers can dictate whether firms will produce goods that are either differentiated or homogeneous and standardized and determine whether firms will invest in either quality-based or cost-based competence. Industries that require contract agreements will be more likely to have firms produce differentiated products. Such firms may focus more on quality-based competence rather than cost-based competence as greater differentiation between products may reduce the amount of price competition between firms. Therefore, industries that are characterized by high contract intensity may have firms within it to be more likely impacted by the effect of pressure from foreign competition on the decision to introduce new products than on production costs. Vice versa results may be observed for firms within industries characterized by low contract intensity, in which price competition between firms can play a role on influencing the product switching activities of firms. Categorizing firms according to their productivity levels, constraints due to the lack of supply of adequately educated labor, and the contract intensive nature of the industry, I determine whether the influence of foreign competition on product switching activities varies across such subgroups.

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[37]Product churning will require greater fixed costs than any other of the activities as it involves firms to pay fixed costs to add products as well as drop products. If such fixed costs are paid, it can imply that firms are improving the efficiency of their product range by replacing products that are produced less effectively.

4.2 Theoretical Background

The theoretical model used below is borrowed from Bernard et al (2010), Mayer et al (2011), Brambilla et al (2009) and Allanson and Montagna (2005). These models integrate a multi-product framework into the single product model on heterogeneous firms using the standard monopolistic competition assumption. For simplicity, the model below is based on a static one period model, where firms receive a shock from foreign competitors that can spillover onto the decision of firms on their product switching activities through channels that improve productivity such as investments in R & D projects, inputs embedded with higher technology, or more educated and skilled workers[38]. Firms are likely to switch products as they face a greater price elasticity of demand for all products as their consumers have access to greater variety of products.

Firms that churn products add new products into their product range, while at the same time drop old products that become more inefficient to produce. However, firms maintain their production of the baseline product range which can be benchmarked at their core competency. Eckel and Neary (2010) and Mayer et al (2011) describe the baseline product as the product which provides the greatest value to their customers. Multiple product firms may have one product at their core competency, while several other products that are inferior to their core competency. Addition of new products can occur due to investments in R & D activities and improvements in productivity levels, which can spur firms to churn products. Bustos (2011) suggests that trade liberalization process allows exporting firms to increase their export revenues which is subsequently invested

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[38]It is important to note that initial productivity levels of firms will dictate whether they undertake investments in R & D activities or invest in higher technology. This is more specifically discussed in Aw et al (2009).

in technology that incorporates higher quality inputs which results in greater productivity levels for firms. Trade liberalization episodes increase the exposure to competition from foreign goods as firms either expand their sales into foreign markets or face greater competition from foreign goods within the home market. Firms that invest in R & D activities and participate in export activities, or expand their knowledge base by being able to employ a highly educated workforce are likely to generate higher productivity levels that promote subsequent undertaking of product switching activities.

The utility function is defined as:

$$U = (C_B^{\frac{\theta-1}{\theta}} + \int_0^N C_i^{\frac{\theta-1}{\theta}} di)^{\frac{\theta}{\theta-1}}$$

where $\theta > 1$ is the elasticity of substitution across products. C_B is the base-line product, while C_i is the composite for the other products that have been introduced by firms over time.

The products, $i > 0$ is defined as:

$$C_i = (\int_0^{n_i} ((\gamma(\phi))c_j)^{\frac{\sigma-1}{\sigma}} dj)^{\frac{\sigma}{\sigma-1}}, \ i \in [0, N]$$

where n_i is the number of varieties, $\gamma(\phi)$ indicates the quality (quality, γ, is an increasing function of productivity,ϕ), of the variety indexed by j, or the 'consumer taste' of each variety within the product produced. The parameter σ is the elasticity of substitution between varieties within products. σ is larger than θ[39]. For the purpose of this paper, the quality of each product can be aggregated

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[39] Although, the elasticity of substitution between varieties is greater than that across products, we do not rule out the cannibalization effect across products as firms can still substitute one product over another. However, it will be less costly for a firm to substitute within products and between varieties.

by the quality of varieties within each product. Therefore, the quality of varieties within products will determine the quality of the product range of the firms. Similar to Bernard at al (2010), $\gamma(\phi)$ is the demand parameter that represents the relative demand by consumers for varieties of the same product across different firms. Firms that provide greater quality of varieties within products are also likely to obtain greater sales of their products relative to other firms. Firms that add products to their product range will add additional varieties within those specific products, while firms that drop products will also drop the related varieties of the product as well. Eckel et al (2010) introduce the option of firms to focus on either cost-based competence or quality-based competence, with the former likely to increase the marginal costs as they move away from their core competency product and the latter likely to decrease the marginal costs but increase product quality. The increase in quality of products comes at the cost of an increase in the marginal costs of production. Dhingra (2010) and Bas and Bombarda (2011) discuss the effects of trade liberalization episodes on the pressure from foreign competition. In turn, the degree of pressure from foreign competition can induce firms to produce at either cost-based competence or quality-based competence.

I also assume that the total cost is an increasing function of the number of products firms produce, with the baseline quantity being produced at the lowest total cost.

The baseline product with multiple varieties, j is defined as:

$$C_0 = (\int_0^{n_0} c_j^{\frac{\sigma-1}{\sigma}} \, dj)^{\frac{\sigma}{\sigma-1}}, \quad i \in (0, N]$$

The effect of pressure from competitors may lead to changes in consumer tastes,

which may require firms to undertake product switching activities. However, firms that will drop their baseline variety will cease to exist. On the other hand, all firms that either add or drop products will also have incurred the initial fixed cost f_{NP} to enter the industry. Firms that either add new products or drop old products pay additional fixed costs, f_{AP} and f_{DP} respectively. For instance, firms that add products with multiple varieties may be required to invest in new technologies necessary, while firms that drop products with multiple varieties may be required to pay fixed costs towards the displacement of equipment and workers associated with the production of the dropped products. For the purpose of simplicity, f_{AP} = f_{DP} and the fixed cost to churn products is $f_{AP} + f_{DP} = f_{CP}$.

The probability of product churning should increase with the productivity levels of firms. The quality or efficiency of products produced is an increasing function of productivity. An increase in productivity levels will lower production costs, particularly important for firms that prefer cost-based competence. Hence, shocks to productivity can affect the dynamic nature of the firms as they churn their products. For instance, firms that receive a positive productivity shock are also likely to make investments towards improving the efficiency of products within the product range, even though they are moving further away from their baseline variety. Aw and Lee (2009) suggest that firms will drop products that are farthest away from their core set of products. Firms would use the opportunity to drop products in favor of producing products that can be more effectively produced and subsequently improve performance of firms.

Using a derivation similar to Brambilla (2009), the price function is the standard markup over marginal cost:

$$p_j(\phi, \gamma) = \frac{1}{\rho\phi}$$

where $\rho = \frac{\sigma-1}{\sigma}$. The initial productivity level is exogenously given to firms.

The aggregate price function is:

$$P = (P_0^{1-\theta} + \int_0^N P_i^{1-\theta} di)^{\frac{1}{1-\theta}}$$

where P_0 is the aggregate price for baseline variety and the P_i is the aggregate price for the products introduced.

$$P_i = (\int_0^{n_i} (\gamma(\phi))^\sigma p_j^{1-\sigma} dj)^{\frac{1}{1-\sigma}}, \ i \in (0, N]$$

The profit function of a product variety j within each product i can be expressed as:

$$\pi_j(\phi, \gamma(\phi), P_i, P) = \frac{\rho^{\sigma-1}}{\sigma} (\gamma(\phi))^\sigma \phi^{\sigma-1} P_i^{\sigma-\theta} P^{\theta-1} y - f_j$$

which can also be expressed more simply as:

$$\pi_j(\phi, \gamma(\phi), P_i P) = \Phi_j(\phi, \gamma(\phi), P_i, P) - f_j$$

where f_j is the variety-level fixed cost used to produce and promote each variety within the products. The effect of pressure from foreign competition on firms will likely result in changes in productivity dynamics of firms that may induce them to either increase their product range by adding new products, decrease their product range by dropping old products or maintain their product range by churning products. I determine the value associated to each product switching

activity below. Given the price indices, firms receive a larger value if they exhibit higher productivity levels as such firms can pay greater up-front fixed costs.

Firms that do not undertake any product dynamics will value themselves as V_{NP}, if they produce i products.

$$V_{NP} = (i)(\Phi_j(\phi, \gamma(\phi), P_i, P) - f_j) - f_{NP}$$

with $i > 0$. f_{NP} is the fixed cost associated with the basic operation of the firms and is incurred by all firms that add, drop and churn products.

Firms that add m products with j varieties to their range of products will have a value of V_{AP}, if they produce $i + m$ products.

$$V_{AP} = (i + m)(\Phi_j(\phi, \gamma(\phi), P_i, P) - f_j) - f_{AP} - f_{NP}$$

Firms that drop k products with j varieties from their range of products will have a value of V_{DP}, if they produce $i - k$ products.

$$V_{DP} = (i - k)(\Phi_j(\phi, \gamma(\phi), P_i, P) - f_j) - f_{DP} - f_{NP}$$

where $i - k \geq 0$

Firms that add and drop products will have a value of V_{CP}, if they produce $i + m - k$ products.

$$\begin{aligned} V_{CP} &= (i + m - k)\pi_j(\phi, \gamma(\phi)P_i, P) = (i + m - k)\Phi_j(\phi, \gamma(\phi), P_i, P) - f_j) \\ &\quad - f_{CP} - f_{NP} \end{aligned}$$

with $f_{CP} = f_{AP+DP}$. For simplicity, each number of product i, m and n have the same number of varieties j.

I assume $V_{NP} > 0$ in order for firms to enter the industry and produce greater than just the baseline product. Firms will prefer to churn products than add products only and drop products only if $V_{CP} > V_{AP}, V_{DP}$. I further assume $V_{AP} \simeq V_{DP}$ as addition of products increases total revenue which compensates for the increase in total fixed costs related to this activity, while dropping products may reduce costs of production associated with the varieties dropped, it can also reduce the revenues associated with the dropped products. Similarly, firms will undertake one of the product switching activities if (i) $V_{CP} > V_{AP}$, (ii) $V_{CP} > V_{DP}$ and (iii) $V_{AP}, V_{DP} > V_{NP}$. Therefore, I can rank the values as $V_{CP} > V_{AP}, V_{DP} > V_{NP} > 0$ if firms churn products rather than undertake other product switching activities.

Mayer et al (2011) notes that consumers have a 'love for variety', which can be within products as well as across products. Holding prices constant, welfare increases as the number of products increases. Firms may increase total costs of production as they add products with improved efficiency to their product range that also generates an increase in their welfare. As fixed costs to either add products or drop products are assumed to be similar, the 'love for variety' by the consumers can compensate for the increase in total costs for firms that add products. Firms that drop products will reduce their total costs of production, while considering the revenue forgone of the product dropped is minimal for firms as the dropped product is the farthest from core competency of firms.

The pressure from foreign competition may induce firms to undertake product switching activities as they may get inclined to invest in R & D activities and export participation in order to increase productivity levels necessary to pur-

chase the technology and inputs needed to achieve greater competency in their production. The testable implication for this theoretical model is that the effect of pressure from foreign competition on the decision to introduce new products and on production costs influences firms to churn products rather than undertake other product switching activities.

If firms believe that the value to churn products, V_{CP}, is larger than the value to undertake the other product switching activities, V_{AP} and V_{DP}, the pressure from foreign competition should influence firms to churn products rather than undertake the other product switching activities. As product switching activities entail varying up-front payments of fixed costs, certain firms may not be influenced by the effect of pressure from foreign competition due to constraints related to their firm and industry characteristics, such as lower productivity levels that do not support investments in R & D activities and export participation or the shortage of adequately educated labor relative to other firms within their industry or the nature of contract intensity of their industry.

4.3   The Data

The Enterprise Surveys, by the World Bank, which provide the extensive firm level data used is commonly known as the BEEPS dataset in the Central and Eastern European and Central Asian countries[40]. It is created jointly by the World Bank and the European Bank for Reconstruction and Development. In Appendix 4A, I list the names of the countries. There are 7,288 observations for

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[40]Enterprise surveys are available at http://www.enterprisesurveys.org. As with every survey, some data collected was marked as being doubtful by the interviewers, as the accuracy of the data collected is ranked. I have eliminated any observations that have been marked as doubtful by the interviewer.

27 countries, with 3,600 surveys conducted in 2005 and 3,688 surveys conducted in 2009. The firms included in this study only pertain to the manufacturing sector, ISIC Rev 3.1 sectors 15 to 37, although service sector firms were also surveyed in BEEPS. The sample includes mainly small and medium sized firms with less than 10,000 employees, with approximately 50 percent of the firms have less than 35 employees and 75 percent have less than 110 employees. It also includes firms that are located in large cities as well as rural areas. One of the major benefits of this survey is that self-reported variables are listed for various types of activities firms undertake related to international trade, competition and innovation.

The survey allows a creation of a variable that determines whether firms churn products, add products only, and drop products only. For instance, firms are asked whether they have introduced new products in the last 3 years, discontinued at least one product in the last 3 years or outsourced production activity that was previously conducted in-house during the last 3 years. The first variable defines the decision of firms to add products, while the latter two variables define the decision of firms to drop products from internal production.

[Figure 4.1 about here]

In Figure 4.1, I list the percentages of firms that undertake various activities related to product switching. However, the dataset does not provide details on whether firms have a net gain of products or a net loss of products[41].

