The effect of foreign competition on product switching activities: A firm level analysis

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

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Abstract

Pressure from foreign competition on the decision to introduce new products or on production costs may influence firms to particpate 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, or 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 one of the two activities. As firms constrained by the lack of adequately educated workers may have workers who cannot adapt to different set of skills necessary for product switching activities, I consider whether such firms are likely to churn products as they are exposed to pressure from foreign competition in comparison to firms not constrained by the lack of adequately educated 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 or 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.

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 adding or dropping products as they undertake activities related to the switching of their product range[1]. 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 either 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. 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

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[1]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.

costs related to addition of new products as this may require purchase of new equipment and facilities[2]. 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 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

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[2]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.

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 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 entry 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 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 change the number of products produced as firms add and drop 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[3]. 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 competition 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 either add products only, or drop products only 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

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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. 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.

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[4]. 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 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 them 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.

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

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[4]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.

such as investments in R & D projects, inputs embedded with higher technology, or more educated and skilled workers[5]. 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 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 baseline 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:

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

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[5]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).

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[6]. For the purpose of this paper, the quality of each product can be aggregated 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

[6]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.

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.

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

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 purchase 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.

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[7]. It is created jointly by the World Bank and the European Bank for Reconstruction and Development. In Appendix A, I list the names of the countries. 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, 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

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[7]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.

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 1 about here]

In Figure 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[8].

[Figure 2 about here]

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[9]. 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

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[8]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.

[9]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.

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 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[10]. For instance, firms that consider the impact of pressure on introduction of new products to be important can also have similar considerations 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 B, 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 C determines the relationship between the GDP per capita (constant 2000 US$) of a country and the country level averages

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[10]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.

of firms that churn products rather than not undertaking any product switching activities, add products only and drop products only[11]. It is observed that the relationship is positive across the three activities. In Appendix D, I correlate the impact of the pressure from foreign competition on the decision 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 decision to introduce new products and on production costs[12].

Results

OLS and Probit Estimations

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

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

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 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

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

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

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[13].

[Table 1 about here]

In Table 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.

The main observation in Table 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 the US data, this difference can be explained

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

by the fact that the US firms face lower barriers to entry, are typically smaller and face lower constraints in terms of labor relations than firms in the Central and Eastern Europe and Central Asia. Firms in the US 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 from foreign competition on the performance of firms.

[Figure 3 about here]

In Figure 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 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

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$\Pr(Y = 1|X) = \Phi(X'\beta)$. 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 and on the decision on production costs respectively, with the former likely to determine the pressure on preference of firms for quality-based competence and the latter for pressure on the preference of firms for cost-based competence[14]. 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 2 about here]

In Table 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 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

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[14]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.

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 their 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.

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 3 about here]

[Table 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 3 and 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.

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.

In Table 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 and add products only[15]. The effect of pressure from domestic competition is significant at the 10% level for the former category of product switching. On the other 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.

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

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[15]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.

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[16]. 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 6 to Table 9. The number of observations of product switching activities and pressure from foreign competition per firm level characteristics is listed in Appendix E.

R & D Activities and Export Participation

Atkeson and Burstein (2007) discuss the impact of reduced marginal trade costs on product and process innovation 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

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[16]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.

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 about here]

[Figure 5 about here]

In Figure 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

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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 5. Firms exposed to foreign competition will churn products if they are characterized by the necessary levels of productivity.

[Table 6 about here]

In Table 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 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

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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 7 about here]

In Table 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

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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 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 [17]. 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 6 about here]

[Figure 7 about here]

In Figure 6, I show that the firms with adequately educated labor are slightly 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

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[17]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.

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 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.

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 8 about here]

In Table 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 9 about here]

In Table 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

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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 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 and 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 and 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 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.

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 (2012) 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[18]. With the likely existence of production networks between countries that exist

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

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. Such firms may prefer to achieve cost-based competence.

[Figure 8 about here]

[Figure 9 about here]

Figures 8 and 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 E1 and E2 respectively.

[Table 10 about here]

In Table 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[19]. 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 11 about here]

In Table 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 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

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[19]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.

