Sequential Exporting with Carry-along Trade Products: Evidence from Turkey.

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Statement

I hereby declare that this thesis has not been and will not be submitted in whole or in part to another University for the award of any other degree or as part of required coursework. I hereby declare that this thesis is the product of my own research.

The data used in this thesis are provided by the Turkish Statistical Office (TurkStat), and all the analysis are conducted at the Microdata Research Centre of TurkStat respecting the law on statistic secrets and personal data protection. The results and views expressed in this thesis are the sole responsibility of the author and do not represent those of the Turkish Statistical Office.

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Sevi Sertkaya, MPhil Thesis

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SUMMARY

International trade literature rationalizes that inexperienced firms mostly start exporting with small shipments to a neighboring country to discover their own capabilities. This strategy is called sequential exporting and is observed in different countries and with different products.

On the other hand, recent evidence shows that manufacturing firms do not actually produce all of their exports. Carry-along Trade (CAT) refers to the exports of manufacturing firms that are not produced by themselves. CAT exports turn out to be relevant in terms of intensive and extensive margins of firms' aggregate exports.

The aim of the thesis is to combine these two different strands of literature by using the theoretical and empirical characteristics of CAT (not self-produced), and MAN (self-produced) products.

In the theoretical framework, MAN products have high sunk costs and low marginal costs, whereas CAT products have higher marginal costs and lower sunk costs. The sequential exporting model of Albornoz et al., (2012) is adjusted slightly to allow for different CAT and MAN cost structures and new predictions are derived.

In the empirical section, these predictions are tested by exploiting matched firm-level Turkish Foreign Trade, Production, and Structural Business Statistics datasets for the period 2005-2011. New exporters which survive to export in the second year are classified into two groups: sequential exporters that experiment in only one market and simultaneous exporters that experiment in at least two markets. The results show that both sequential and simultaneous exporters tend to use CAT exports for experimentation and for expanding their market coverage. For second-year expansion in their first-markets, simultaneous exporters' use CAT and MAN products roughly equally while sequential exporters derive their export growth largely from CAT products. Operating in non-credit constrained sectors accentuates the previous findings of first year-first market export growth and the probability of second-year entry to new markets. Findings of first year-first market export growth are intact for added specifications of productivity and foreign ownership. However, no inferences can be drawn for the probability of entering new markets in the second-year of exporting.

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1. Introduction and Background

An emerging stream of research focuses more on the successful exporters' characteristics such as size, the number of markets, number of products, product and market choice, productivity level, financial health, and foreign ownership status. As the composition of these firm characteristics not only shape firms' own exporting strategies and success, but it also shapes the aggregate export flows of their host country.

Amiti and Freund, (2010) explore the factors that drive the export growth of China for the period 1997-2005, and they find that most of China's export growth achieved by exporting existing varieties (the intensive margin growth). Lacovone and Smarzynska Javorcik, (2008) analyze 85% of Mexican industrial output during the export boom period 1994-2003 and find that the export boom is mainly driven by the firm's pre-existing products. Cebeci and Fernandes, (2015) find that existing products and existing markets play a crucial role Turkish export growth in the short-run. However, they state that Turkish exporters' net entry to new markets plays a critical role in the long-run export growth of the country. The findings of Amiti and Freund, (2010); Cebeci and Fernandes, (2015); Lacovone and Smarzynska Javorcik, (2008) show the importance of intensive margin growth for the developing countries' aggregate export growth in the short-run, and the importance of extensive margin growth for the export growth of developing countries in the long-run.

However, neither intensive margin growth nor extensive margin growth targets are easy to accomplish for the firms due to the costs of exporting. Studies of Alvarez and López, (2005); Bernard and Jensen, (2004); Bugamelli and Infante, (2003); Eaton et al., (2008a); Wagner, (2007) indicate that entering a foreign market is costly for the firms. The findings of Greenaway and Kneller, (2007) are in line with the literature that emphasizes the importance of sunk costs for the firms exporting decisions and success. Freund and Pierola, (2010) show that there are significant differences between entry into exporting, entry into new markets, and entry into new product lines for Peruvian firms operating in the non-traditional agriculture sector for the 1994-2007 period. They find that sunk costs are lower for the firms that enter into existing markets with the existing products. Hence, they underline that entering a new market is harder than entering an existing market, but it is still easier for the firms to enter a new market with existing products compared to entering markets with new products that require discovery costs.

Sunk costs of exporting cannot be financed by the least productive firms or by the firms that have considerable financial problems. Besedeš et al., (2014); Egger and Kesina, (2013); Halldin, (2012); Manova, (2008) show that firms' financial characteristics also play an important role in their exporting decisions. Halldin, (2012) shows that there is a strong relationship with firms' collateralizable assets and their decision to enter export markets. Besedeš et al., (2014) find a positive correlation between firms' initial export growth and being non-credit constrained. Egger and Kesina, (2013) deliver supporting evidence about the negative relationship between extensive and the intensive margins of firm-level exports and being credit constrained as they find credit constrained firms are less likely to become exporters and if they become exporters, they have lower export values. Chaney, (2016) explores the relationship between firm productivity and firms' export participation decision. He finds that firms with higher productivity levels are more likely to be exporters because they are able to generate liquidity from domestic sales and lower their credit constraints.

Greenaway and Kneller, (2007) discover a direct link between exporting, and productivity and their findings show that successful exporters are larger and more productive than non-exporters and exiters. Lee, (2011) provides contradicting evidence by demonstrating a weak relationship between exporting and productivity for Malaysian manufacturing exporters. He finds that both product and process innovation is driving the decision to export. Freund and Pierola, (2010) demonstrate that the firms that discover new products are larger and more likely to succeed in exporting and they rarely use trial and error as an exporting strategy.

Alvarez and López, (2005); Bernard and Jensen, (2004); Cadot et al., (2013); Eaton et al., (2008a); Lawless, (2010); Wagner, (2007) report that a considerable share of firms are using trial and error as an exporting strategy as they re-enter export markets despite their initial failures. Buono et al., (2008) documents that on average 27% of all French exporters in a year are new exporters that stop exporting the next year. Their calculations reveal that nearly 90% of all French export growth is achieved by the firms that continue to export two subsequent years. Eaton et al., (2008b) find that in the long-run, surviving new exporters (that continue to export two subsequent years) contribute a fair amount to aggregate export growth in Colombia. Studies of Kneller, (2013); Kneller and Pisu, (2011); Ruhl and Willis, (2014) are just examples of a growing body of empirical evidence that suggests, exploring the new exporters' exporting dynamics is important to understand the needs of new exporters for providing and suggesting accurate policy implications for their survival and export growth that would contribute to the aggregate export growth of a country.

How should inexperienced firms start exporting and increase their chances of survival? Inexperienced manufacturing firms that are willing to export needs to solve this puzzle. The solution to the puzzle "how to start exporting?" lies in answering three main questions; where to export, how much to export and what to export.