[Figure 4.2 about here]

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[41]It is interesting to note that Iacovone and Javorcik (2010) observe the percentage of firms that introduce new export varieties to gradually decrease after the trade liberalization period. The percentages of firms that drop varieties or churn varieties remain constant and is much lower than the initial percentage of firms that add varieties.

The dataset provides a list of other variables that are useful to this study. The main independent variables are the indicators that define the impact of the pressure of competition, foreign and domestic, and customers on the introduction of new products and on the production costs[42]. Firms rank the pressure as 1, 2, 3 and 4. Firms that rank the pressure as 1 indicate that the pressure is not all important to them, while firms that rank the pressure as 4 indicate that the pressure is very important to them. A dummy variable is constructed using these variables with 0 indicates firms that consider pressure to be not important at all or slightly important (1 and 2 on the scale of rank of pressure), while 1 indicates that firms consider pressure to be fairly important or very important (3 and 4 on the scale of rank of pressure). In Figure 4.2, I plot the distribution of the indicator on pressure from foreign competition for firms that consider it to be fairly or very important. As I consider two different indicators on pressure, on the introduction of new products and on the production costs, it is important to separate the two variables and use them in separate regressions to avoid the issue of multicollinearity[43]. For instance, firms that consider the impact of pressure on introduction of new products to be important can also have similar considerations

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[42]Although, the export status and import status of firms can be highly correlated with pressure from foreign competition, it is likely that there are foreign firms located within the national market that contribute to this pressure. Roughly 40% of the non-exporters report pressure from foreign competition, and 35% of the non-importers report pressure from foreign competition. Further, about 31% of the firms that do not participate in any international trading activity are affected by pressure from foreign competition. This implies the presence of foreign firms and products within the national market as it affects approximately one-third of the firms that neither import nor export.

[43]The dummy variables on the effect of pressure from foreign competition on the introduction of new products and the pressure from foreign competition on the production costs reveal a correlation of about 75%. Only about 12% of the firms do not record higher pressure from foreign competition to introduce new products or on production costs if the other does, and vice versa. This shows that firms that face high pressure from one effect is likely to record high pressure from the other effect as well.

for the impact of pressure on production costs. There are several firms that can be affected by the pressure to improve quality as well as cut production costs (in terms of marginal costs of production).

In Appendix 4B, I list the other control variables used in the dataset. The purpose of these variables is to control for whether firms are domestic or foreign-owned, conduct their own in house R & D activities, the size of the firms by considering the number of full-time production workers and the output each worker generates. It also considers whether firms have vertical linkages with foreign firms or customers by either exporting their final product or importing their inputs from a foreign source. Bustos (2011) determines revenues from exporters as an important channel for firms to finance the fixed costs related to the undertaking of the adoption of higher and improved technology after a trade liberalization episode involving the home country. Further, the indicators also control for the capacity utilized by current production, whether firms have their assets financed by bank loans, provides labor quality improvement opportunities to their workers by having them participate in formal training programs and the composition of highly educated labor by accounting for the percentage of employees with a university degree.

Product churning should be correlated with market access and be more likely to be undertaken by firms located in the more developed and advanced markets where products produced by firms are likely to have greater demand. Therefore, Appendix 4C determines the relationship between the GDP per capita (constant 2000 US$) of a country and the country level averages of firms that churn products rather than not undertaking any product switching activities, add products

only and drop products only[44]. It is observed that the relationship is positive across the three activities. In Appendix 4D, I correlate the impact of the pressure from foreign competition on the desicion on introduction of new products and on production costs respectively with the GDP per capita (constant 2000 US$) of each country in the sample. Again, as predicted, I see a positive relationship between pressure from foreign competition at the country level and the GDP per capita (constant 2000 US$). Firms that are exposed to foreign markets due to the membership of their home country in the European Union (EU) also observe greater effect of pressure from foreign competition on the decisions to introduce new products and on production costs[45].

4.4 Results

4.4.1 OLS and Probit Estimations

Firm level characteristics are regressed with different trading activities, which can be expressed in the following equation:

$$Z_{ijct} = \beta_1 ADDONLY_{ijc(t-3,t)} + \beta_2 DROPONLY_{ijc(t-3,t)} + \beta_3 CHURN_{ijc(t-3,t)}$$
$$+\eta_t + \alpha_j + \alpha_c + \varepsilon_{ijct}$$

where Z_{ijct} is the firm characteristics, and dummies $ADDONLY_{ijc(t-3,t)}$ are firms that add products only, $DROPONLY_{ijc(t-3,t)}$ are firms that drop products

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[44]The data for the GDP per capita (Constant 2000 US$) is borrowed from the World Development Indicators by the World Bank.

[45]The countries that joined the EU in 2004 are Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia.

only, $CHURN_{ijc(t-3,t)}$ are firms that churn products only during the last 3 years, η_t is the year dummies, α_c is time-invariant country dummy, α_j is 3 digit ISIC (Rev 3.1) industry dummy, and ε_{ijct} is the error term. The purpose of this estimation is to determine the correlation between various product switching activities and firm characteristics as is done in Bernard et al (2010). This is an important contribution as it will help to determine whether firms that drop products only reveal similar correlation with firm characteristics as firms participating in other product switching activities. The results to the regressions that estimate the effect of pressure from foreign competition are reported later in the section[46].

[Table 4.1 about here]

In Table 4.1 , I observe that firms which churn products to significantly influence all firm characteristics compared to firms that do not undertake any product switching activities as their counterparts. Domestic firms and capacity utilization are negatively influenced, while the other firm characteristics are positively influenced. Firms that add products only are similar to firms that do not undertake any product switching activities in terms of the number of full-time production workers, capacity utilization and age of firms as these variables are not significantly affected by the decision of firms to add products to their product range or increase their varieties of products. On the other hand, firms that drop products only from their product range or reduce their varieties of products are similar to firms that do not undertake any product switching activities in terms of their domestic ownership, full-time production workers, sales per worker and percentage of employees with a university degree.

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[46]All results, except under the instrumental variable section, are calculated as the marginal effects at the mean values of the independent variables.

The main observation in Table 4.1 is that firms which undertake any one of the product switching activities correlate with firm characteristics similarly. That is, if firms add products only or drop products only, their correlation on firm characteristics do not differ in terms of the direction of the effect. With such a result, I can assume that firms that add products only or drop products only are likely to incur fixed costs similar to firms that churn products and that the product switching activities are related to the improvement of firm level characteristics. This result is different than that reported in Bernard et al (2010) as they determine that firms that drop products (net) are oppositely correlated with firm level characteristics such as change in real output and change in employment levels compared to firms that add products (net) to their product range. As Bernard et al (2010) focus on US data, this difference can be explained by the fact that US firms face lower barriers to entry, are typically smaller and face lower constraints in terms of labor relations than firms in Central and Eastern Europe and Central Asia. US firms may drop products more frequently compared to firms in my dataset as their products become less profitable. In addition, this difference in results can also be a result of subsidies to protected products by the governments in the CEEC and Central Asian countries which may not necessarily result in the drop of production as profitability of firms fall. Further, there is a positive correlation between firms that add products and firms that drop products as firms that churn products reveal better firm level characteristics. This emphasizes the fact that there is a reallocation of resources within firms as firms may face external pressure rather than a reallocation of resources across firms. Bernard et al (2010) reveal a similar result for add and drop rates at the product-level. This is an important finding as it can determine the significance of the impact of pressure

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from foreign competition on the performance of firms.

[Figure 4.3 about here]

In Figure 4.3, I observe that firms which churn products are likely to outperform firms that undertake other product switching activities and not undertake any product switching activity. In addition, all firms that undertake any of the activities related to product switching record generally better firm characteristics than firms that do not undertake any of the activities. Only the indicators on domestic ownership of firms and capacity utilization appear to be similar.

In Table 4.2, I report the regression of different activities related to product switching activities, expressed in the following equation:

$$Y^*_{ijc(t,t-3)} = \beta_1 PRESSFOR^*_{ijct} + \beta_2 Z_{ijct} + \eta_t + \alpha_j + \alpha_c + \varepsilon_{ijct}$$

where $Y^*_{ijc(t,t-3)}$ is the dummy variable related to product switching. Firms that churn products are assigned a value of 1, while the counterpart activities, which include firms that do not undertake any product switching activities, add products only and drop products only, are assigned a value of 0. $PRESSFOR^*_{ijct}$ is the dummy variable that takes a value of 1 if the pressure from foreign competition is either fairly important or very important and a value of 0 if the pressure is not important or slightly important. I assume that Y takes the form $\Pr(Y = 1|X) = \Phi(X'\beta)$. The $\varepsilon_{ijct} \sim N(0,1)$. I consider two blocks of regressions based on the effect of pressure from foreign competition on the decision to introduce new products or on the decision on production costs respectively, with the former likely to determine the pressure on preference of firms for quality-based competence and

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the latter for pressure on the preference of firms for cost-based competence[47]. It is important to note that preference of firms on the quality-based competence and the cost-based competence both require investments in upgrading production technology and introduction of new production techniques. The other notations are as listed previously above.

[Table 4.2 about here]

In Table 4.2, I present the results of the probit estimation with $PRESSFOR^*_{ijct}$ as dummy variables. The effect of pressure from foreign competition on the decision to introduce new products has a positive and significant impact at the 1% level on the probability that firms will churn products rather than not undertake any of the product switching activities and add new products only, but such an impact is not observed for firms that are likely to churn products rather than drop products only. The effect of pressure from foreign competition on the decision on production costs has a positive and significant impact on the probability that the firm will churn products rather than not undertake any product switching activities at the 5% level of significance and on the probability that the firm will churn products rather than add products only is significant at the 1% level. There is again no significant impact of the pressure from foreign competition on the decision on production costs to increase the likelihood that the firm will churn products rather than drop products only. This indicates that firms which drop products

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[47]As mentioned in Dhingra (2010), the effect of pressure from competition can be on the introduction of new products and production costs. The survey is devised to take into account the two effects of pressure from competition, where pressure on quality-based competence can be separated from pressure on cost-based competence. However, several individual firms can report importance to both types of pressure, which can lead to collinearity issues if regressed in one equation. The empirical strategy I employ separates the two variables into different regressions and determines the influence each of the effect of pressure from foreign competition has on the decision of firms to churn their products.

only do not face significantly greater pressure from foreign competition on both introduction of new products as well as production costs, implying that pressure from foreign competition does not induce firms to reduce varieties rather than invest in improving the efficiency of their product range by churning products. The dummy on R&D, import status, formal training of employees and percentage of employees with a university degree significantly impact the decision of firms to churn products against all three activities, determining the importance of these investments to product switching activities. Additionally, this indicates that it is not just investments in R & D projects that affect product switching activities, but investments in complementary assets are also important. However, the export status and financial leverage positively impacts firms that drop products only to churn products, while not influence firms that add products only. This can imply that firms which borrow from banks and export their products are also likely to add new products instead of just drop its old products or not undertake any product switching activities. On the other hand, capacity utilization has a negative effect on the likelihood that firms will churn products rather than add new products only to their product range and not undertake any product switching activities. If capacity utilization is a proxy for demand of a product, this is an indication that firms are likely to add products only and not undertake any product switching activities instead of churn products when faced with greater demand for their products.

The basic result from the probit estimation is that foreign competition does affect certain product switching activities, particularly if firms are to churn products. However, it does reveal varying impact of foreign competition between firms that undertake different activities. For instance, there is no significant impact of

both proxies of foreign competition on firms that churn products against firms that just drop old products. This implies that foreign competition does not play a role in determining the decision of firms to churn their products rather than drop a product only from their product range. This also suggests that the impact of foreign competition on the decision to introduce new products and on production costs increases the likelihood that firms which expand their product range may instead churn products, while firms that reduce their varieties of products are not likely to churn products. If firms that churn products are likely to increase their efficiency at which a product range is produced, firms that add varieties only instead move towards a more effective product range similar to their core competency level. The fact that pressure from foreign competition fails to influence firms to churn products rather than drop products only signifies that exposure to foreign competition leads to product churning activities only for selected firms that undertake certain product switching activities. The insignificance of the pressure from foreign competition after holding variables that account for productivity and firm performance constant explains the lack of impact of pressure from foreign competition on firms to churn products rather than drop products only. It will be interesting to determine whether the pressure from foreign competition is likely to influence product churning within firms that invest in R & D activities and participate as exporters as such firms can exhibit greater productivity levels with their ability to generate greater revenue.

4.4.2 Robustness Check–Instrumental Variable Estimation

The probit estimation can reveal inconsistent and biased results as it may not take into account the problems with potential endogeneity of the effect of pressure from

foreign competitors. The excluded instrument used in the first stage regression is the measure on obstacle from customs and trade regulation. Firms that record greater obstacles from customs and trade regulation are likely to face greater costs to export their final product to and import their inputs from a foreign country. The obstacles from customs and trade regulation may increase trade costs and create trade friction that can as a result lead to greater pressure from foreign competitors. Although, trade liberalization procedures between trading partners can reduce trade costs, certain obstacles from customs and trade regulations can still exist at the firm level and influence the effect of pressure from foreign competition. Firms that face greater constraints are likely to face greater pressure from foreign competitors as the products they sell or their imports of foreign inputs will be more expensive to procure. Aghion et al (2005) use policy instruments as excluded instruments to control for the endogeneity of competition, which is similar to the strategy adopted in this paper. Gorodnichenko et al (2008) use instruments that affect the entry of firms into the market, as competition may be influenced by the constraints of setting up business. As the obstacle to trade is more likely to affect domestic firms rather than foreign firms, it will lower the market size for the domestic firms, while potentially increasing the market size available to foreign firms within the international and national markets. The obstacles from customs and trade regulation will impact the effect of pressure from foreign competition on the decisions to introduce new products and on the production costs, which should in turn influence the product switching activities of firms.