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 10 and 11. This is similar to the results in Table 6 and 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.

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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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 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 2: Probit Estimation of Pressure From Foreign Competition

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

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

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var: Churn Products vs	No Switch	Add Only	Drop Only	No Switch	Add Only	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 5: Probit Estimation of Pressure from Competition and Customers

	(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 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 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 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 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 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 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 11: Probit Estimation of Pressure from Competition and Customers on Production Costs per Contract Intensity of Industries
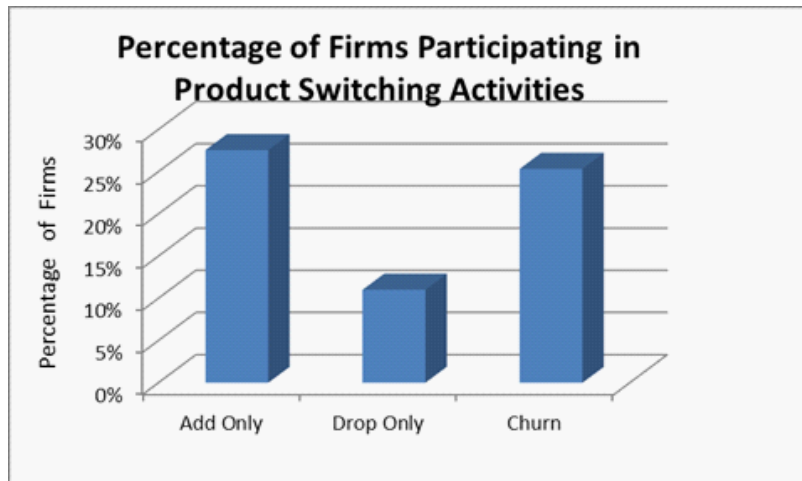
Figures

Figure 1: Percentage of Firms Participating in Product Switching Activities
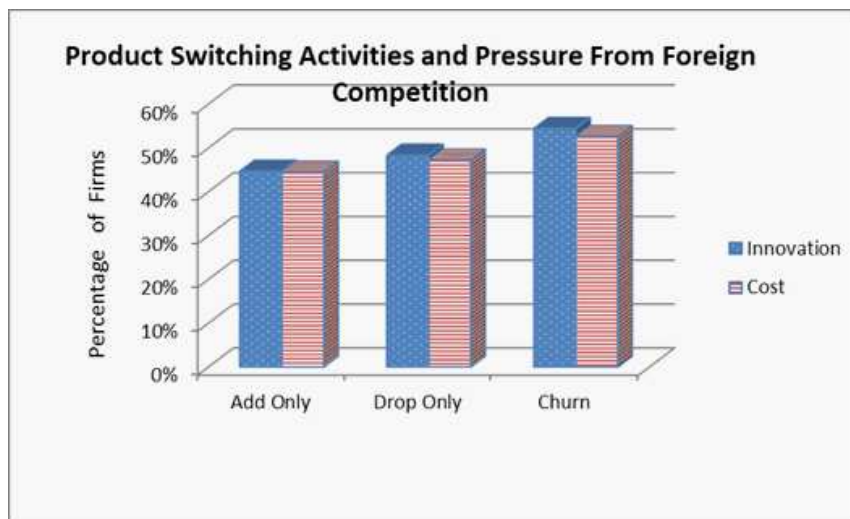