The first two questions "where to export" and "how much to export" has been answered by the authors Eaton et al., (2008a); Buono et al., (2008); Akhmetova, (2010); Masso and Vahter, (2011); Holloway, (2011); Albornoz et al., (2012) that show that most of the first-time exporters start exporting with small initial sales in a neighboring country to minimize the exporting costs. Additionally, they find that successful first-time exporter's small initial sales increase rapidly in the next period. New exporters' rapid export growth in the second period is attributed to their first export experience (experimentation) that allows them to unveil the uncertainty about the sunk and variable costs of exporting and discover that they can gain profits abroad. On the other hand, they show that many new exporters stop exporting after their first experience. This exporting pattern is known as sequential exporting and observed in many countries with different products.

Even there is substantial evidence that sequential exporting is the cost effective way for the firms to start exporting their products, apparently not all manufacturing firms are able to export their own production. Bernard et al., (2013) documents that medium-sized Italian manufacturers with the average productivity levels are exporting their products through intermediaries. Since intermediaries are found to be larger and more productive, they are able to export the other manufacturers' products at a lower cost for some range of products and for some markets compared to the manufacturers. Chan, (2014) shows that trade intermediaries are more likely to be used by financially constrained firms and financially less developed countries, where he shows that both of these effects are found to be stronger in financially more vulnerable industries.

The third question “what to export” is answered by many authors by accounting for the variety and sophistication of the manufacturers’ exports with the assumption that they produce all their exports. However, a relatively recent and important discovery of Bernard et al., (2012) shows that manufacturing firms are not producing all of their exports and they act as an intermediary as well. Their empirical study reveals that 90% of Belgian multi-product manufacturers, export products that were not self-produced. This phenomenon is called Carry-along Trade (CAT), and it creates new dimensions to firm and product heterogeneity. Moreover, CAT products appear in more than 95% of the exported product spectrum that account for 30% of the aggregate export value of Belgian multi-product manufacturers in 2005. Additionally, Bernard et al., (2012) show that CAT products were the main factor behind firms’ extensive and intensive margin growth.

Since the discovery, the CAT phenomenon has been only explored empirically in Slovenia by Damijan et al., (2013), in Turkey by Turco and Maggioni, (2013) and in Italy by De Nardis and Pappalardo, (2011) and Di Nino, (2015). Damijan et al., (2013) focus on a sub-set of CAT phenomenon where they track the CAT products that are imported to be exported, and they label this process of importing as to export as pass-on trade (POT) which is a subset of all CAT exports. Study of Turco and Maggioni, (2013) highlights the existence of CAT in Turkey and confirms the findings of Bernard et al., (2012) by showing that there is a positive relationship between productivity, foreign ownership, and size and Turkish manufacturing firms’ CAT engagement where CAT exports are widespread and relevant in terms of export value share among the Turkish manufacturing firms’ exports.

De Nardis and Pappalardo, (2011) confirms the findings of Bernard et al., (2012) by exploring the Italian firms in the year 2006. De Nardis and Pappalardo, (2011) also found that 90% of all exporters and 50% of all multi-product exporters, are exporting at least one CAT product and they are more productive compared to only MAN exporters. They find that CAT products play a substantial role for both intensive and extensive margins of trade in Italy, where CAT exports have higher importance compared to Belgium. Their calculations show that the average Italian multi-product exporter exports nine CAT products and less than three MAN products. Di Nino, (2015) explores the CAT phenomenon in Italy, and she benefits from a special CAT survey and finds that most of the CAT products are complementary to the firms' own production. Additionally, the study shows that the profit margins of CAT products are found to be higher, especially when CAT products are packaged and rebranded. She puts a strong emphasis on the widespread rebranding of CAT products that suggests final customers' perception of these products are similar to those of internal production in terms of quality and country of origin. Her calculations show much less prevalence of CAT products in Italy and, she highlights that the CAT prevalence might be driven by manufacturing firms' intermediary role. Bernard et al., (2013) show that even intermediaries are smaller than manufacturing exporters, they focus on smaller number of countries that are more distant, and they have a wider range of products.

CAT phenomenon is attracting increasing interest from the scholars, despite this interest, no one to the best of my knowledge, explored CAT exports' role in the new exporters' exporting dynamics. This thesis presents a pioneering attempt to provide the first portrait of CAT exports' role in the new exporters' exporting dynamics in sequential exporting context.

To incorporate these two different strands of literature (Carry-Along Trade, and Sequential Exporting), theoretical and empirical differences between CAT (not self-produced/purchased), and MAN (self-produced) products are defined.

The theoretical framework builds heavily on the sequential exporting model of Albornoz et al., (2012). Their model is slightly adjusted by adding four different sets of products that have different cost structures from each other. Later on, we observe how the rational exporting strategies change by the different set of products that have different sunk and marginal costs. In this framework, characteristic differences between CAT and MAN products are defined by their cost structures. The core theoretical assumption states that MAN products have high sunk costs and low marginal costs, while CAT products have higher marginal costs and lower sunk costs. Using four sets of products with different cost structures serves us in figuring out all the possible scenarios that might happen with CAT and MAN products. However, this framework does not capture any possible differences in productivity, size, foreign ownership, rebranding activities or subcontracting status across firms. Additionally, adjusted framework assumes that different sets of products are the same kind, but their sunk and marginal costs differ due to the obtaining method of the firm and disregards the fact that cost structures of these products might be different due to productivity, quality, being a wholesaler, and being a manufacturer. Simply, the adjusted framework tries to explain the firms' rational exporting strategy with CAT and MAN products' assumed cost structures only. The adjusted framework delivers three new predictions. The first prediction suggests that new exporters are more likely to experiment with CAT products. The second prediction suggests that conditional on survival, a new exporters' MAN intensive margin growth is higher than a new exporters' CAT intensive margin growth in their first export market (test market) in their initial years of activity than in subsequent markets or later years of activity. The third prediction suggests that conditional on survival, new exporters are more likely to enter new markets with MAN products.

These three new predictions are tested by exploiting matched firm-level Turkish Foreign Trade, Production, and Structural Business Statistics datasets for the 2005-2011 period. The estimations are carried with ordinary least-squares (OLS) and linear probability (LPM) regressions. In the process of separating CAT and MAN products, a firms' all exports are categorized as firms' MAN exports if the firm produced a small amount of that particular product in that year. Only the products that the firm exports but not produces to any extent are categorized as firms' CAT exports.

The descriptive statistics show that on average 88% of all Turkish manufacturing exporters, export CAT products, and on average CAT products appear in 87% of the whole spectrum of manufacturers' exported products that account on average 65% of manufacturing firms' export value during the 2005-2011 period. Additionally, it is also found that firms' export bundles are composed of different combinations of CAT and MAN products which are not static across markets and time. Moreover, one-third of the aggregate CAT export value is driven by exporting CAT products different markets than the MAN markets. This study uses a similar dataset with De Angelis et. al (2011) for different countries, but our findings are in line. However, recent findings of Di Nino, (2015) provide contradicting evidence for the findings of De Angelis et. al (2011) by accounting for the branding of CAT products and her findings documented that 36% of all exporters engage in CAT trade and CAT export value accounts 22% of the aggregate export value in Italy.