The first stage regression is:

$$\Pr(PRESSFOR^*_{ijct} = 1) = \beta_1 OBSTRADE_{ijct} + \beta_2 Z_{ijct} + \eta_t + \alpha_j + \alpha_c + v_{ijct}$$

where $OBSTRADE_{ijct}$ is the obstacle from trade regulations and customs firms may face ranked as no obstacles to very severe obstacles. v_{ijct} is the error term associated with the first-stage regression.

The second stage regression is:

$$\Pr(Y^*_{ijc(t-3,t)} = 1) = \beta_1 PRESSFOR^*_{ijct} + \beta_2 Z_{ijct} + \eta_t + \alpha_j + \alpha_c + \varepsilon_{ijct}$$

[Table 4.3 about here]

[Table 4.4 about here]

The instrumental variable estimations result in an insignificant relationship between the endogenous variable and the dependent variable in the second stage regressions as is observed in Tables 4.3 and 4.4. Further, there is a negative and significant impact, at the 10% level, of both indicators on foreign competition for firms that drop products only. The negative effect can be explained by the correlation of the excluded instrument on the endogenous regressor. If obstacles to trade strongly influence the pressure from foreign competition, the fitted value of pressure from foreign competition can result in having a negative effect on the product churning activities of firms. With the standard errors much larger for the endogenous regressors in the instrumental variable estimations, the effect of pressure from foreign competition may not have a significant effect on product

churning activities as is observed in the probit estimations for firms that churn products rather than add products only and not undertake any product switching activities. Further, the excluded instruments can be considered valid as a high F-statistic for the weak instrument test and a significant outcome at the 1% level for the underidentification tests is observed for all the regressions. Inclusion of the export status, import status and capacity utilization as controls in the first stage regression does not reduce the power of the aforementioned tests. This determines that the excluded instrument significantly influences the endogenous variables in the first stage regressions and reveals explanatory power, even after other firm level characteristics are used as controls.

With the failure to reject the tests for exogeneity in each of the regressions, the instrumental variable estimations are consistent but inefficient, while the probit estimations are consistent and efficient. One explanation for this result is that it is unlikely that product switching activities themselves can influence the effect of pressure from foreign competition if the goal of the firms is to provide best value to their customers at the lowest marginal cost or at the best possible quality within their industry. In addition, as investments in R & D offer some sort of market power for the firms, it will not be optimal for firms to increase the effect of pressure from foreign competition as a result of switching products.

A similar strategy of instrumental variable estimation (not reported) reveals similar results using excluded instruments on obstacles to entry into business as suggested by Gorodnichenko et al (2008). However, the obstacles to business entry such as obtaining permits and licenses reported in the first stage regression reduce the effect of pressure from foreign competition instead.

4.4.3 Including Pressure From Domestic Competition and Customers

It is important to control for the effect of pressure from domestic competitors and customers on the decision to introduce new products and on production costs as well. There are possibilities of spillover effects between domestic firms that cannot be determined by the effect of pressure from foreign competition. In addition, pressure from customers can determine the strategy of firms related to product switching. It is necessary to include pressure from domestic competitors and customers into a regression. For instance, a dairy product firm in central Russia that also exports to nearby Central Asian countries, can be the only producer in the whole region but it may face competition from similar firms located near Moscow that sell their products to this region as well as from customers located in other regions of Russia. Given the competitive nature of an industry, it is important to isolate pressure from domestic competitors as well as customers in order to obtain the significance of the effect of foreign competitors on the decision to introduce new products and on production costs.

[Table 4.5 about here]

In Table 4.5, I observe that the effect of pressure from foreign competition on the decision to introduce new products is significant at the 1% level for firms that churn products rather than not undertake any product switching activities or add products only[48]. The effect of pressure from domestic competition is significant at the 10% level for the former category of product switching. On the other

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[48]The variables on competition can be strongly correlated to each other, which could cause problems related to multicollinearity within the listed variables in a regression. However, after testing for the inflation of the variance, through the variance inflation factor (vif), the problem of multicollinearity of the control variables is not a major issue.

hand, there is no significant impact on the probability that firms that reduce their varieties of products only are likely to churn products due to the effect of pressure from foreign competitors on either the decision to introduce new products or on production costs. Further, the effect of pressure from foreign competition on the decision on production costs does not significantly impact the probability that firms churn products rather than not undertake any product switching activities and drop products only. The effect of pressure from customers on the decision on production costs significantly influences the former at the 5% level, while the effect of pressure from domestic competition significantly influences the latter at 5% level. I do obtain a positive and significant impact at the 5% level on the probability that firms will churn products rather than add products only as it faces the effect of pressure from foreign competition on the decision on their production costs. The pressure from customers on production costs is also significant at 10% level for such firms. This basically implies the effect of pressure from foreign competition on the decision to introduce new products on firms that churn their products rather than not undertake any product switching activities and add products only. However, the effect of pressure from foreign competition on the decision on production costs is subtle for firms that are likely to churn products rather than add products only.

4.4.4   Firm Characteristics and Pressure

The following analysis distributes firms according to their knowledge-capital enhancing abilities such as investments in R & D activities and export participation and constraints faced due to an inadequately educated workforce. For the latter categorization, the firms are distributed with respect to the median at the four

digit industry level, with firms that face a greater constraint due to the uneducated labor listed as not possessing adequately educated labor[49]. In-house R & D activities mainly involve introduction of new and improved technology by firms to assist efficient production of their product range and is considered a major source of innovation. Firms can introduce new products by employing more educated and knowledgeable workforce to complement R & D activities, which can increase their desire for more adequately educated labor. In addition, investments in R & D activities and export participation can favor increases in their productivity. It is predicted that the more productive firms are likely to churn products and move towards core competency if they are exposed to the effect of pressure from foreign competition on the decision to introduce new products and on production costs as such firms can afford the fixed costs related to product switching activities. Similarly, firms that are not constrained by uneducated labor and have employees that are relatively more mobile towards the production of skilled intensive products are likely to churn products as they face pressure from foreign competition. Therefore, I will observe the relationship between pressure from foreign competition and the decision to churn products rather than undertake various product switching activities in Table 4.6 to Table 4.9. The number of observations of product switching activities and pressure from foreign competition per firm level characteristics is listed in Appendix 4E.

R & D Activities and Export Participation   Atkeson and Burstein (2007) discuss the impact of reduced marginal trade costs on product and process innova-

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[49]As the number of firms within each 4 digit industry in each country and time period may be limited, there is a possibility that many firms have values equal to that of the median firm.

tion of firms as exporting firms can benefit by the learning effect. Aw et al (2009) determine that firms which undertake both R & D activities and participate in export markets are likely to observe greater productivity levels than firms that do not undertake investments in R&D activities and do not participate in export markets. Investments in R & D activities as well as export participation allow firms to generate positive learning effects that contribute to subsequent gains in their productivity levels. However, such investments require up-front payment of fixed costs, which can only be paid by firms that observe a substantial initial level of productivity. Constantini and Melitz (2008) determine the role of the timing of trade liberalization on the strategies of exporting firms to innovate, as lower trade costs generate incentives for firms to invest in innovative activities to obtain greater returns due to higher productivity levels in the future.

Girma (2008) introduces the concept of the impact of foreign competition on exporters as it determines that firms exposed to international markets may need to raise their productivity levels through investments in R & D activities and higher technology inputs in order to remain competitive. Considering British and Irish firms, Girma et al (2008) suggest the evidence for learning by exporting is greater for the Irish firms as they are likely to be more dependent upon foreign markets than the British firms. Lileeva and Trefler (2010) determine that the Canadian plants which export their products are likely to participate in process innovation and adopt improved technology as their productivity levels increase. Nardis and Pappalardo (2009) determine that exporting firms that undertake product switching activities are likely to perform better than those firms that do not undertake any product switching activities. Brambilla et al (2009) consider R& D activities to indicate the level of sophistication of firms and associate R &

D activities with the increase in the likelihood that the firms will introduce new products. Growth in labor productivity allows such plants and firms to invest in higher technology, improved production processes and in relation to this paper, invest in product switching activities to achieve higher competency in their range of products.

[Figure 4.4 about here]

[Figure 4.5 about here]

In Figure 4.4, I sort the percentage of firms that undertake each product switching activity into groups categorized on the basis of firms that i) invest in both R & D activities and export participation and ii) invest in R & D activities or export participation but not both. Firms that invest in both activities, R & D and export participation, are also more likely to churn products than their counterparts. Firms that undertake investments in R&D activities and export participation are likely to observe greater productivity levels, which can increase the likelihood that firms will churn products. On the other hand, there can be several exporters that adopt higher quality inputs in order to substitute for the investments in R & D activities, while several firms that invest in R & D activities but not necessarily export their products directly. Firms that undertake either of the two investments, R & D activities and export participation, can also increase the probability that they will undertake product switching activities. Their productivity levels can be lower than firms that undertake both investments but can be high enough to allow them to pay the fixed costs associated with product switching activities. However, I will determine whether the group of firms that undertake either of the two investments, R & D activities or export participation,

will churn products rather than undertake the other product switching activities as such firms are exposed to the pressure from foreign competition.

The correlation of 12% between firms that experience pressure from foreign competition and undertake both or either of the two investments suggests that firms facing pressure from foreign competition are not strongly biased towards the group of firms that invest in both activities. As majority of the firms export rather than invest in R & D activities, firms that undertake either investments are likely to have firms report exposure to foreign competition as their products compete in foreign markets. However, such firms are likely to be characterized by lower productivity levels than firms that invest in both R & D activities and export participation. In accordance to the theoretical model represented earlier, productivity levels should play an important role in defining the ability of firms to churn products, as can be observed in Figure 4.5. Firms exposed to foreign competition will churn products if they are characterized by the necessary levels of productivity.

[Table 4.6 about here]

In Table 4.6, the impact of pressure from foreign competition on the decision to introduce new products significantly influences firms that invest in R & D activities and export as well to churn products, at either the 1% level or the 5% level of significance, but there is no impact of pressure from foreign competition on firms within the group that undertakes either but not both of the activities. This can indicate that firms which are perceived to be more productive than their counterparts and have invested in activities that increase their knowledge base are more likely to switch products to achieve a product range closer to their core

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competency with exposure to foreign competition. Firms that invest in either of the activities observe investments in R & D activities to significantly influence the decision to churn products, at either the 1% level or the 5% level of significance, rather than do not undertake any product switching activity and drop products only.

This result asserts the complementing nature of R & D activities and export participation. Within the group of firms that have paid the up-front fixed costs for investments in R & D activities and export participation, it is likely that they will churn products rather than undertake other activities as exposed to foreign competition. For such firms, exogenous variations through pressure from foreign competitors can influence them to churn products. Firms that are not participating in both R & D activities and export activities may not exhibit the productivity levels necessary to pay the fixed costs necessary to churn products as they are exposed to foreign competition. Firms within this group that face pressure from foreign competition are not likely to churn products rather than undertake other product switching activities. The other indicators on the pressure from competition, from domestic competitors and customers, do not have any positive significant impact on the decision of firms to churn products within the two groups of firms. It is also interesting to note that the import status is likely to influence firms to churn products rather than add products only but it will influence firms that invest in R & D activities and export to drop products only than churn products. Importers are not likely to increase the size of their product range but may tend to contract it as importing firms may focus on a limited product range, which can be a result of the relatively expensive and higher quality foreign inputs. In columns 2 and 6, the variable on R & D is significant and positive

at either the 1% level or the 5% level, determining that firms which only invest in R & D activities are likely to churn products rather than not undertake any product switching activities and drop products only. However, I do not observe R & D activities to influence firms to churn products rather than add products only. This can imply that firms that invest in R & D activities may not necessarily promote firms to churn products rather than add products only.

[Table 4.7 about here]

In Table 4.7, I observe that the effect of pressure from foreign competition on the decision on production costs significantly influences the probability that firms will churn products rather than add products only and drop products only within the group of firms that undertake both investments, at the 1% level and the 5% level respectively. The effect of pressure from foreign competition on the decision on production costs does not significantly influence firms to churn products rather than not undertake any product switching activities. This can imply that if fixed costs to churn products is significant in comparison to not undertake any product switching activities, firms facing pressure on production costs will not churn products to lower their production costs to achieve cost-based competence. They may only churn products rather than add products only and drop products only in order to achieve such competence. Other variables observed are very similar to that in Table 4.6, except that the pressure from domestic competitors on production costs is likely to positively influence firms to churn products than drop products only.

The effect of foreign competition on the decision to introduce new products and on production costs significantly influences firms to churn products within

the category of firms that have invested in R & D activities and participate as exporters. However, if firms have undertaken either one of the investments but not both, firms within this category are not likely to churn products rather than undertake other product switching activities. As firms that churn products may pay substantially greater fixed costs than firms that undertake other product switching activities, the productivity gains from investing in R & D activities and participating in export activities may be essential. With no evidence that foreign competition influences firms to churn products if firms invest in either R & D activities or export participation but not both activities, it is likely that the lack of productivity within this group of firms is inhibiting them. The analysis in the following section considers firms sorted according to the availability of educated workforce that can increase the productivity levels of firms.