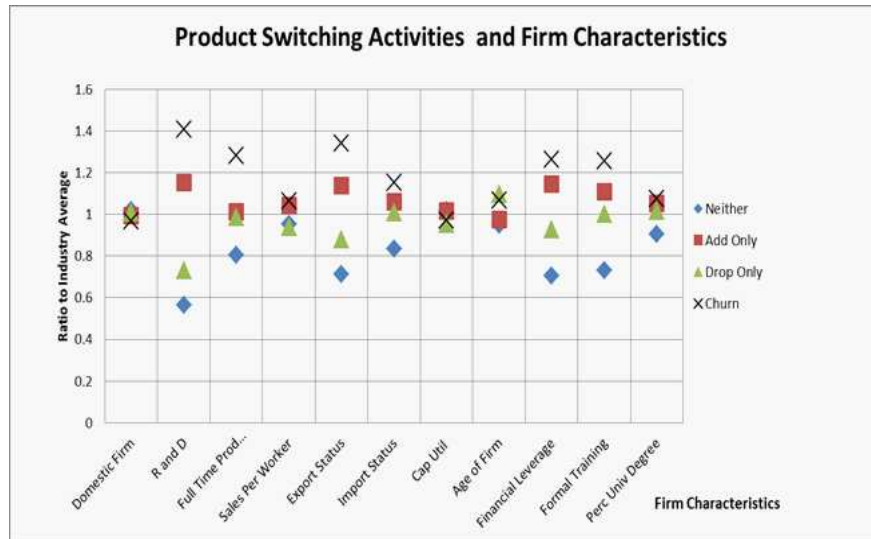Figure 2: Product Switching Activities and Pressure from Foreign Competition

Figure 3: Product Switching Activities and Firm Characteristics
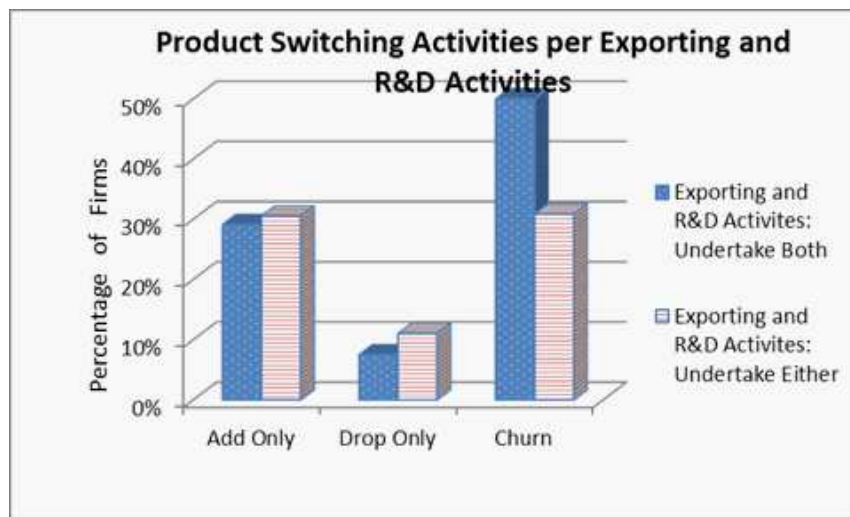

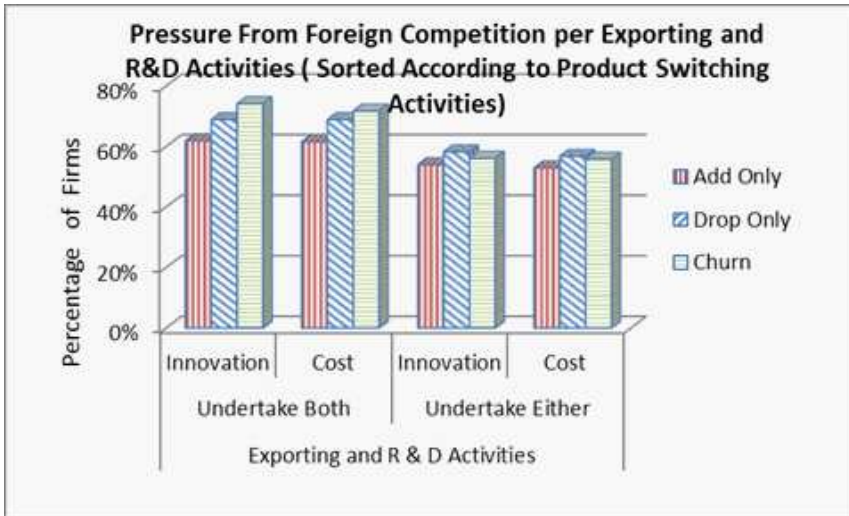Figure 4: Product Switching Activities per Exporting and R&D Activities