In the estimations only consider a small sample of new exporters that export at least one MAN, and at least one CAT product through the 2005-2011 period and this selection method disregards the small-sized only MAN exporters which might have positively affected the results. The continuously exporting new exporters are classified into two groups, according to the number of their experimentation market/markets. Continuously exporting new exporters that experiment in one market are sequential exporters, and simultaneous exporters experiment in more than one market. The empirical findings show that both sequential and simultaneous exporters are more likely to export CAT products to new markets. On the other hand, intensive margin growth results are different across sequential and simultaneous exporters. Only simultaneous exporters' aggregate intensive margin growth a year after the experimentation in their first-market is achieved equally with their CAT and MAN export growth where the sequential exporters' CAT export growth is the driving force behind their aggregate export growth. Alternative estimates show that operating in non-credit constrained sectors accentuates the previous findings of first year-first market export growth and the probability of second-year entry to new markets. Previous findings of first year-first market export growth are intact for added specifications of productivity and foreign ownership. However, no inferences can be drawn for the probability of entering new markets in the second-year of exporting. I acknowledge the fact that some of these results might have been a result of overestimating the CAT products due to unobserved branding activities and not including the small-sized new exporters that do not export any CAT products.

The rest of this thesis is organized as follows: Section 2 slightly adjusts the framework of Albornoz et al., (2012) according to cost differences of CAT and MAN products. Section 3 describes the data, provides descriptive statistics, and focuses on the empirical results of experimentation, intensive margin growth and entry. Additionally, this section provides additional estimates for intensive margin growth and entry. The final section provides the conclusion by discussing the limitations of this work and suggesting potential avenues for further research.

2. Theoretical Framework

The potential profits that can be made from foreign markets are prompting all firms to export. However, not all firms that are willing to export are able to profit due to uncertainty in foreign markets and incurring sunk and marginal costs of exporting. This complex yet profitable nature of exporting poses a challenge for firms – to be able to make an entry to the world of exporting, learning about foreign markets and their ability to export while the by minimizing costs,

To address the firms' concerns and gains from the exporting decision Albornoz et al., (2012) structure a two-period, two-market decision-making model. Whilst, firms are trying to acquire information about their ability to export via experimenting. In this decision-making model, firms decide whether to enter new markets with or not, the amount of the optimal quantity to be served in a particular market if they decide to enter or to stop exporting to avoid further loss.

In this section, the framework of Albornoz et al., (2012) is explained and expanded by considering three different sets of products that have different sunk and marginal cost structures from each other. Firstly, a theoretical distinction between MAN and CAT products are made according to their cost structures. The core theoretical assumption states that MAN products have high sunk costs, and low marginal costs, whilst CAT products have higher marginal costs and lower sunk costs. However, there is not an assumption that defines the magnitude of decreased or increased sunk and marginal costs for CAT and MAN products. Therefore, this framework considers three different product sets in addition to the original cost structure of Albornoz et al., (2012) to illustrate the possible outcomes for the original cost structure and three different sets of products with different cost structures. Later on, comparing the illustrations will enable us to figure out how CAT and MAN products' outcome could be. Finally, new predictions for the firms' experimentation, intensive margin growth, and entry are delivered by the adjusted framework.

2.1 Assumptions For CAT and MAN Products

To enhance the sequential exporting theory, I will try to draw a line between self-produced (MAN) products and purchased (CAT) products sunk costs and marginal costs. Later on, the paper tries to obtain predictions based on the differences in the cost structures of CAT and MAN products.

The differences between purchased (CAT) products and self-produced (MAN) products are twofold:

- **CAT products' sunk costs are lower than the sunk costs of MAN products:** The total sunk costs of CAT products are equal to trade-related sunk costs. These trade-related sunk costs consist of the expenses related to establishing distribution channels, designing a marketing strategy, exporting procedures and documentation, familiarization with the institutional and policy characteristics of the foreign country, etc. MAN product's total sunk costs are made up of two components that root from different practices, one from trade production adjustment. MAN products require additional sunk costs on top of trade-related sunk costs to adjust the products according to the standards, requirements, and tastes of the export market.

- **MAN products' marginal costs are lower than the marginal costs of CAT products:** There are two major components that marginal costs consist of- export costs per product and purchasing costs per product. MAN products are produced by the exporter firm, and CAT products are purchased from other firms. Therefore, there is a profit payment made to the actual producer by the exporter firm to obtain CAT products. So, MAN products' marginal costs are composed of export costs per product only. CAT products marginal costs are composed of export costs per product and purchasing costs per product.

2.1 Adjusted Framework

The central assumption of Albornoz et al., (2012) model is self-discovery. Self-discovery states that the uncertainty of the firms' exporting ability that can only be resolved by firms' own export experience. Further, the important assumptions of this two-period sequential exporting model are perfectly correlated margin and sunk/fixed export costs across markets and time. As the margin is same across markets and time, experimenting in one market provides perfect information about how profitable other markets are as well or how capable the firm is in other markets and at other time periods. On the other hand, the model also states that once a firm decides to test their export ability, it also acknowledges a possible loss by this experimenting.

Additionally, this model considers the firms' entry strategies and separates firms into two categories according to their initial exporting strategies i.e. sequential exporters and simultaneous exporters. The framework of Albornoz et al., (2012) defines simultaneous exporters as "confident firms" that enter more than one market at a time with large sales as they trust that they will succeed in foreign markets. Sequential exporters are "less confident firms" and only enter one market initially with small experimental sales in a specific foreign market.

Albornoz et al., (2012) particularly focus on sequential exporters as these firms need to know if they are really capable of gaining profits abroad and the only way of gaining this information is doing it by themselves. Nevertheless, the information about the firms' own ability to profit abroad is not free or readily available due to sunk/fixed costs that this action incurs. As the Dutch saying *De kost gaat voor de baat uit* suggests, costs factor in before profits are gained. So, firms need to bear the cost of exporting to discover if they can gain profits in foreign markets. At this point, firms need to consider the cost of testing themselves i.e. experimenting and how profitable those markets are expected to be. In this model, firms start exporting to learn about their export ability and in the next period, they either keep exporting because they found that they are able to do so or they quit exporting as they learned that they are not capable enough.

The adjusted framework adds three sets of products with different sunk and marginal costs from each other to the model of Albornoz et al., (2012). In this adjusted framework, the sunk/fixed costs of exporting are identical across markets and time for a particular product type. On the other hand, variable trade costs, demand in a particular market and minimum export quantities are assumed to be identical across all sets of products. Since the sunk costs are identical across markets for a particular product type, a firm tries to gain information about its export ability by spending the minimum costs possible. The firm chooses to test itself in the market where the variable trade costs(τ^j) are lowest with the minimum quantity of exports.

As the variable trade costs $(\hat{\tau}_{\mathrm{p}}^j)$ differ across markets (j=A, B) but it is identical across product types (p=1, 2, 3), it is also identical across CAT and MAN products $(\tau^j = \hat{\tau}_{\mathrm{CAT}}^j = \hat{\tau}_{\mathrm{MAN}}^j)$. Therefore, variable trade costs for market B is higher than market A for all product types, $(\tau^B) \geq (\tau^A)$. So, if the firm enters a market it will be market A which is the least costly market. Also, the firm will try to minimize its operational costs so that it enters market A with very small initial sales (ε_p>0 where ε is a positive arbitrary number and identical across all product types and CAT and MAN products $((\varepsilon = \varepsilon_p), (\varepsilon_1 = \varepsilon_2 = \varepsilon_3 = \varepsilon_{CAT} = \varepsilon_{MAN}))$ in the model), in expense of one time market and product specific export related sunk costs (F, F_{CAT} , F_{MAN} and $F \geq 0,\ F_{CAT} \geq 0,\ F_{MAN} \geq 0$) to learn their profits before sunk costs (margins μ_p).