Adequately Educated Labor   Acemoglu (2000) discusses the increase in skill bias in production due to the change in technology available such as personal computers and other skill-complementary investments. With the assumption that skilled labor and unskilled labor are imperfect substitutes, it is difficult for firms that hire workers who lack adequate education to adapt to tasks that require certain specialized knowledge in order to undertake product switching activities. The benefit of having skilled or educated labor not only allows firms to introduce new products that are of original variety but also allows firms to imitate products introduced by firms that are similar in nature as firms adopt technological change. Pointed out in Aghion (2002), there is an increase in demand of skill premium as a result of faster pace of technological change that may accompany introduction of new technologies as this may require adjustment and restructuring necessary

to learn the new technology. Falvey et al (2008) suggest that increased foreign competition can lead to disparities between wages of skilled and unskilled labor leading workers to switch from one industry to another. Further, skill upgrading within an industry that faces foreign competition may potentially increase the demand for skilled labor, where firms may need to employ more skilled workers.

This dataset provides a firm level indicator that determines whether firms have adequately educated labor. Firms are considered to have adequately educated labor if the firms record a lower value for the constraint due to uneducated labor than the median value of the constraint within the respective 4 digit ISIC industry in a given country and year [50]. Firms that face an inadequately educated workforce can be associated with their greater demand for educated labor than currently met by them. Inadequately educated workforce can indicate the desire of firms to undertake product switching activities and move towards core competence as they seek educated labor to undertake such activities. It is likely that firms which invest heavily in R&D activities are likely to be constrained by the lack of educated labor as they seek to complement their R&D activities by enhancing the knowledge base of their workforce. The positive correlation between R & D activities and the degree of the constraint of inadequately educated workforce indicate such a relationship.

[Figure 4.6 about here]

[Figure 4.7 about here]

In Figure 4.6, I show that the firms with adequately educated labor are slightly

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[50]The fixed effect industry dummy is at the 3 digit level as there is a potential problem of very few number of observations within certain 4 digit ISIC industries. As industry medians can still be calculated at the 4 digit industry level, I prefer to implement this level of disaggregation to calculate whether firms are constrained due to inadequately educated labor.

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more likely to add products only followed by churn products, with the least number of firms likely to drop products only. I also determine that the ranking is almost consistent across the constraints. Firms with inadequately educated labor are more likely to undertake product switching activities, as their demand for educated labor can be connected to their undertaking of product switching activities. However, it is important to note that the differences in the percentage of firms undertaking each of the product switching activity is not large across the two groups determining the constraints due to lack of adequately educated labor. In Figure 4.7, I present the distribution of the pressure from foreign competition according to the product switching activities. The distribution of firms that face pressure is similar across the two groups of firms with adequately educated and inadequately educated labor. There is a correlation of only 6% between the constraints that firms have inadequately educated labor and face pressure from foreign competition, indicating that the impact of pressure from foreign competition is not strongly biased towards a single group of firms. For instance, firms that desire high-skilled labor can be heavily constrained by the lack of having an adequately educated workforce even if they are able to employ all skilled labor available and are not able to generate enough productivity. On the other hand, firms that produce using a large proportion of unskilled labor can also be constrained by the lack of having an adequately educated workforce if they are to undergo changes in the production process that may alter the need for educated workers and their desire for greater productivity. Further, firms that are heavily constrained by the lack of adequately educated labor may not possess the labor sophistication necessary to undertake product switching activities that may require specialized training of their employees to obtain the productivity levels necessary for such activities.

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With the assumption that skilled labor tends to be more mobile than unskilled labor, similarly educated labor can move between products much more easily than uneducated labor. The basic idea of this constraint is that firms with adequately educated labor are not demanding educated labor given the supply of educated labor within the economy and are likely to be more flexible in allocating labor. The degree of the constraint can dictate whether the shocks from the pressure of foreign competition can induce firms to churn products as they can easily employ workers that are more mobile between products. Therefore, I can predict that the effect of pressure from foreign competition on the decision to introduce new products and on production costs should have a greater influence on firms that churn products if they have adequately educated labor. Even though such firms are less likely to undertake product switching activities, the pressure from foreign competition does influence firms with adequately educated labor to churn products, as will be observed in the following tables.

[Table 4.8 about here]

In Table 4.8, for firms characterized by adequately educated labor, I observe the effect of pressure from foreign competition on the decision of firms to introduce new products to have a positive and significant impact at the 1% level on the firms that churn products rather than firms that do not undertake any product switching activities. Similar result is obtained for firms that churn products rather than add products only. Again, there is no significant impact on firms that churn products against firms that drop products only across the levels of labor constraints. I observe a similar pattern for firms that churn products rather than add products only, with only the export status significantly impacting, at the 1% level, the

probability that firms with churn products. The effect of pressure from foreign competition on the decision to introduce new products, R & D activities and the percentage of employees with a university degree influence firms with inadequately educated workforce to churn products rather than add products only at the 10% level of significance. Firms that have adequately educated labor are likely to drop products only rather than churn products, at the 10% level of significance, if they face pressure from customers on the decision to introduce new products.

[Table 4.9 about here]

In Table 4.9, the effect of pressure from foreign competition on the production costs influences the probability at the 10% level that firms characterized by adequately educated labor are likely to churn products rather than add products only and not undertake any product switching activities. Further, pressure from customers and domestic competitors are significant for firms that are likely to churn products rather than add products only at the 5% level. Firms with adequately educated labor are likely to churn products rather than drop products only as the effect of pressure from domestic competitors on the production costs increases, with the level of significance recorded at the 1% level. Firms that have inadequately educated labor are likely to drop products only rather than churn products at the 5% level if the pressure from domestic competitors on production costs increases and at the 10% level if the pressure from customers on production costs decreases. Although, the effect of pressure from foreign competition is significant only at 10% level, it does indicate that firms with adequately educated labor will likely move towards the product range that exhibits cost-based competence.

The differences in the constraints by the level of adequately educated labor

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indicate that firms with adequately educated labor are more likely to churn products if they face pressure from foreign competition than not undertake any product switching activities or add products only. Firms that lack adequately educated labor are not able to churn products and invest in production of a product range closer to their core competency as they are exposed to pressure from foreign competition, except for the case where I do observe a slight impact at the 10% level of significance on the probability that the effect of pressure from foreign competition on the decision to introduce new products will increase the likelihood that the firm will churn products rather than add products only. The significance of firm characteristics also suggests that firms which are larger, possess financial leverage, have formally trained labor, and a greater percentage of employees with a university degree are also likely to churn products. This can imply that firms with higher firm level characteristics and not constrained by inadequately educated labor are likely to make investments in order to improve the efficiency of the product range as they have labor that is more mobile. I can determine no significance in the probability that the effect of pressure from foreign competition on introduction of new products or on production costs influences firms that drop products to churn products instead. It is important to note that the effect of pressure from foreign competition on the decision to introduce new products is more significant on firms that churn products than the effect of pressure from foreign competition on production costs. The effect of the pressure from domestic competitors and customers on the production costs also influences firms to churn products. In summary, firms that have adequately educated labor are more adaptive to the effect of pressure from foreign competition on both the decisions to introduce new products and on production costs than firms that are constrained

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by the lack of education of their workforce. However, firms are more likely to adapt to the quality-based competence than to the cost-based competence as the effect of pressure from foreign competition on the introduction of new products is significant at the 1% level compared to the 10% level of significance of the effect of pressure from foreign competition on production costs.

The major difference between the results in this section and the previous section where firms invest in R&D activities and export participation is that pressure from foreign competition does not influence firms to churn products rather than drop products only even if firms do possess adequately educated labor, while investments in R&D activities is likely to increase the probability that firms will churn products rather than drop products only. This implies that firms which invest in R&D activities and participate in export activities are likely to churn products rather than drop products only if exposed to foreign competition but adequate knowledge base may not necessarily have the same effect for such firms.

4.4.5 Contract Intensity

Nunn (2007) determines whether countries that have good environments for contractual agreements are likely to trade in products that require relationship-specific investments. Such investments involve asymmetric information between the contracting parties, which can lead to hold-up problems. Contracts between firms can be signed in order to mitigate this problem. However, such contracts can be very costly due to legal considerations. Although contractual agreements can be plagued with issues related to asymmetric information and moral hazard, they can also promote trade in the form of production networks between firms and increase productivity levels of firms as they purchase inputs that may be

customized to their production process. This effect is similar to investments in R & D activities and export activities as firms may generate productivity levels necessary to switch products by paying up-front fixed costs associated with the contract intensive investments. Eckel et al (2010) implement a similar measure of product differentiation to determine whether the strategy of firms is to achieve cost-based competence or quality-based competence as firms may switch products to achieve a more competent range of products. Nakhoda (2012a) determines the relationship between the extensive and the intensive margins of exports on the extensive and the intensive margins of import of foreign technology for the sample of CEEC and Central Asian countries for the varying contract intensity at the industry level[51]. With the likely existence of production networks between countries that exist in the region, particularly with the developed and advanced countries of Western Europe, I can predict a pattern of product switching activities undertaken by firms.

The measure of contract intensity is borrowed from Nunn (2007) and Manova et al (2011). With large differences in market power between the suppliers and the buyers, the contracting party with greater market power can influence the decision on introduction of new products and on production costs of the other contracting firms. For instance, if the relationship between the parties allows the firms to introduce new products, then the pressure on the introduction of new products can be significant on product churning activities within industries defined by high contract intensity. On the other hand, the more traditional contractual agreements can have prices fixed in advance, and make production costs important for firms.

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[51]Nakhoda (2012) has a useful discussion on this indicator measuring the contract intensive nature of industries.

Such firms may prefer to achieve cost-based competence.

[Figure 4.8 about here]

[Figure 4.9 about here]

Figures 4.8 and 4.9 define the percentage of firms undertaking different switching activities and the effect of foreign competition on these activities. The number of observations of product switching activities and pressure from foreign competition per contract intensity at the industry level is listed in Appendix 4E1 and 4E2 respectively.

[Table 4.10 about here]

In Table 4.10, the effect of pressure from domestic competition on the decision to introduce new products positively impacts the decision of firms to churn products rather than not undertake any product switching within low contract intensive industries. On the other hand, none of the variables on the pressure to introduce new products significantly influence firms to churn products within high contract intensive industries. The effect of pressure from foreign competition on introduction of new products significantly impacts the probability that firms will churn products rather than add products only within both types of industries. Within low contract intensive industries, the domestic pressure has a positive impact at the 10% level of significance, while the pressure from customers has a negative impact at the 10% level of significance within high contract intensive industries. The pressure from customers in high contract industries may rather increase the probability that firms do not churn products but only add products to their product range. Further, within high contract intensive industries, R&D

investments does not significantly impact the probability that the firms will churn products rather than add products only, implying the nature of contractual relationship may reduce the incentive for firms to invest in R&D activities and firms may find it difficult to eliminate obsolete products. This can also imply that firms are likely to borrow technology from their contracting partners, reducing the need for investments in R&D activities. Pressure from domestic competition positively impacts the decision of firms to churn products rather than drop products within low contract intensity industries at the 10% level of significance and within high contract intensity industries at the 5% level of significance[52]. Within high contract intensity industries, I observe the percentage of employees with a university degree to increase the likelihood that firms churn their products at either the 5% or 1% level of significance. This may indicate that within such industries, firms may require employment of highly educated workforce in order to achieve core competency.

[Table 4.11 about here]

In Table 4.11, I observe the impact of pressure from foreign competition on the decision on production costs to positively influence firms that churn products rather than add products only within high contract intensive industries at the 5% level of significance. The effect of pressure from foreign competition on the decision on production costs increases the likelihood that firms will churn products rather than add products only if they are within industries that sell differentiated products. On the other hand, the pressure from foreign competition on production

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[52]The presence of firms within a high contract intensity industry rather than low contract intensity is determined by the sales of their main product. If multiproduct firms sell additional products that do not require contracts between the suppliers and the buyers, they can drop those products without facing penalties imposed on breaking contractual agreements.

costs has a negative impact on the decision of firms to churn products rather than drop products only within low contract intensive industries. When firms are not bound by contractual agreements they are likely to drop products only instead of churning products as they can be under pressure to reduce their marginal costs of production and sell products that are closer to their core competency. However, the influence of pressure from domestic competitors on production costs positively influences firms to churn products rather than add products only within high contract intensive industries, but positively influences firms to churn products rather than drop products only across both industries at either the 5% level or the 10% level of significance. Pressure from customers on production costs significantly influences firms to churn products rather than not undertake any product switching activities or add products only within low contract intensive industries at the 1% level of significance, implying the importance of such pressure within industries in which products are sold or inputs purchased from the spot market.