Figure 5: Pressure From Foreign Competition per Exporting and R&D Activities
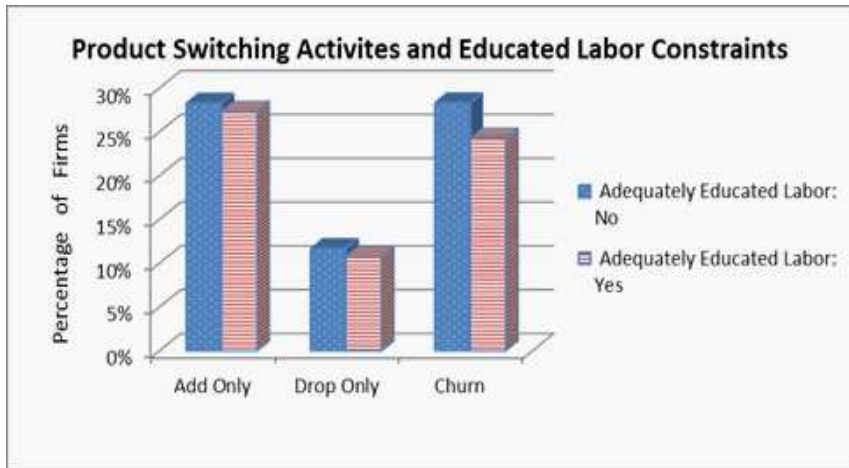

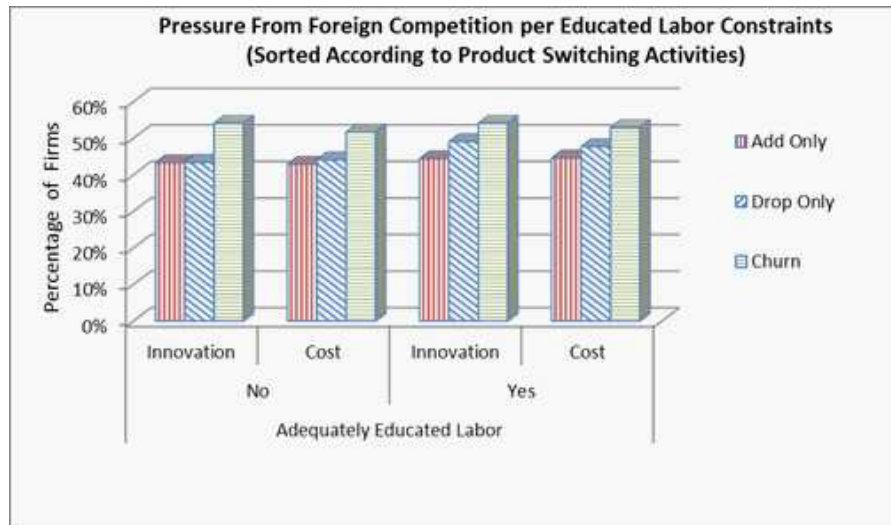Figure 6: Product Switching Activities and Educated Labor Constraints

Figure 7: Pressure from Foreign Competition per Educated Labor Constraints
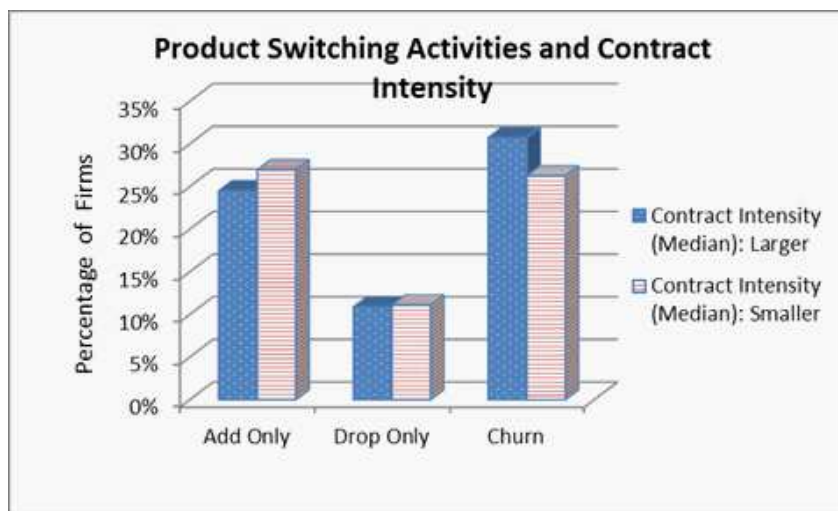