The marginal cost of the exports for product type p (c_p^j), covers the unit product costs $(\mathrm{Ƥ}_p)^j$, and export unit costs, x^j which is identical across all product types.

$$c_p^j = x^j + \mathrm{Ƥ}_p^j \quad (1)$$

Purchasing costs $(\mathrm{Ƥ}^j)$, are composed of two factors, unit manufacturing costs, and profit payments. Unit manufacturing costs are denoted by m and profit payments are denoted by η.

MAN products' purchasing costs $\mathrm{Ƥ}_{man}^j$, are equal to unit manufacturing costs m because firm obtains the product by producing so, the firm does not need to purchase.

$$\mathrm{Ƥ}_{man}^j = m, \quad (2)$$

On the other hand, the firm needs to purchase the CAT product from the producer by paying some profits on top of the unit manufacturing costs of the product. Therefore, purchasing costs of CAT products are equal to the sum of unit manufacturing costs (m) and profit payments per product (η).

$$\mathrm{Ƥ}_{cat}^j = (\eta + m), \quad (3)$$

As a result, MAN products' purchasing costs are lower than the CAT products' purchasing costs.[1] Higher purchasing costs of CAT products inflates the marginal costs of CAT products and makes the marginal costs of CAT products larger than the marginal costs of MAN products. $c^j_{cat} > c^j_{man}$, because $Ƥ^j_{cat} > Ƥ^j_{man}$ and
$c^j_{cat} = x^j_p + (\eta + m)$ and $c^j_{man} = x^j_p + (m)$

$$Ƥ^j_{cat} > Ƥ^j_{man}\ , so\ c^j_{cat} > c^j_{man}\ , \tag{4}$$

Demand in each market j (d^j_p) is an unknown parameter and identical across product types, firms face the following demand in market A and market B.

$$q^j_p(d^j_p) = d^j_p - p^j_p, \tag{5}$$

where, q^j_p denotes the quantity of product type p sold in destination j and p^j_p denotes the corresponding price of exported product type (p =1,2,3).

μ^j_p is the firms' profit before the sunk costs, in other words, it denotes all the information that captures and determines firms' export margin in the market j for product type p . μ^j_p is a random variable with a continuous cumulative distribution function $G_p(\cdot)$ on the support of highest margin ($\overline{\mu^j_p}$), and lowest margin ($\underline{\mu^j_p}$) in market j for the product type p. The highest margin ($\overline{\mu^j_p}$) is obtained when the highest possible demand intercept (d^j_p) and the lowest possible export unit cost ($\underline{c^j_p}$) is realized together for the product type p, vice versa for the lowest margin ($\underline{\mu^j_p}$). Therefore, the model allows uncertainty in both demand and supply parameters.

[1] I assume that CAT and MAN products are the same kind (e.g. - Ski-boots, headphones, copper springs or fully-automatic Washing Machines).

$$\mu_p^j \equiv \ d_p^j - \ c_p^j \ , \tag{6}$$

To remind, it is explained in equations 5 that $\text{Ƥ}_{cat}^j \ > \text{Ƥ}_{man}^j \ , so \ c_{cat}^j > c_{man}^j$. The margin of each product type (CAT and MAN) is denoted by the equation below where the demand in market *j* is identical for CAT and MAN products.

$$d^j = d_{cat}^j = d_{man}^j \ , \tag{7}$$

$$\mu_{cat}^j \equiv \ d^j - \ c_{cat}^j \text{ and } \mu_{man}^j \equiv \ d^j - \ c_{man}^j \tag{8}$$

Ignoring the relevant sunk costs, the equation above shows that the higher marginal costs of CAT products ($c_{cat}^j > c_{man}^j$) make the margin of CAT products lower than the margin of MAN products ($\mu_{man}^j > \mu_{cat}^j$).

$$\mu_{man}^j > \mu_{cat}^j \ , \tag{9}$$

Albornoz et al., (2012) use backward induction optimization technique to predict firms' future export performance in the guidance of their previous export performance in a two-period model as outlined below.

First of all, the model denotes the firms' decision of entering a foreign market by e_t^j which represents the firm's decision to enter market j, at time t. If the firm decides to remain in the market or enter the market $e_t^j = 1$, $e_t^j = 0$ otherwise. The model allows the firm to choose between three undominated entry strategies- simultaneous entry, sequential entry, and no entry/exit.

For the first period, the sequential entry suggests that firm enters only market A, at first-period, and simultaneous entry suggests that firm enters both markets in the first period with product type *p*. If the sequential entrant firm in the first-period decides to continue exporting, the firm will optimize the quantity served to each market/markets at second-period to maximize its profits. Sequential entrant firms' entry decision and optimal product quantity to be served in market/markets are solved with a backward induction method for both periods, $(t = 1, t = 2)$. On the other hand, the model assumes that simultaneous entrants are confident of their success, therefore they enter both markets initially, and they do not experiment. The backward induction method provides sequential exporters' and simultaneous exporters' optimal export quantity in market A with product type p for both periods[2], $(t = 1, t = 2)$:

$$\hat{q}^{A}_{1\mathrm{p}}(\tau^{A}) = 1_{\{\mathrm{E}\ \mu_\mathrm{p} > \tau^\mathrm{A}\}}\left(\frac{\mathrm{E}\ \mu_\mathrm{p} - \tau^\mathrm{A}}{2}\right) + 1_{\{\mathrm{E}\ \mu_\mathrm{p} \leq \tau^\mathrm{A}\}}\varepsilon\ , \tag{10}$$

Equation (11) above includes the probability of the variable costs of market A being larger than the margin in market A and denoted by the term $1_{\{\mathrm{E}\ \mu_\mathrm{p} \leq \tau^\mathrm{A}\}}\varepsilon$. This case is especially important for the sequential firms that enter only market A, at the first period.[3]
The optimal export quantity of sequential and simultaneous exporters for market B is:

$$\hat{q}^{B}_{1\mathrm{p}}(\tau^{B}) = 1_{\{\mathrm{E}\ \mu_\mathrm{p} > \tau^\mathrm{B}\}}\left(\frac{\mathrm{E}\ \mu_\mathrm{p} - \tau^\mathrm{B}}{2}\right), \tag{11}$$

Firms need to test the market with small initial sales in order to adjust their export quantity to an optimal level. Equation (7) shows that the demand for CAT and MAN products (d^{j}_{p}) and variable costs (τ^{j}_{p}) are identical in markets $\left((\tau^{j}_{man}) = (\tau^{j}_{cat}) = (\tau^{j})\right.$, $\left.(d^{j}_{man}) = (d^{j}_{cat}) = (d^{j})\right)$ even the firms' cost settings are different. From equations (5), (7), (8), and (10) we obtain;

$$\hat{q}^{j}_{1\mathrm{p}} = \frac{1}{2}\left(d^{j} - \tau^{j} - c^{j}_{p}\right) \tag{12}$$

[2] Model disregards production costs and productivity differences.
[3]Simultaneous exporters are "confident about their success" therefore, the term $1_{\{\mathrm{E}\ \mu_\mathrm{p} \leq \tau^\mathrm{A}\}}\varepsilon$ is equal to zero for simultaneous exporters. Simultaneous exporters enter both markets with a belief that they can deliver positive profits by doing so and they do not experiment by small initial sales (ε).