In conclusion, I can determine that the effect of pressure to introduce new products, foreign and domestic, influences firms to churn products rather than add products only is stronger, with the significance at the 1% level, within industries characterized by low contract intensity rather than within industries characterized by high contract intensity, which records the significance at the 5% level. The influence of the pressure from foreign competition and domestic competition on production costs is stronger on the probability that a firm will churn products, as the significance is recorded at the 5% level, within industries characterized by high contract intensity. Comparatively, either no significance or significance at the 10% level for the impact of these variables is recorded for firms within industries characterized by low contract intensity. This can indicate that the contractual

agreements are of a more traditional nature, where the focus of the subcontracting party is to lower production costs. Further, Eckel et al (2010) suggest that differentiated products within high contract intensive industries are likely to focus on quality-based competence, while non-differentiated products within low contract intensive industries are likely to focus on cost-based competence. However, in this paper, I observe firms that sell differentiated products are also likely to focus on cost-based competence if the objective of firms as subcontractors is to lower production costs. As terms of contracts may involve low prices for their differentiated products, firms can be contract bound to lower production costs as firms are influenced by the effect of pressure on production costs. If firms sell differentiated products that are bound by contracts and are more sensitive to differences in quality across products, firms are likely to churn products rather than add products only within highly differentiated industries as they face pressure from foreign competition on the introduction of new products and on production costs to achieve both desired quality-based and cost-based competence, which is observed in Tables 4.10 and 4.11. This is similar to the results in Table 4.6 and 4.7. Firms that have paid up-front fixed costs to invest in either R & D activities or belong within industries characterized by high contract intensity that are likely to achieve quality-based and cost-based competence. On the other hand, if firms sell non-differentiated products the effect of the pressure from foreign competition and pressure from domestic competitors on the decision to introduce new products and the effect of pressure from customers on the decision on production costs is likely to influence firms to churn products rather than add products only.

Firms that churn products rather than add products only within low contract intensive industries are likely to be influenced by the pressure to introduce new

products, but it is pressure from customers on production costs that promotes the cost-based competence for firms that churn products rather than undertake neither product switching activities. Aghion and Schankerman (1998) suggest that in a more competitive environment where price competition between firms can be severe, which can be indicated by trading in a spot market, fewer high cost firms will be present as reduction of transaction costs improves entry of low cost firms into such industries. With low transaction costs between firms and customers due to the less contract intensive nature of the industries within which firms are present, the pressure from customers on production costs will play a significant role in influencing firms to move towards core competency as customers may demand lower prices for the products. The differences in contract intensity has revealed the effect of pressure from competition in different environments where transaction costs, asymmetry of costs between high cost and low cost firms and the market density for firms may vary.

4.5   Conclusion

I determine that the impact of pressure from foreign competition on the decision to introduce new products and on production costs influences firms to churn products, particularly those firms that add products only and do not undertake any product switching activities. Hence, I conclude that the effect of pressure from foreign competition is selective. The pressure from foreign competition has no effect on influencing firms to churn products rather than drop products only, except when the firm has invested in both R & D activities and export participation. Further, the effect of pressure from foreign competition to introduce new products and on production costs vary as the former is found to have a greater influence

on the product churning activities of firms rather than the latter in terms of the level of significance as well as the coefficients on the effect of pressure from foreign competition. Therefore, firms that add varieties to their product range are instead likely to churn products and move towards their core competency, which is more likely to be quality-based, under the effect of pressure from foreign competition. On the other hand, foreign competition has no influence on firms that reduce their variety to churn products instead. I can conclude that trade and investment liberalization by countries that allow firms to be influenced by foreign competition has a beneficial effect on firms that add varieties to their product range as they are also likely to replace their old products with a better quality or a lower cost option of products.

Subgroups on the basis of firm level investment activities and characteristics determine whether the effect of pressure from foreign competition is concentrated within firms that invest in R & D activities and export participation and possess adequately educated labor. It is indeed the case, as firms investing in R & D activities and export participation are likely to churn products rather than not undertake any product switching activities as they face pressure from foreign competition on the decision on introduction of new products and on production costs. The pressure from foreign competition has a significant effect for firms that possess adequately educated labor, as both pressure on introduction of new products and pressure on production costs significantly influence the decision of firms to churn products rather than not undertake any product switching activities and add products only. Regardless of the nature of contract intensity of industries, firms that face pressure from foreign competition on introduction of new products are likely to churn products rather than add products only. However, the

effect of pressure from foreign competition on production costs is likely to be significant only for firms that are within industries characterized by high contract intensity. Further, pressure from customers on production costs will increase the likelihood that firms will churn products within industries characterized by low contract intensity, as it indicates the nature of firms where products are likely to be exchanged on a spot market.

I contribute to the literature on multi-product firms and their product switching activities as I study the effect of pressure from foreign competition on firms that churn products rather than undertake other activities related to product switching. I determine the importance of such pressure on firms that move towards core competency as they face challenges to allocate their resources optimally in order to provide their customers with the greatest possible value from their product and at the same time reduce their own costs of production. Policymakers can benefit from this study as it determines that effect of pressure from foreign competition influences firms to churn products within the group of firms that are likely to invest in R & D activities and export participation or have access to an adequately educated workforce or belong to industries that are characterized by high contract intensity.

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4.6 Tables

Dep Variables:	(1) Domestic Firm	(2) R and D	(3) Full Time Prod Workers	(4) Sales Per Worker (t-3)	(5) Export Status	(6) Import Status
Add Products Only	-0.029*	0.162***	12.254	0.093***	0.145***	0.136***
	(0.017)	(0.021)	(7.563)	(0.033)	(0.022)	(0.016)
Drop Products Only	-0.009	0.063***	17.740	0.002	0.072**	0.107***
	(0.018)	(0.021)	(12.122)	(0.047)	(0.031)	(0.026)
Churn Products Only	-0.050***	0.280***	41.748***	0.110***	0.230***	0.229***
	(0.017)	(0.021)	(9.441)	(0.042)	(0.023)	(0.016)
Constant		0.001	-8.074	0.920***		
		(0.040)	(19.651)	(0.025)		
Observations	4,000	4,075	4,075	4,075	4,052	3,987
R-squared		0.211	0.158	0.007		

Dep Variables:	(7) Capacity Utilization	(8) Age of Firm	(9) Financial Leverage	(10) Formal Training	(11) Perc Univ Degree
Add Products Only	-1.187	0.378	0.148***	0.189***	2.548***
	(0.863)	(0.688)	(0.019)	(0.023)	(0.746)
Drop Products Only	-6.703***	2.976***	0.100***	0.160***	1.002
	(1.430)	(1.001)	(0.025)	(0.030)	(0.974)
Churn Products Only	-5.921***	2.781***	0.194***	0.278***	4.360***
	(0.971)	(0.837)	(0.019)	(0.025)	(0.828)
Constant	78.069***	10.858***			18.238***
	(2.500)	(1.416)			(2.062)
Observations	4,075	4,075	4,044	4,053	4,075
R-squared	0.126	0.141			0.282

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

Table 4.1: Probit and OLS Estimations of Firm Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var: Churn Products vs	No Switch	Add Only	Drop Only	Neither	Add Only	Drop Only
Press Foreign Innovation	0.090***	0.100***	-0.001			
(Dummy)	(0.025)	(0.022)	(0.031)			
Press Foreign Cost				0.057**	0.075***	0.003
(Dummy)				(0.029)	(0.023)	(0.029)
Domestic Firm	0.012	-0.010	-0.020	0.018	-0.008	-0.018
	(0.040)	(0.043)	(0.037)	(0.040)	(0.043)	(0.037)
R and D	0.290***	0.087***	0.179***	0.292***	0.091***	0.171***
	(0.028)	(0.030)	(0.026)	(0.028)	(0.029)	(0.026)
No FT Prod Workers	-0.000	0.000	-0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	0.001	-0.005	0.027	0.002	-0.004	0.025
	(0.016)	(0.011)	(0.019)	(0.016)	(0.011)	(0.019)
Export Status	0.111***	0.015	0.079**	0.113***	0.019	0.076**
	(0.027)	(0.027)	(0.033)	(0.027)	(0.027)	(0.034)
Import Status	0.162***	0.086***	0.083**	0.171***	0.091***	0.080**
	(0.025)	(0.026)	(0.032)	(0.025)	(0.025)	(0.032)
Cap. Util	-0.003***	-0.003***	-0.000	-0.003***	-0.003***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of Firm	-0.000	0.000	-0.001	-0.000	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Financial Leverage	0.155***	0.029	0.052*	0.150***	0.026	0.055*
	(0.029)	(0.028)	(0.030)	(0.029)	(0.029)	(0.032)
Formal Training	0.174***	0.062**	0.054*	0.176***	0.060**	0.053*
	(0.031)	(0.026)	(0.029)	(0.030)	(0.025)	(0.028)
Perc w/ Univ Degree	0.003***	0.001**	0.002**	0.002***	0.001**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,406	2,148	1,472	2,408	2,138	1,464

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.2: Probit Estimation of Pressure From Foreign Competition

	(1)	(2)	(3)	(4)	(5)	(6)
	Sec Stage	First Stage	Sec Stage	First Stage	Sec Stage	First Stage
Dep Var: Churn Products vs	No Switch		Add Only		Drop Only	
Press Foreign Innovation	-0.045		0.286		-1.126*	
	(0.487)		(0.453)		(0.598)	
Domestic Firm	-0.016	-0.124	-0.050	-0.116	-0.078	-0.134
	(0.108)	(0.111)	(0.106)	(0.101)	(0.118)	(0.107)
R and D	0.773***	0.231***	0.218**	0.202***	0.591***	0.251**
	(0.082)	(0.082)	(0.096)	(0.071)	(0.091)	(0.103)
No FT Prod Workers	-0.000	0.000	0.000	0.000**	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	-0.024	0.019	-0.014	-0.009	0.074	0.031
	(0.039)	(0.036)	(0.025)	(0.031)	(0.062)	(0.038)
Export Status	0.299***	0.428***	-0.004	0.416***	0.378***	0.433***
	(0.107)	(0.078)	(0.102)	(0.073)	(0.110)	(0.094)
Import Status	0.494***	0.413***	0.181*	0.386***	0.417***	0.543***
	(0.100)	(0.066)	(0.094)	(0.096)	(0.124)	(0.115)
Cap. Util	-0.007***	-0.001	-0.006***	-0.003**	-0.002	-0.005***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Age of Firm	0.000	0.002	0.002	-0.001	-0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Financial Leverage	0.401***	0.058	0.038	0.004	0.225**	0.203*
	(0.081)	(0.075)	(0.074)	(0.069)	(0.092)	(0.104)
Formal Training	0.449***	0.024	0.156**	0.026	0.105	-0.042
	(0.078)	(0.063)	(0.067)	(0.073)	(0.089)	(0.090)
Perc w/ Univ Degree	0.007***	0.002	0.003*	-0.001	0.005**	-0.001
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Obstacle from Customs		0.193***		0.188***		0.158***
and Trade Regulation		(0.029)		(0.025)		(0.043)
Constant	-0.340	-0.714***	0.218	-0.349*	0.249	-0.197
	(0.394)	(0.251)	(0.324)	(0.199)	(0.387)	(0.268)
Underident Test (p-value)	0		0		0	
Weak ident Test (F-stat)	39		39		22	
Wald test of rho=0	0.613		0.908		0.234	
Observations	2,220	2,220	1,979	1,979	1,406	1,406

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.3: Bi Probit Estimation of Pressure From Foreign Competition on Introduction of New Products

Dep Var: Churn Products vs	(1) Sec Stage	(2) First Stage	(3) Sec Stage	(4) First Stage	(5) Sec Stage	(6) First Stage
	No Switch		Add Only		Drop Only	
Press Foreign Cost	-0.314		-0.052		-1.044*	
	(0.487)		(0.476)		(0.542)	
Domestic Firm	-0.014	-0.184*	-0.051	-0.147	-0.059	-0.108
	(0.109)	(0.110)	(0.109)	(0.098)	(0.119)	(0.113)
R and D	0.783***	0.251***	0.245***	0.209***	0.551***	0.199**
	(0.082)	(0.072)	(0.091)	(0.068)	(0.090)	(0.096)
No FT Prod Workers	-0.000	-0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	-0.024	-0.018	-0.013	-0.031	0.062	0.005
	(0.039)	(0.043)	(0.027)	(0.030)	(0.057)	(0.059)
Export Status	0.313***	0.339***	0.045	0.369***	0.375***	0.444***
	(0.092)	(0.082)	(0.097)	(0.084)	(0.116)	(0.114)
Import Status	0.520***	0.261***	0.223**	0.338***	0.315***	0.280***
	(0.084)	(0.070)	(0.090)	(0.091)	(0.092)	(0.100)
Cap. Util	-0.007***	-0.003**	-0.006***	-0.003*	-0.002	-0.003*
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Age of Firm	-0.000	0.001	0.002	-0.002	-0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Financial Leverage	0.387***	0.053	0.033	-0.032	0.209**	0.130
	(0.080)	(0.072)	(0.075)	(0.070)	(0.096)	(0.101)
Formal Training	0.459***	0.098	0.157**	0.063	0.152*	0.107
	(0.078)	(0.065)	(0.063)	(0.068)	(0.089)	(0.079)
Perc w/ Univ Degree	0.007***	-0.000	0.003	-0.003**	0.005*	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Obstacles from Customs		0.167***		0.187***		0.178***
and Trade Regulations		(0.029)		(0.029)		(0.037)
Constant	-0.249	-0.533**	0.339	-0.714***	0.110	-0.430
	(0.395)	(0.253)	(0.295)	(0.237)	(0.364)	(0.282)
Underident Test (p-value)	0		0		0	
Weak ident Test (F-stat)	25		40		30	
Wald test of rho=0	0.394		0.637		0.189	
Observations	2,221	2,221	1,969	1,969	1,398	1,398