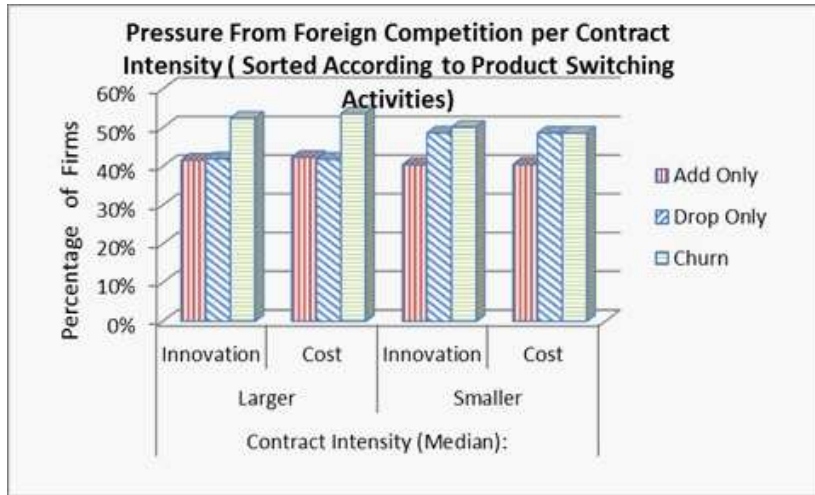Figure 8: Product Switching Activities and Contract Intensity of Industries

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Figure 9: Pressure from Foreign Competition per Contract Intensity of Industries
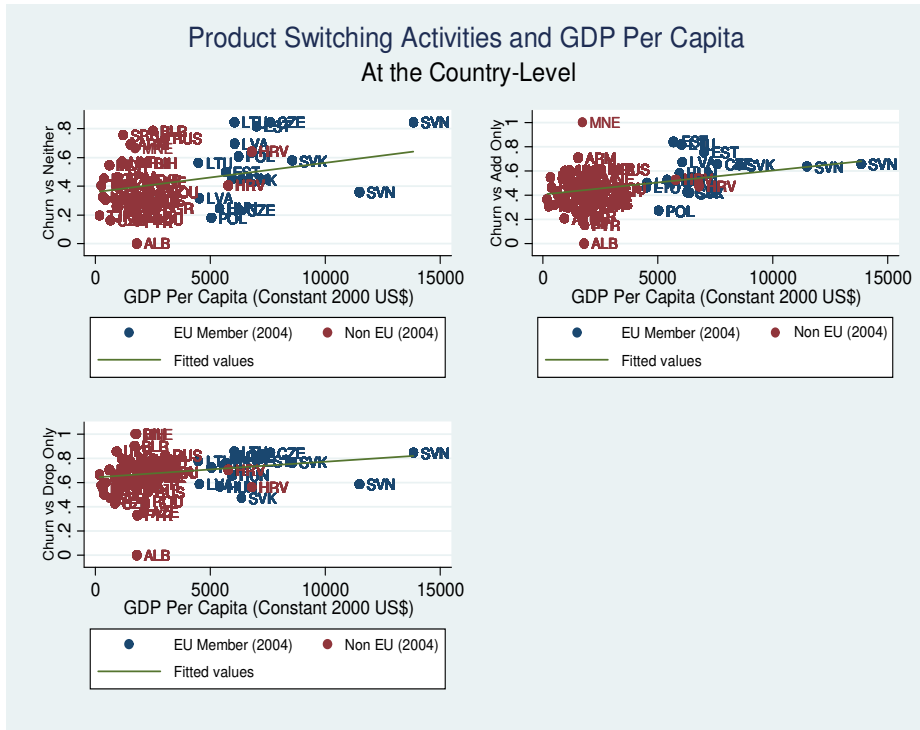
Appendix