So when c_p^j declines, $\hat{q}_{1p}^j$ increases. As the marginal costs of MAN products are lower than the marginal costs of CAT products, optimal quantity for MAN products are larger than the optimal quantity of CAT products $\hat{q}_{man}^j > \hat{q}_{cat}^j$.

Up until here, the model solves the firms' optimal export quantities by strictly assuming that the margin in market A is larger than the variable costs of market A. Because, if the margin in market A is lower than the variable costs of market A, the firm will exit to avoid any further loss. However, there is a special situation where firm might decide to export its optimal export quantities to both markets at the second-period even if the experimentation in market A at the first-period is unprofitable due to larger variable trade costs (τ^A), when compared to the margin earned in that market with product type p ($E\mu_p^A$).

Figure 1 below shows why being a sequential exporter is possible and rational when the initial experimentation is not profitable in market A, when trade costs (τ^A) are larger than the margin in that market ($E\mu_p^A$) with the original cost structure. The x-axis in *Figure 1* indicates the product quantity and the y-axis represents a nominal value for profits for the original cost structure.

The basic premise of *Figure 1* below is a firms' testing (experimentation) in the foreign market A with small initial sales (ε) in order to discover its margin at the expense of the associated total sunk costs (F) and a small initial operational loss. The firm's experimentation quantity (small initial sales) is shown by ($\tilde{q}_{1p}^A = \varepsilon$). The experimentation quantity is represented by the green line on the right hand side of y-axis in *Figure 1*. Firm exports a very small quantity ($\tilde{q}_{1p}^A = \varepsilon$), to minimize its operational losses.

The profit curves in *Figure 1* are an illustration of the profit functions. However, the profit curve being on the left-hand-side of the x-axis is not ordinary. The profit curve is in the left-hand-side of the x-axis as the optimum quantities are $\left(\frac{E\,\mu_p - \tau^A}{2}\right)$ in the model, and in this setting the margin in market A (μ_p), is lower than the variable trade costs of market A (τ^A), ($E\,\mu_p < \tau^A$). Variable trade costs of market A, being larger than the margin in market A, results in a negative prediction for the optimal quantities.

The shape of the profit curves in *Figure 1* shows that there is only one maximum point at the optimal quantity, which delivers the maximum profits. Until the profit maximization point, marginal profits gained by serving an additional quantity (in absolute values) in foreign markets are positive, and after the maximum profit point, marginal profits delivered by serving an additional quantity (in absolute values) at foreign markets are negative.

The lowest point on the y-axis represents the experimentation in the entry market (market A) and equals to -*F*. The middle point on the y-axis adds the value of experimentation in the entry market (market A). $V(\tau^A)$ represents the firms' option value in market A. In other words, $V(\tau^A)$ denotes the firms' expected second-period profit, if it serves the optimal quantity $\left(\hat{q}^A_{1\mathrm{p}}(\tau^A)\right)$, in market A. $V(\tau^A)$ is the distance between the lowest point and the middle point on the y-axis in *Figure 1*. $W(\tau^B, F)$ represents the option value in market B. It is the distance between the middle point and the highest point on the y-axis at *Figure 1*. $W(\tau^B, F)$ denotes the firm's expected second-period profit if it serves the optimal quantity in market B $(\hat{q}^B_{1\mathrm{p}}(\tau^B))$, which is the firms' option value in market B.

As the firm experiments in the first period in market A with small initial sales ($\tilde{q}^A_{1p} = \varepsilon$), which is represented by the green line on the right hand side of the y-axis, and markets are symmetric, the option values in each market are known by the firm after the initial experiment. Firms' option value in market A, $V(\tau^A)$ is larger than the option value in market B, $W(\tau^B, F)$ because variable trade costs of market A is lower than the variable trade costs of market B, $(\tau^A < \tau^B)$[4].

[4] $V(\tau^j) = \int_{\tau^j}^{\bar{\mu}} \left(\frac{\mu_p - \tau^j}{2}\right) dG_{(\mu_p)},\ j = A, B.$

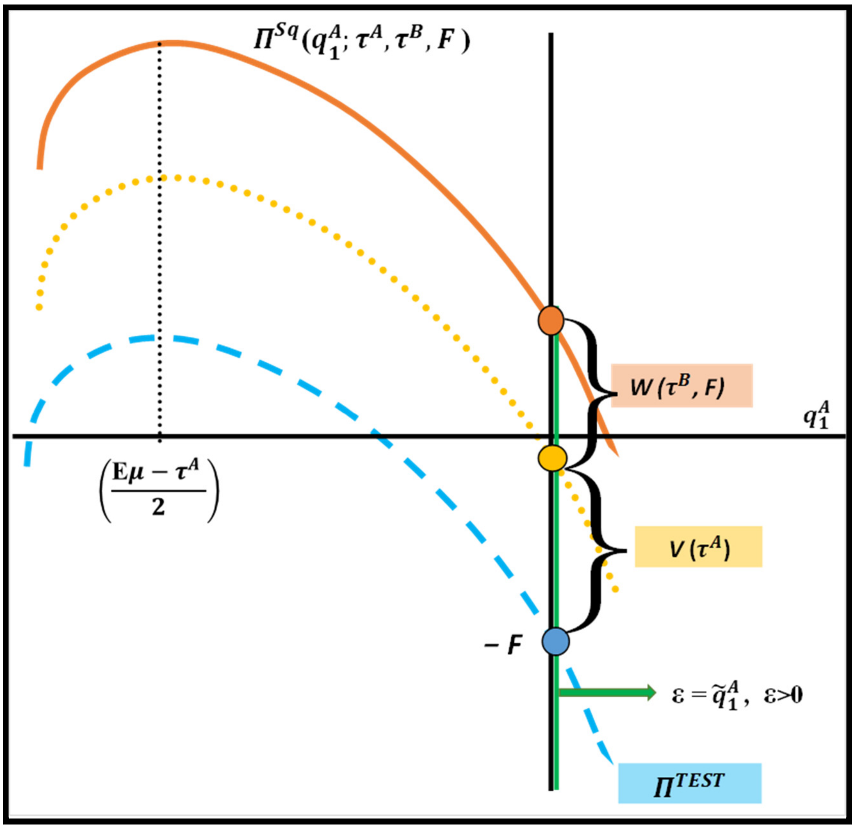
$W_(\tau^B; F) \equiv \int_{2F^{\frac{1}{2}}+\tau^B}^{\bar{\mu}} \left[\left(\frac{\mu_p - \tau^B}{2}\right)^2 - F\right] d\,G\left(\mu_p\right) = \left\{\mathrm{V}(\tau^B) - \int_{\tau^B}^{2F^{\frac{1}{2}}+\tau^B} \left(\frac{\mu_p - \tau^B}{2}\right)^2 dG\left(\mu_p\right)\right\} - F\left[1 - G(2F^{\frac{1}{2}} + \tau^B)\right].$

However, the firm knows that the option value in the market A is not enough to cover the sunk costs and deliver positive profits in that market. As the option value in market B is also known after the experimentation, the firm knows that it is only possible to deliver positive profits if both markets are served the optimal quantities.[5]

In this case *(* $\mu_p < \tau^A$*)*, the experimentation is worthwhile because firm can deliver positive profits from the other market i.e. market B. Otherwise, the value of the information gained by experimenting would not be high enough to compensate for the sunk costs in example; $[V(\tau^A) + W(\tau^B, F) > F > V(\tau^A)]$.