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.4: Bi Probit Estimation of Pressure From Foreign Competition on Production Costs

Dep Var: Churn Products vs	(1) No Switch	(2) Add Only	(3) Drop Only	(4) No Switch	(5) Add Only	(6) Drop Only
Press Foreign Innovation	0.070***	0.098***	-0.004			
	(0.027)	(0.022)	(0.033)			
Press Dom Innovation	0.057*	0.036	0.027			
	(0.030)	(0.028)	(0.030)			
Press Cust Innovation	0.024	-0.015	-0.024			
	(0.030)	(0.031)	(0.028)			
Press Foreign Cost				0.029	0.055**	-0.017
				(0.031)	(0.026)	(0.032)
Press Dom Cost				0.024	0.024	0.055*
				(0.030)	(0.027)	(0.033)
Press Cust Cost				0.075**	0.053*	0.002
				(0.032)	(0.030)	(0.032)
Domestic Firm	-0.003	-0.019	-0.029	0.014	-0.015	-0.024
	(0.040)	(0.043)	(0.037)	(0.041)	(0.043)	(0.038)
R and D	0.294***	0.093***	0.185***	0.288***	0.087***	0.173***
	(0.028)	(0.031)	(0.026)	(0.028)	(0.029)	(0.027)
No FT Prod Workers	-0.000	0.000	-0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	-0.001	-0.005	0.027	0.005	-0.003	0.026
	(0.016)	(0.011)	(0.019)	(0.016)	(0.011)	(0.019)
Export Status	0.119***	0.016	0.084**	0.122***	0.025	0.085**
	(0.028)	(0.028)	(0.033)	(0.028)	(0.028)	(0.033)
Import Status	0.158***	0.083***	0.081**	0.170***	0.090***	0.077**
	(0.026)	(0.026)	(0.032)	(0.025)	(0.026)	(0.032)
Cap. Util	-0.003***	-0.003***	-0.000	-0.003***	-0.003***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of Firm	-0.000	0.001	-0.001	-0.000	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Financial Leverage	0.152***	0.027	0.050*	0.147***	0.022	0.053*
	(0.029)	(0.028)	(0.030)	(0.029)	(0.029)	(0.032)
Formal Training	0.173***	0.063**	0.058**	0.172***	0.060**	0.052*
	(0.030)	(0.026)	(0.028)	(0.030)	(0.026)	(0.028)
Perc w/ Univ Degree	0.003***	0.001**	0.002**	0.002***	0.001**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,390	2,136	1,463	2,396	2,124	1,457

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.5: Probit Estimation of Pressure from Competition and Customers

R&D and Exports	(1)	(2)	(3)	(4)	(5)	(6)
	Both	Either	Both	Either	Both	Either
Dep Var: Churn Products vs	No Switch		Add Only		Drop Only	
Press Foreign Innovation	0.331***	0.053	0.248***	0.055	0.088**	-0.006
	(0.110)	(0.055)	(0.065)	(0.047)	(0.037)	(0.045)
Press Dom Innovation	-0.078	0.057	0.018	0.000	0.011	0.053
	(0.069)	(0.054)	(0.064)	(0.057)	(0.014)	(0.042)
Press Cust Innovation	0.087	-0.014	-0.085	0.015	0.002	-0.123**
	(0.119)	(0.063)	(0.074)	(0.049)	(0.012)	(0.058)
R and D		0.201***		0.082		0.110**
		(0.050)		(0.051)		(0.052)
Domestic Firm	0.170*	0.055	-0.039	0.009	0.001	-0.075
	(0.090)	(0.064)	(0.067)	(0.067)	(0.014)	(0.054)
No FT Prod Workers	0.0003**	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.0001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	-0.209***	-0.008	0.003	-0.012	-0.004	0.048*
	(0.063)	(0.026)	(0.037)	(0.015)	(0.011)	(0.025)
Import Status	0.031	0.085	0.243***	0.141**	-0.023***	0.004
	(0.109)	(0.070)	(0.092)	(0.063)	(0.009)	(0.062)
Cap. Util	-0.000	-0.004***	-0.001	-0.004***	0.000	-0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)
Age of Firm	0.000	-0.001	0.000	0.001	0.000	-0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Financial Leverage	0.076	0.168***	0.062	0.039	0.023	0.042
	(0.079)	(0.051)	(0.060)	(0.047)	(0.014)	(0.050)
Formal Training	0.234***	0.109**	0.102*	-0.044	0.013	0.023
	(0.090)	(0.044)	(0.060)	(0.044)	(0.020)	(0.039)
Perc w/ Univ Degree	0.004	0.004**	0.001	0.001	0.000	0.003**
	(0.003)	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)
Observations	229	689	419	745	214	489

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.6: Probit Estimation of Pressure From Competition and Customers on Introduction of New Products per R & D Activities and Export Participation

	(1)	(2)	(3)	(4)	(5)	(6)
R & D and Exports	Both	Either	Both	Either	Both	Either
Dep Var: Churn Products vs	No Switch		Add Only		Drop Only	
Press Foreign Cost	0.106	-0.015	0.211***	0.006	0.075**	-0.031
	(0.102)	(0.058)	(0.069)	(0.047)	(0.038)	(0.049)
Press Dom Cost	-0.016	0.013	0.084	-0.005	0.019	0.125**
	(0.097)	(0.054)	(0.063)	(0.056)	(0.018)	(0.063)
Press Cust Cost	0.081	0.082	-0.067	0.079	0.000	-0.045
	(0.140)	(0.062)	(0.081)	(0.060)	(0.010)	(0.055)
R and D		0.172***		0.063		0.094*
		(0.050)		(0.050)		(0.052)
Domestic Firm	0.144	0.077	-0.037	0.008	-0.000	-0.054
	(0.091)	(0.064)	(0.070)	(0.066)	(0.011)	(0.060)
No FT Prod Workers	0.0004***	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.0001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	-0.188***	-0.000	0.005	-0.012	-0.005	0.043
	(0.059)	(0.026)	(0.037)	(0.015)	(0.009)	(0.029)
Import Status	0.040	0.081	0.269***	0.143**	-0.019**	-0.005
	(0.116)	(0.066)	(0.096)	(0.062)	(0.009)	(0.062)
Cap. Util	-0.001	-0.005***	-0.002	-0.004***	0.000	-0.002
	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Age of Firm	0.000	-0.001	0.000	0.001	0.000*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Financial Leverage	0.128*	0.160***	0.068	0.031	0.019	0.045
	(0.071)	(0.052)	(0.060)	(0.047)	(0.013)	(0.051)
Formal Training	0.202**	0.116**	0.074	-0.033	0.005	0.025
	(0.082)	(0.045)	(0.059)	(0.043)	(0.014)	(0.042)
Perc w/ Univ Degree	0.004	0.004**	0.001	0.001	0.000	0.003**
	(0.003)	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)
Observations	230	695	420	738	213	488

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.7: Probit Estimation of Pressure From Competition and Customers on Production Costs per R & D Activities and Export Participation

	(1)	(2)	(3)	(4)	(5)	(6)
Adequately Educated Labor	Yes	No	Yes	No	Yes	No
Dep Var: Churn Products vs	No Switch		Add Only		Drop Only	
Press Foreign Innovation	0.100***	-0.018	0.098***	0.095*	-0.007	-0.029
	(0.033)	(0.049)	(0.032)	(0.049)	(0.044)	(0.047)
Press Dom Innovation	0.067*	0.019	0.052	0.008	0.052	-0.038
	(0.035)	(0.068)	(0.032)	(0.061)	(0.043)	(0.046)
Press Cust Innovation	0.026	0.031	0.018	-0.087	-0.056*	0.071
	(0.034)	(0.064)	(0.035)	(0.061)	(0.030)	(0.058)
Domestic Firm	0.013	0.004	-0.003	-0.010	0.023	-0.148***
	(0.045)	(0.088)	(0.052)	(0.073)	(0.051)	(0.055)
R and D	0.316***	0.320***	0.098***	0.101*	0.209***	0.193***
	(0.038)	(0.057)	(0.036)	(0.059)	(0.036)	(0.044)
No FT Prod Workers	0.000	-0.000	0.000*	-0.000	0.000	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	-0.007	0.007	0.013	-0.026	0.027	0.039
	(0.016)	(0.030)	(0.014)	(0.019)	(0.026)	(0.026)
Export Status	0.077**	0.218***	-0.017	0.151***	0.082**	0.021
	(0.038)	(0.065)	(0.035)	(0.052)	(0.042)	(0.061)
Import Status	0.176***	0.137*	0.078**	0.087	0.063	0.103
	(0.033)	(0.072)	(0.037)	(0.055)	(0.046)	(0.092)
Cap. Util	-0.003***	-0.002	-0.003***	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of Firm	-0.000	0.000	0.000	0.001	-0.002**	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Financial Leverage	0.119***	0.237***	-0.020	0.091	0.066*	0.033
	(0.039)	(0.049)	(0.032)	(0.057)	(0.036)	(0.061)
Formal Training	0.155***	0.185***	0.060**	0.032	0.068*	0.123***
	(0.033)	(0.058)	(0.031)	(0.061)	(0.038)	(0.044)
Perc w/ Univ Degree	0.002**	0.005***	0.001	0.002*	0.002**	0.003*
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	1,678	626	1,453	614	961	402

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.8: Probit Estimation of Pressure from Competition and Customers on Introduction of New Products per Educated Labor Constraints

	(1)	(2)	(3)	(4)	(5)	(6)
Adequately Educated Labor	Yes	No	Yes	No	Yes	No
Dep Var: Churn Products vs	No Switch		Add Only		Drop Only	
Press Foreign Cost	0.064*	-0.051	0.058*	0.063	-0.033	-0.009
	(0.036)	(0.053)	(0.033)	(0.055)	(0.042)	(0.052)
Press Dom Cost	0.025	0.048	0.072**	-0.087	0.137***	-0.094**
	(0.037)	(0.065)	(0.034)	(0.055)	(0.043)	(0.042)
Press Cust Cost	0.082**	0.039	0.068**	0.042	-0.035	0.099*
	(0.039)	(0.063)	(0.034)	(0.066)	(0.044)	(0.059)
Domestic Firm	0.033	0.044	-0.005	0.010	0.019	-0.142**
	(0.045)	(0.089)	(0.053)	(0.078)	(0.050)	(0.057)
R and D	0.310***	0.320***	0.092***	0.080	0.191***	0.191***
	(0.038)	(0.058)	(0.035)	(0.059)	(0.036)	(0.045)
No FT Prod Workers	0.000	-0.000	0.0001**	-0.000	0.000	-0.0004*
	(0.000)	(0.000)	(0.0001)	(0.000)	(0.000)	(0.0002)
Sales per Worker (t-3)	-0.005	0.016	0.016	-0.031*	0.023	0.041
	(0.016)	(0.029)	(0.015)	(0.019)	(0.026)	(0.027)
Export Status	0.080**	0.234***	-0.008	0.162***	0.085**	0.012
	(0.037)	(0.063)	(0.035)	(0.050)	(0.040)	(0.058)
Import Status	0.188***	0.140*	0.082**	0.089	0.053	0.109
	(0.032)	(0.072)	(0.037)	(0.058)	(0.045)	(0.092)
Cap. Util	-0.003***	-0.003**	-0.003***	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of Firm	-0.000	-0.001	0.000	0.001	-0.001*	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Financial Leverage	0.114***	0.227***	-0.031	0.103*	0.076**	0.028
	(0.039)	(0.049)	(0.032)	(0.059)	(0.036)	(0.062)
Formal Training	0.152***	0.182***	0.060**	0.034	0.067*	0.119***
	(0.032)	(0.056)	(0.030)	(0.062)	(0.038)	(0.044)
Perc w/ Univ Degree	0.002**	0.005***	0.001	0.002*	0.002**	0.002
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	1,681	632	1,444	611	957	400

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes 3 digit industry, country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.9: Probit Estimation of Pressure from Competition and Customers on Production Costs per Educated Labor Constraints

	(1)	(2)	(3)	(4)	(5)	(6)
Contract Intensity	Low	High	Low	High	Low	High
Dep Var: Churn Products vs	No Switch		Add Only		Drop Only	
Press Foreign Innovation	0.042	0.051	0.086***	0.094**	-0.070	0.010
	(0.045)	(0.038)	(0.032)	(0.037)	(0.049)	(0.040)
Press Dom Innovation	0.164***	0.024	0.078*	0.049	0.064*	0.073**
	(0.055)	(0.047)	(0.046)	(0.041)	(0.034)	(0.032)
Press Cust Innovation	0.051	0.022	0.071	-0.079*	0.053	-0.077**
	(0.040)	(0.050)	(0.047)	(0.044)	(0.038)	(0.034)
Domestic Firm	0.095	-0.039	-0.008	-0.018	-0.076	0.032
	(0.068)	(0.071)	(0.057)	(0.064)	(0.062)	(0.044)
R and D	0.329***	0.316***	0.138***	0.029	0.193***	0.194***
	(0.033)	(0.045)	(0.045)	(0.042)	(0.032)	(0.041)
No FT Prod Workers	-0.000	0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	0.032	0.000	-0.002	0.023	0.026	0.026
	(0.023)	(0.020)	(0.017)	(0.017)	(0.030)	(0.019)
Export Status	0.137***	0.214***	0.055	0.071	0.054	0.143***
	(0.041)	(0.049)	(0.044)	(0.045)	(0.048)	(0.047)
Import Status	0.208***	0.165***	0.109***	0.107**	0.143***	0.047
	(0.043)	(0.060)	(0.039)	(0.045)	(0.040)	(0.043)
Cap. Util	-0.006***	-0.003***	-0.002***	-0.003***	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of Firm	0.000	-0.000	-0.000	0.001	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Financial Leverage	0.147***	0.156***	0.027	0.113**	0.059	0.044
	(0.041)	(0.048)	(0.046)	(0.048)	(0.042)	(0.043)
Formal Training	0.228***	0.150***	0.090**	0.020	0.065*	0.074**
	(0.055)	(0.050)	(0.042)	(0.038)	(0.039)	(0.036)
Perc w/ Univ Degree	0.000	0.003***	0.000	0.002**	-0.000	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	891	692	853	718	613	525