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 A: List of Countries and Number of Observations

| 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 B: 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 C: Product Switching Activities at the Country Level and GDP per Capita
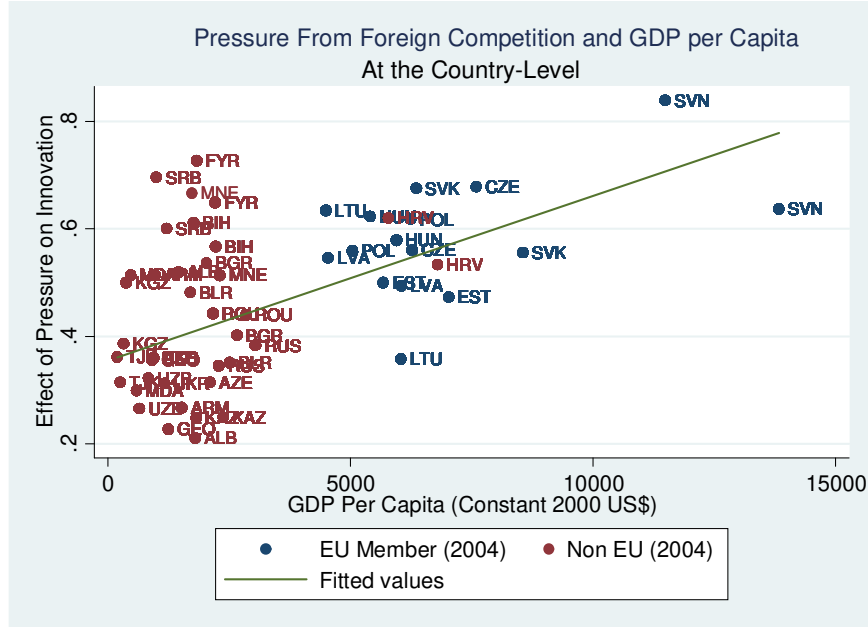
Appendix D1: Pressure From Foreign Competition on the Introduction of New Products at the Country Level and GDP per Capita
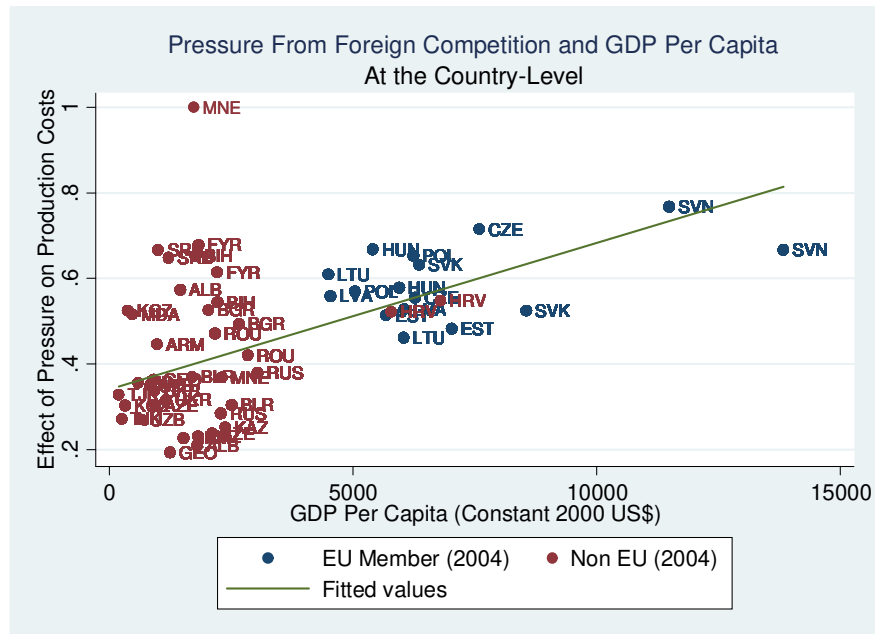
Appendix D2: Pressure From Foreign Competition on Production Costs at the Country Level and GDP per Capita

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 E1: 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 E2: Number of Observations of Pressure from Foreign Competition per Firm and Industry Characteristics