[5] The theory derives the firms profit curve as a function of sunk costs, variable trade costs and marginal costs. Each profit curve has a maximum point that indicates the optimal quantity in the x-axis and corresponds to a nominal value of maximum profits in y axis. However the optimal quantity is negative, so it is inaccurate to comment on the maximum profits that relate to this negative quantity. Optimal quantity in Figure 1 is negative as the theory predicts the optimal quantity of sequential exporting, $\hat{q}_1^A(\tau^A)$ from the equation: $\hat{q}_{1p}^A(\tau^A) = 1_{\{E\ \mu_p > \tau^A\}}\left(\frac{E\ \mu_p - \tau^A}{2}\right) + 1_{\{E\ \mu_p \leq \tau^A\}}\ \varepsilon$. The margin (E μ_p) is smaller than the variable trade costs (τ^A). This provides a negative prediction of the optimal quantity. If the margin (E μ_p) was larger than the variable trade costs (τ^A), only then optimum quantity $\left(\frac{E\ \mu_p - \tau^A}{2}\right)$, would have been positive. All in all, the explanation of the optimal quantities is made for the circumstances where margin is larger than the variable trade costs.

Figure 1: The Profit Function of sequential Exporter Firms where (E $\mu<\tau^{A}$).



Note: The graph is redrawn in color while remaining faithful to the original figure of Albornoz et al., (2012)

Now, we will try to reconstruct this scenario with three additional different sets of sunk and marginal costs. This is an attempt to understand the role of sunk and marginal costs in the firm's decision to become a sequential exporter. Having four different set of cost structures enable us to observe how firms might behave with every sunk and marginal cost combination, which will guide us in predicting the firms' behavior with CAT and MAN products later on.

Figure 2 illustrates the experimentation[6] with four different sets of sunk and marginal costs when the variable trade costs of market A (τ^{A}), is larger than the expected operational profits in that market (E $\mu_{p} < \tau^{A}$), at $t = 1$ with four different sets of sunk and marginal costs.

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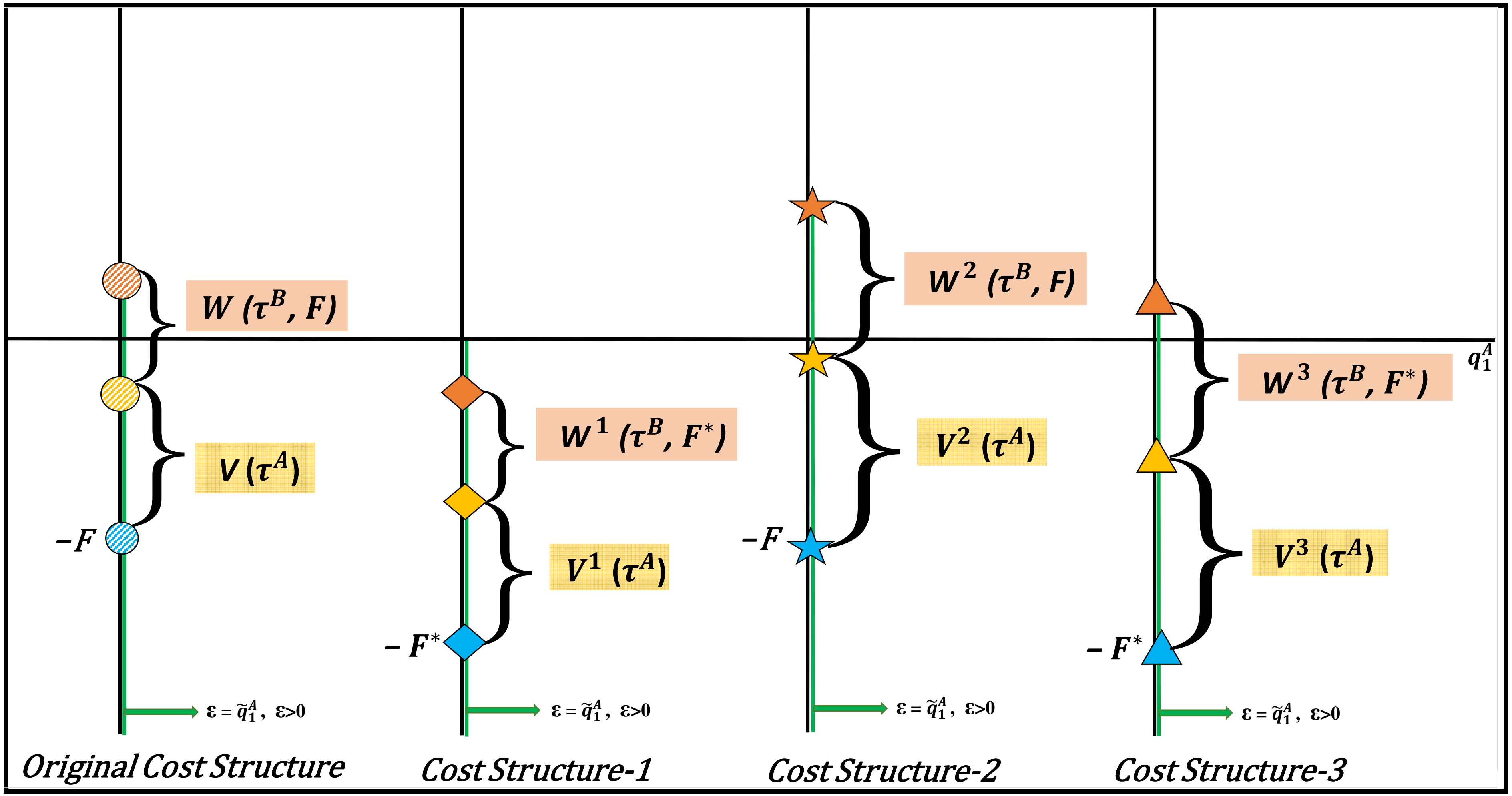
[6] Firm tests the market with small initial sales ($\tilde{q}_{1p}^{A} = \varepsilon$) in every set of sunk and marginal costs.

Figure 2: The Profit Function of Sequential Exporter Firms with Different Cost Structures where (E $\mu_p < \tau^A$).