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Includes country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.10: Probit Estimation of Pressure from Competition and Customers on Introduction of New Products per Contract Intensity of Industries

	(1)	(2)	(3)	(4)	(5)	(6)
Contract Intensity	Low	High	Low	High	Low	High
Dep Var: Churn Products vs	No Switch		Add Only		Drop Only	
Press Foreign Cost	-0.033	0.049	0.029	0.100**	-0.093**	0.034
	(0.039)	(0.054)	(0.033)	(0.041)	(0.039)	(0.048)
Press Dom Cost	0.069	0.060	0.034	0.087**	0.097**	0.075*
	(0.045)	(0.056)	(0.035)	(0.043)	(0.043)	(0.041)
Press Cust Cost	0.185***	0.034	0.135***	-0.037	0.055	-0.037
	(0.043)	(0.047)	(0.032)	(0.048)	(0.046)	(0.045)
Domestic Firm	0.129*	-0.023	0.016	-0.024	-0.070	0.029
	(0.067)	(0.071)	(0.061)	(0.065)	(0.063)	(0.046)
R and D	0.326***	0.305***	0.138***	0.030	0.196***	0.182***
	(0.034)	(0.046)	(0.042)	(0.042)	(0.034)	(0.043)
No FT Prod Workers	-0.000	0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sales per Worker (t-3)	0.038	-0.000	0.003	0.023	0.027	0.018
	(0.024)	(0.021)	(0.018)	(0.016)	(0.032)	(0.019)
Export Status	0.137***	0.239***	0.063	0.083*	0.055	0.139***
	(0.040)	(0.051)	(0.042)	(0.046)	(0.049)	(0.046)
Import Status	0.216***	0.165***	0.114***	0.105**	0.126***	0.037
	(0.044)	(0.055)	(0.039)	(0.044)	(0.037)	(0.043)
Cap. Util	-0.006***	-0.003***	-0.002**	-0.003***	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of Firm	-0.000	-0.000	-0.000	0.001	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Financial Leverage	0.146***	0.137***	0.018	0.100**	0.062	0.035
	(0.042)	(0.049)	(0.048)	(0.050)	(0.042)	(0.044)
Formal Training	0.244***	0.142***	0.091**	0.009	0.071*	0.059
	(0.054)	(0.052)	(0.040)	(0.040)	(0.039)	(0.037)
Perc w/ Univ Degree	0.001	0.003***	0.001	0.002**	0.000	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	891	696	846	713	612	522

Robust clustered standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Includes country and year dummies

The dependent variable is a dummy variable with 1 denoting firms that churn products

Table 4.11: Probit Estimation of Pressure from Competition and Customers on Production Costs per Contract Intensity of Industries

4.7   Figures
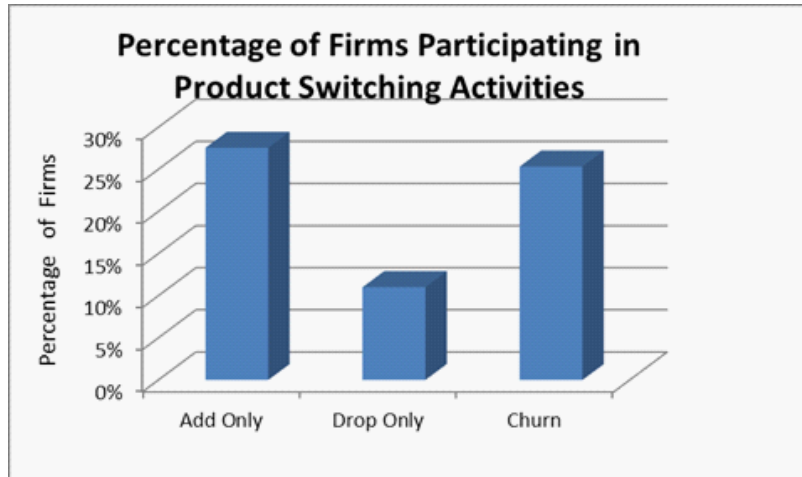
Figure 4.1: Percentage of Firms Participating in Product Switching Activities
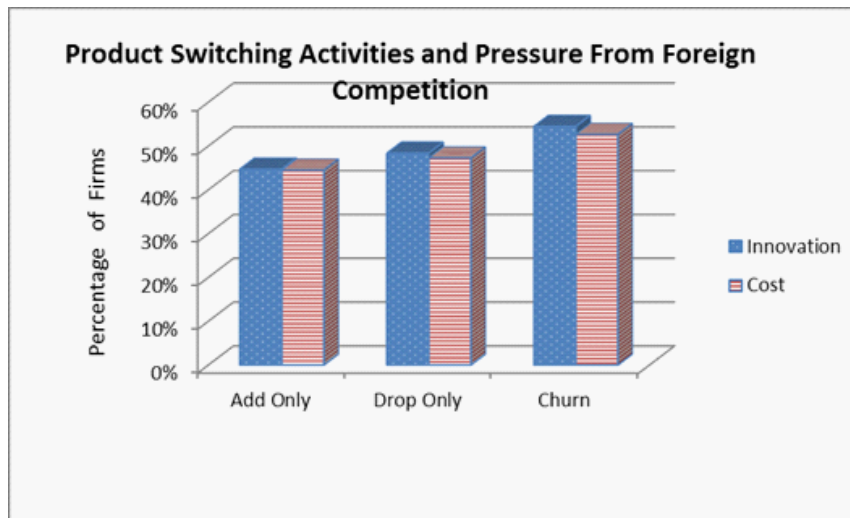
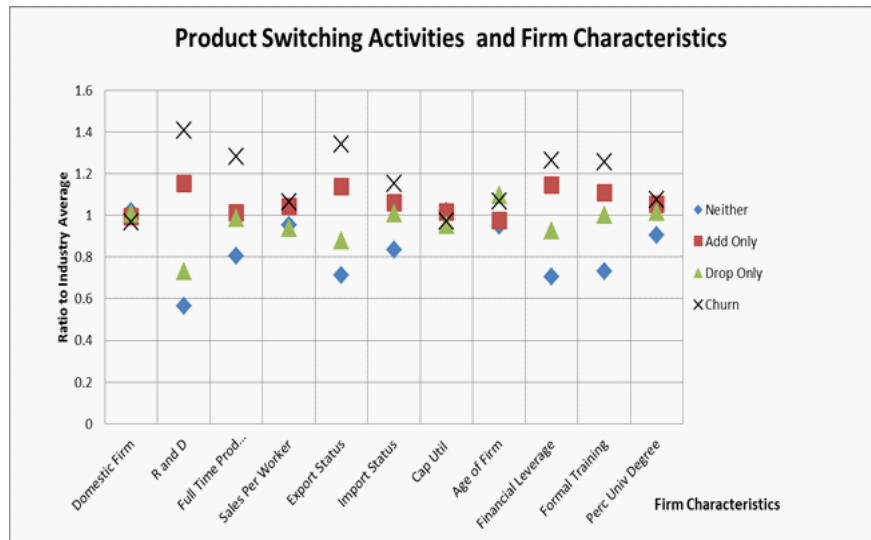Figure 4.2: Product Switching Activities and Pressure from Foreign Competition

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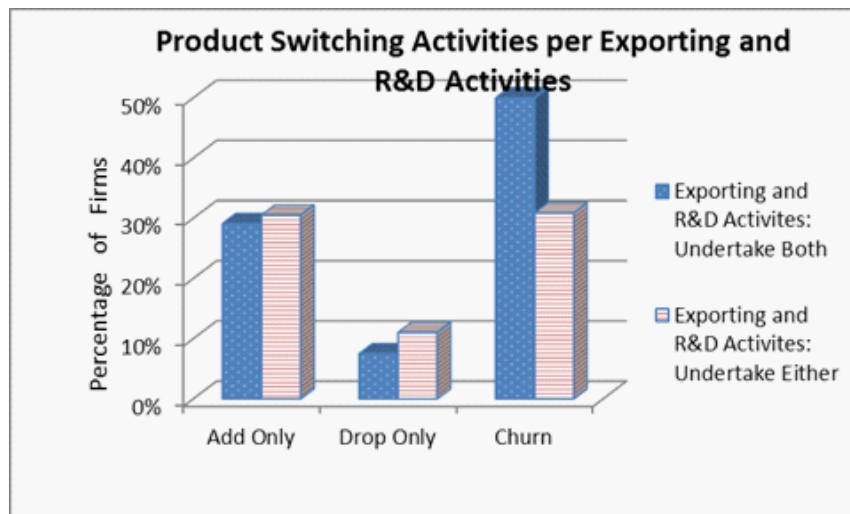Figure 4.3: Product Switching Activities and Firm Characteristics

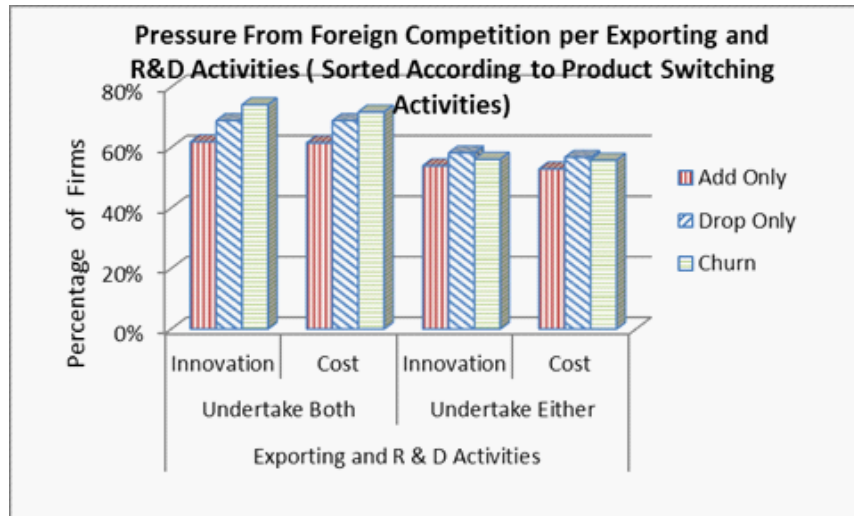Figure 4.4: Product Switching Activities per Exporting and R&D Activities

Figure 4.5: Pressure From Foreign Competition per Exporting and R&D Activities
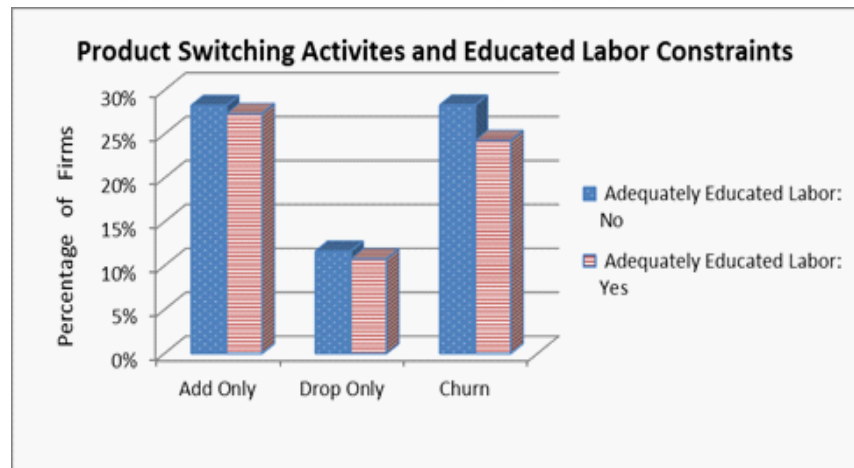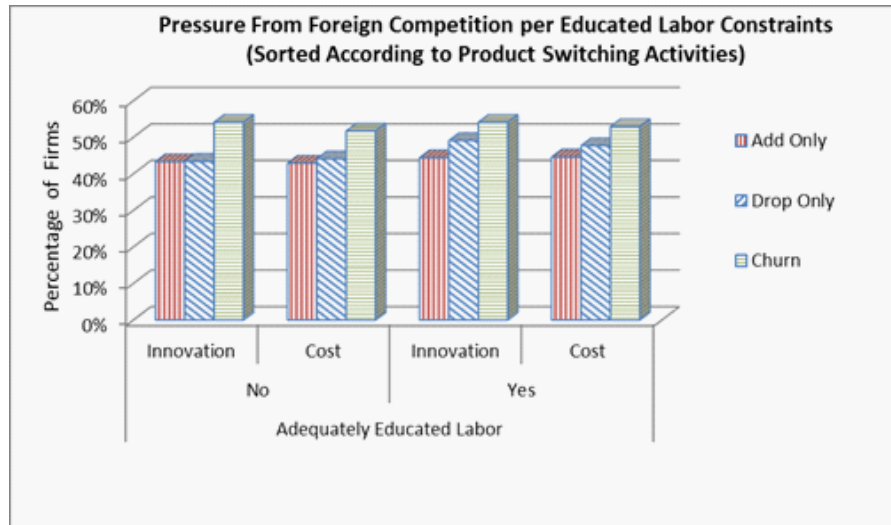