The original cost structure (first from the left in *Figure 2)* repeats the sunk and variable costs of *Figure 1* where sunk cost is represented by F and marginal costs are represented by c.

The first cost structure (second from the left in *Figure 2*) has higher sunk costs and all the three expected profit points move down due to higher sunk costs (F^*) , ($F^* \geq F$). The marginal costs of the product in the first cost structure is equal to the marginal costs of the product at the original cost structure (c). In the first cost structure, option values in market A $(V^1(\tau^A))$, and market B $(W^1(\tau^B,\ F^*)$ are equal to the option values at the original cost structure.

$$W^1(\tau^B,\ \mathrm{F}^*) = \mathrm{W}\ (\tau^B, \mathrm{F}),\ V^1(\tau^A) = \mathrm{V}\ (\tau^A). \tag{13}$$

Even though the option values in market A $(V^1(\tau^A))$, and market B $(W^1(\tau^B,\ F^*)$ are equal to the option values at the original cost structure. It is obvious that firm is not likely to deliver positive profits, even if it exports the optimal quantities in both markets. This outcome is due to the fact that, sunk costs (F^*), are larger than the total of margin from both markets ($F^* > (\ V^1(\tau^A)\ +\ (W^1(\tau^B,\ F^*))$. In this cost structure, I expect that the firm stops exporting in the second-period.

In the second cost structure (second from the right in *Figure 2)*, sunk costs are equal to the sunk costs of the original cost structure (F). However, the marginal costs (c^*) of the second cost structure are lower than the marginal costs of the original cost structure $(c \geq c^*)$. Here, option values in market A $(V^2(\tau^A))$, and market B (W^2) are larger than the option values of the original cost structure ($V\ (\tau^A)$ and $W\ (\tau^B,\ F)$) due to lower marginal costs (c^*) compared to the marginal costs at the original cost structure(c).

$$W^2(\tau^B, \mathrm{F}) > \mathrm{W}\ (\tau^B, \mathrm{F}),\ V^2(\tau^A) > \mathrm{V}\ (\tau^A). \tag{14}$$

In this setting, option values in market A $(V^2(\tau^A))$, and market B $(W^2(\tau^B,\ F^*)$ are larger than the option values at the original cost structure. The firm is able to deliver positive profits by exporting optimal quantities to both markets $((\ V^2(\tau^A)\ +\ W^2(\tau^B,\ F)) > F)$. The difference in the second cost structure compared to the original cost structure is the larger option values due to larger optimal quantities as the negative correlation between marginal costs and optimal quantities result in different profits for the firm.[7]

$$\hat{q}_1^{2A}(\tau^A) > \hat{q}_1^A(\tau^A) \; and \; \hat{q}_1^{2B}(\tau^B) > \hat{q}_1^B(\tau^B). \quad (15)$$

[8]

In the third cost structure, (first from the right in *Figure 2*), both sunk and marginal costs are different from that of the original cost structure. The third cost structure has higher sunk costs and lower marginal costs compared to the sunk and marginal costs of the original cost structure. In this case, all the expected profit points move down due to higher sunk costs (F^*) and the option values in market A ($V^3(\tau^A)$), and market B ($W^3(\tau^B,\ F^*)$) are larger due to lower marginal costs (c^*) compared to the marginal costs of the original cost structure($c, c \geq c^*$). Lower marginal costs, create larger optimal quantities $\hat{q}_1^{3A}(\tau^A) > \hat{q}_1^A(\tau^A) \; and \; \hat{q}_1^{3B}(\tau^B) > \hat{q}_1^B(\tau^B)$ and the larger optimal quantities create larger option values in both markets.[9]

$$W^3(\tau^B,\ F^*) > W(\tau^B, F),\ V^3(\tau^A) > V(\tau^A). \quad (16)$$

In this setting, sunk costs (F^*) are larger than the sunk costs of the original cost structure. Furthermore, option values in market A ($V^3(\tau^A)$), and market B ($W^3(\tau^B,\ F^*)$) are larger than the option values in market A ($V(\tau^A)$) and market B ($W(\tau^B, F)$) in the original cost structure. The illustration shows that firm is still able to deliver positive profits if it exports the optimal quantities in both markets despite larger sunk costs. This outcome is

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[7] Please note that the price and demand are identical in a market for all cost structures.

[8] From equation (5), (7), (8), and (10) demand in a specific market $d_p^j$and variable costs τ_p^j are always identical across products even if the cost settings change ($d_p^j = d^j, \tau_p^j = \tau^j$) so, $\hat{q}_{1p}^j = \frac{1}{2}(d^j - \tau^j - c_p^j)$. We observe that when c_p^j declines $\hat{q}_{1p}^j$ is increasing.

[9] From equation (5), (7), (8), and (10) demand in a specific market d_p^j and variable costs τ_p^j are always identical across products even if the cost settings change ($d_p^j = d^j, \tau_p^j = \tau^j$) so, $\hat{q}_{1p}^j = \frac{1}{2}(d^j - \tau^j - c_p^j)$. We observe that when c_p^j declines $\hat{q}_{1p}^j$ is increasing.

due to the fact that, the total of option values from both markets, are larger than the sunk costs (F^*) (($V^3(\tau^A)$ + ($W^3(\tau^B,\ F^*)$ > F^*). In this cost structure, the firm is expected to export to both markets in the second-period.

$V^{\mathbf{2}}(\tau^A)$= $V^{\mathbf{3}}(\tau^A)$ >V $(\tau^A) = V^{\mathbf{1}}(\tau^A)$ and

$W^{\mathbf{2}}(\tau^B,\ F\ ) = W^{\mathbf{3}}(\tau^B,\ F^*) > W\ (\tau^B,\ F) = W^{\mathbf{1}}(\tau^B,\ F^*)$

The total margins from both markets are larger than the sunk costs in the original, first and third cost structure. In these cases, it is expected that the firm will export to both markets in the second period. However, if it is assumed that these cost structures belong to different product types that firm can choose to experiment with, then the optimal product choice for all firms to experiment in export markets would either have the original or the second cost structure. Since the sunk costs of the original cost structure and the second cost structure are lower than the first and the third cost structure's sunk costs. The original and second cost structure's lower sunk costs provide a less costly experimentation opportunity (least possible loss) for the firm. However, if the firm would have to choose between the products with the original cost structure and the second cost structure, then it is likely that the firm chooses the product with the second cost structure as it has lower marginal costs compared to the original cost structure.
arket B at each cost structure.

Table 1 below summarizes the sunk costs, marginal costs, option value in market A and option value in market B at each cost structure.

Table 1: Sunk Costs, Marginal Costs, Option Values of Different Cost Structures.