Figure 4.6: Product Switching Activities and Educated Labor Constraints

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Figure 4.7: Pressure from Foreign Competition per Educated Labor Constraints
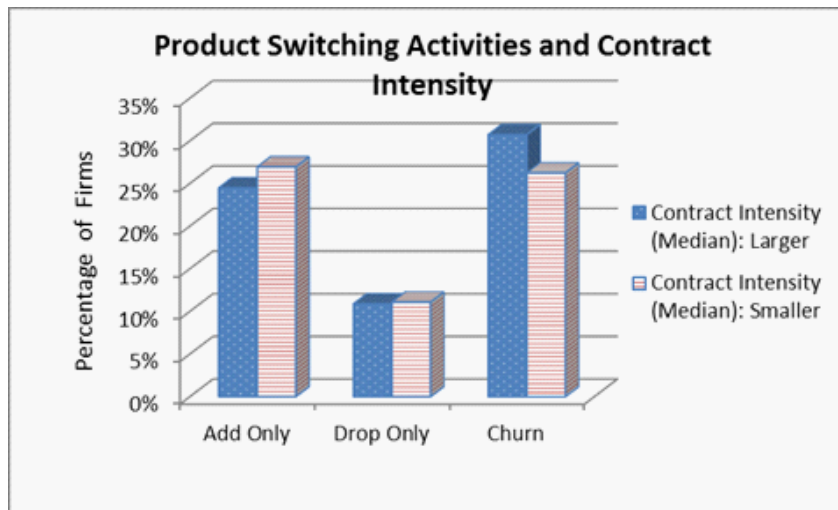
Figure 4.8: Product Switching Activities and Contract Intensity of Industries
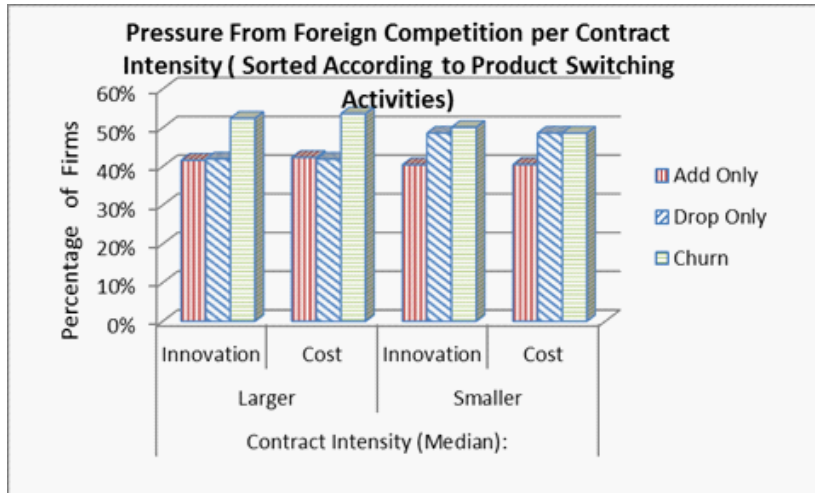
Figure 4.9: Pressure from Foreign Competition per Contract Intensity of Industries

4.8 Appendix

Country Name	No of Observation	Country Name	No of Observation
Albania	96	Latvia	124
Armenia	329	Lithuania	142
Azerbaijan	326	Macedonia, FYR	152
Belarus	157	Moldova	314
Bosnia and Herzegovina	178	Montenegro	41
Bulgaria	153	Poland	631
Croatia	103	Romania	563
Czech Republic	167	Russian Federation	807
Estonia	131	Serbia	213
Georgia	161	Slovak Republic	121
Hungary	473	Slovenia	159
Kazakhstan	520	Tajikistan	164
Kyrgyz Republic	141	Ukraine	732
		Uzbekistan	190

Appendix 4A: List of Countries and Number of Observations

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| Variable	Description
R & D (Dummy)	Investments in research and development activities during the last 3 years.
Domestic Firm (Dummy)	Less than 10% of the firm owned by a foreign entity
# of Full Time Production Workers	Workers (up through supervisor level) engaged in the production activities closely related to the production operations. Workers above the working-supervisor level are excluded.
Sales per Worker (Ratio to Industry Average)	Sales divided by number of full-time workers. [Sales/ number of full-time workers] at t-3
Export Status (Dummy)	Sells to an immediate recepient outside the border of the country
Import Status (Dummy)	Purchases inputs, equipment and installs production techniques that may have originated from a foreign source. For instance, imported yarn, foreign licensed weaving machine and ISO certification can be included as foreign inputs
Capacity Utilization	The percentage of the maximum level of production this firm can attain by fully utilizing the machinery, equipment and its employees
Age of Firm	Number of years the firm has been in operation in the country
Financial Leverage (Dummy)	Fixed assets funded by private or state owned banks
Formal Training (Dummy)	Has structured and defined curriculum. Includes classwork, seminar, audio visual presentations, lectures, workshop and demonstrations.
Percentage of Employees with a University Degree	Self -explanatory
Note: (Dummy) indicates dummy variable.	Note: Descriptions borrowed from the 'Questionnaire Note' at http://www.enterprisesurveys.org. Source of all variables listed above is Enterprise Surveys (http://www.enterprisesurveys.org), The Word Bank.

Appendix 4B: Description of Control Variables

Note: Sales per worker is calculated as the ratio to the average of all sales per worker within its relevant 4 digit industry for each given country and year.
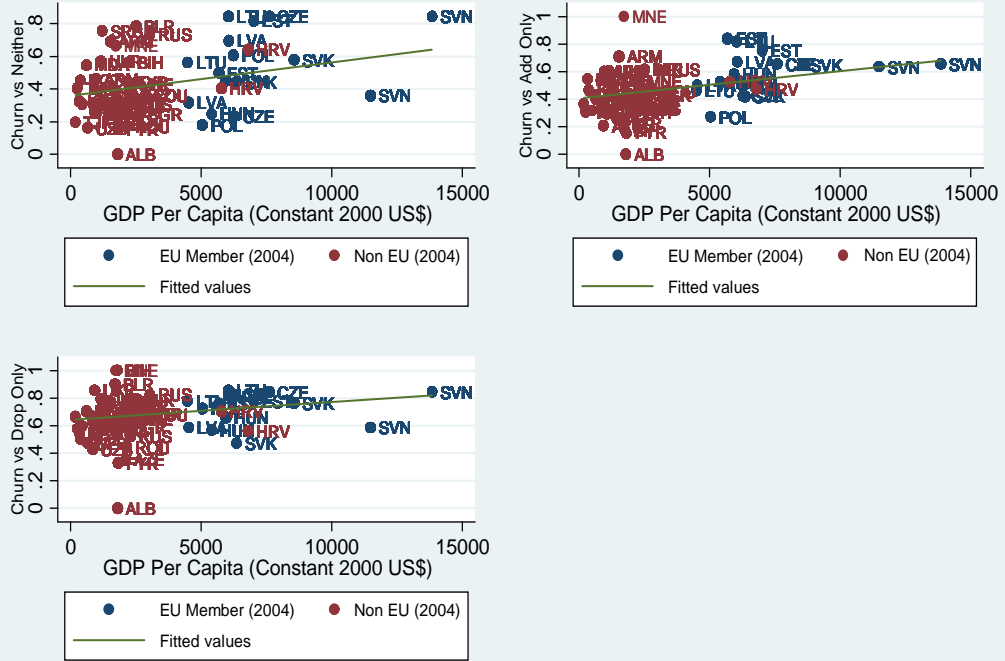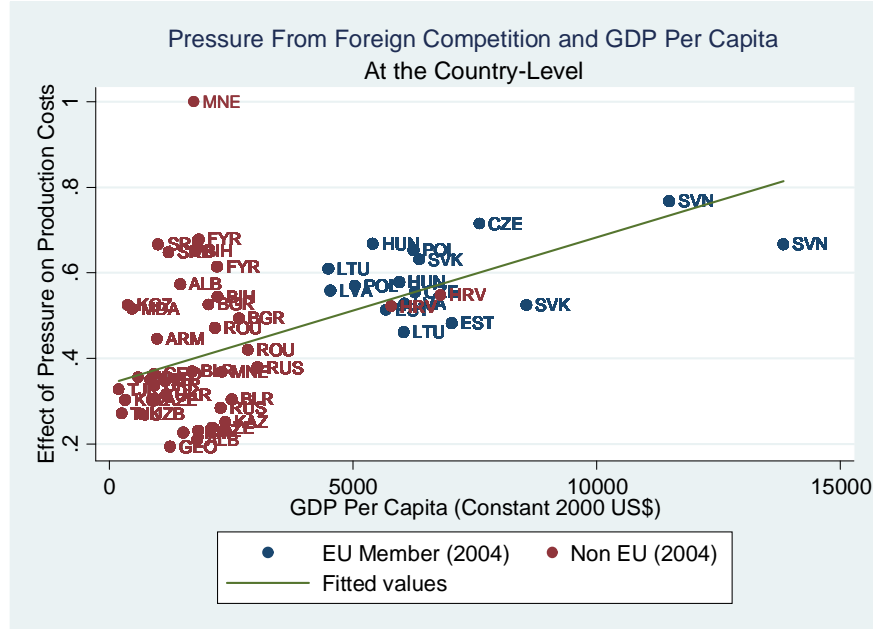
Appendix 4C: Product Switching Activities at the Country Level and GDP per
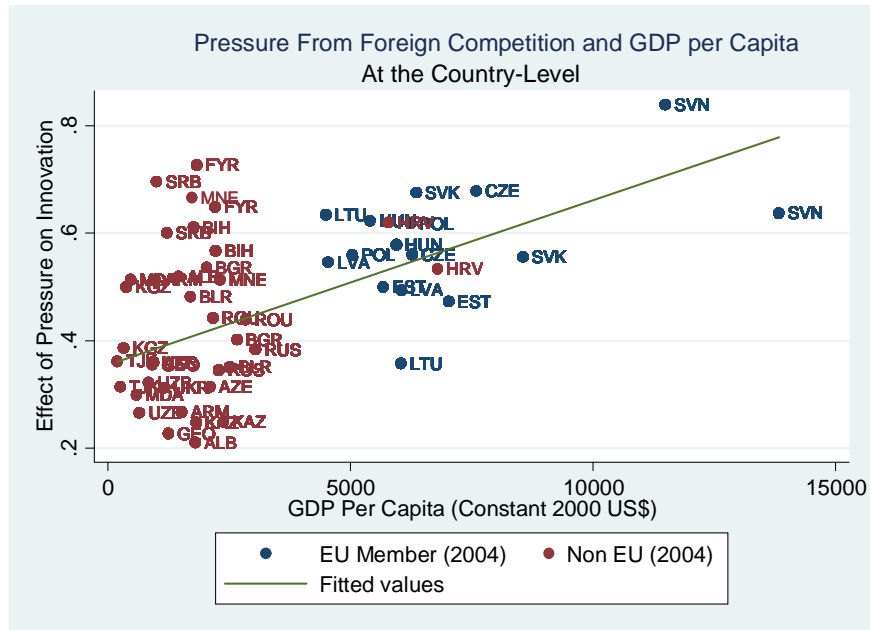
Capita

Appendix 4D1: Pressure From Foreign Competition on the Introduction of New

Products at the Country Level and GDP per Capita

Appendix 4D2: Pressure From Foreign Competition on Production Costs at the

Country Level and GDP per Capita

Product Switching Activities	R&D Investments\ Export		Adequately Educated Labor		Contract Intensity	
	R&D Investments and Export	R&D Investment or Export	No	Yes	Above Median	Below and Equal to Median
Neither	109	625	586	1884	540	823
Add Only	237	692	521	1368	513	724
Drop Only	61	250	215	540	228	298
Churn	407	700	522	1215	644	705
Notes:						
1) The measure for contract intensity only includes those firms that belong to industries for which information could be obtained from Nunn (2007)						

Appendix 4E1: Number of Observations of Product Switching Activities per Firm and Industry Characteristics

Pressure from Foreign Competition	R&D Investments\ Export		Adequately Educated Labor		Contract Intensity	
	R&D Investments and Export	R&D Investment or Export	No	Yes	Above Median	Below and Equal to Median
on Innovation (High)	572	1276	868	2240	878	1102
on Costs (High)	562	1257	868	2213	874	1101
on Innovation (Low)	267	1028	995	2827	1158	1492
on Costs (Low)	276	1052	994	2840	1156	1486
Notes:						
1)This determines the overall number of firms that face pressure from foreign competition						
The break-up according to churning activities are represented in Figures 5, 7 and 9 respectively						
for the three categories						
2) The measure for contract intensity only includes those firms that belong to industries for which information could be obtained from Nunn (2007)						

Appendix 4E2: Number of Observations of Pressure from Foreign Competition per Firm and Industry Characteristics

Note: Figures 5, 7 and 9 refer to Figures 4.5, 4.7 and 4.9 in this dissertation.

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