Cost Structure	Total Sunk Costs	Total Marginal Costs	Option Value at market A	Option Value at market B
Original	$\boldsymbol{F}$	c	$V(\tau^A)$	$W\ \ (\tau^B, F\ )$
1	$\boldsymbol{F}^*$	c	$V^{\mathbf{1}}(\tau^A)$	$W^{\mathbf{1}}\ (\tau^B, F^*)$
2	$\boldsymbol{F}$	c^*	$V^{\mathbf{2}}(\tau^A)$	$W^{\mathbf{2}}\ (\tau^B,\ F)$
3	$\boldsymbol{F}^*$	c^*	$V^{\mathbf{3}}(\tau^A)$	$W^{\mathbf{3}}(\tau^B, F^*)$

$(F^* \geq F)$ and $(c \geq c^*)$ $so,$ $V^{\mathbf{2}}(\tau^A)$= $V^{\mathbf{3}}(\tau^A)$ >$V\ (\tau^A) = V^{\mathbf{1}}(\tau^A)$ and
$W^{\mathbf{2}}(\tau^B,\ F\ ) = W^{\mathbf{3}}(\tau^B,\ F^*) > W\ (\tau^B,\ F) = W^{\mathbf{1}}(\tau^B,\ F^*)$

Figure 2 is just an illustration of possible outcomes of experimentation[10] when the variable trade costs of market A (τ^A), is larger than the margin in that market ($E\mu < \tau^A$), at $t = 1$, with four different set of sunk and marginal costs. *Figure 2* illustrates how the firms' decision to become a sequential exporter is affected by the changes in sunk and marginal costs when the variable trade cost of the experimentation market i.e. market A is larger than the export margin.

If the CAT and MAN product's cost structures are matched with one of the cost structures in *Figure 2*, it seems that the CAT products' cost structure resembles the original cost structure and MAN products' cost structure resembles the third cost structure among the illustrated cost structures in *Figure 2*. As previously mentioned, the firm is expected to choose the product with lower sunk costs to experiment at foreign markets, especially if there is a substantial difference between the sunk costs of two products. In this setting, new exporters are likely to experiment with CAT products. The adjusted experimentation prediction below summarizes these facts:

Adjusted Experimentation Prediction: New exporters are more likely to experiment with CAT products.

The sequential exporting model is constructed for a two-period, two-market world. In this model, sequential exporters enter only one market to learn about their exporting capability and simultaneous exporters' trade in both markets in the first period.

Sequential exporters start exporting small sales (ε) in market A in the first period. After the experimentation, if the firm acknowledges that it can deliver positive profits abroad, they increase their sales in the second period in only the specific foreign market where they tested their export capability in the first period. Only "confident" simultaneous exporters export large quantities at the first period, and the sequential exporters

[10] Firm tests the market with small initial sales ($\tilde{q}_1^A = \varepsilon$) in every set of sunk and marginal costs.

experiment with small initial sales in the least costly market in the first period to learn about the demand at foreign markets and their optimal export level in foreign markets.

So, export growth of a sequential firm is expected to be higher between *t=1* (first-period) and *t=2* (second-period) after testing the market with a small initial quantity ε and understanding that it can gain positive profits abroad between *t=0* and *t=1* (first-period). As previously outlined, the paper now seeks to configure the export growth of a firm with any exports, CAT exports and MAN exports.

2.2 Export Growth Model

At this point, the paper assumes that a two-period, two-market model is perfectly capable of describing the firms' actual exports in a three-period, two-market world. According to this assumption, firms are able to recall their sales in foreign markets A and B, at the first-period and at the second-period with any exports, CAT exports, and MAN exports.

The first column of *Table 2* shows the markets, and the second column shows the type of exports. Columns 3-6 of *Table 2* show the export quantities at *t=0*, *t=1*, *t=2* and *t=3* respectively.

Table 2 shows that once firms experiment in market A, in the first period (time *t=0 - t=1)* and learns that it can earn profits from exporting, it continues to serve its optimal export quantity as an informed exporter in *t=2* and in *t=3* to markets A and B in the second period (time *t=1 - t=2)* and in the third period (time *t=2 - t=3).* Table 2 also shows that intensive margin growth is higher between *t=1* and *t=2* (second period)[11], which indicates that firms acquire all the relevant information in the first-period (*t=0 - t=1*) and act

[11] Export growth in the second period with any exports = $\left\{\left[\left(\frac{E\ \mu_p - \tau^A}{2}\right)\right] - \varepsilon\right\}$.

accordingly to serve the optimal quantity in other periods to markets after the first-year of exporting (testing/experimenting phase).

In the first period (*t=1*), the firm only exports a small initial quantity ε, in *t=2*, the surviving firm is expected to export its optimal quantity and achieve high export growth with any exports, CAT exports, and MAN exports. At the third time period, there is no export growth with neither of export types (any exports, CAT exports, and MAN exports) as there is no further information to be gained where the demand in markets are symmetric across time.[12]

However, the goal of this paper is to compare the export growth of MAN exports and CAT exports. Therefore, the focus is on the export growth of CAT and MAN exports by identifying optimal quantities of each product type after experimenting with small sales (ε).

As the marginal costs of MAN products are lower than the marginal costs of CAT products, optimal quantity of MAN products is larger than the optimal quantity of CAT products $\hat{q}^{j}_{\mathrm{man}} > \hat{q}^{j}_{\mathrm{cat}}$. Therefore, it is expected that the surviving firm will export its optimal quantity of MAN products to achieve higher export growth at the second period (*t=2*) compared to the surviving firm that exports its optimal quantity of CAT products at the second period (*t=2*) as they both test the market with same small sales(ε).[13]

[12] Export growth in the third period with any exports = $\left\{\left[\left(\frac{\mathrm{E}\ \mu_{\mathrm{p}}-\tau^{\mathrm{A}}}{2}\right)\right]-\left[\left(\frac{\mathrm{E}\ \mu_{\mathrm{p}}-\tau^{\mathrm{A}}}{2}\right)\right]\right\}$=0. MAN export growth in the third period = $\{[\hat{q}^{j}_{\mathrm{man}}]-[\hat{q}^{j}_{\mathrm{man}}]\} = 0$. CAT export growth in the third period = $\{[\hat{q}^{j}_{\mathrm{cat}}]-[\hat{q}^{j}_{\mathrm{cat}}]\} = 0$.

[13] MAN export growth in the second period = $\{[\hat{q}^{j}_{\mathrm{man}}]-\varepsilon_{man}\}$ and CAT export growth in the second period = $\{[\hat{q}^{j}_{\mathrm{cat}}]-\varepsilon_{cat}\}$ where $\varepsilon_{cat} = \varepsilon_{man}$= ε and $\hat{q}^{j}_{\mathrm{man}} > \hat{q}^{j}_{\mathrm{cat}}$ and MAN export growth > CAT export growth.

Table 2: Sequential Exporters Export Quantities According to the Theory.

1	2	3	4	5	6
Market	**Exports**	**Export Quantity and Time**			
		t=0	**t=1**	**t=2**	**t=3**
A	**Any Exports**	0	ε	$\left(\frac{\mathrm{E}\,\mu_p - \tau^A}{2}\right)$	$\left(\frac{\mathrm{E}\,\mu_p - \tau^A}{2}\right)$
B	**Any Exports**	0	0	$\left(\frac{\mathrm{E}\,\mu_p - \tau^B}{2}\right)$	$\left(\frac{\mathrm{E}\,\mu_p - \tau^B}{2}\right)$
A	**CAT Exports**	0	ε_{cat}	$\hat{q}^A_{\mathrm{cat}}$	$\hat{q}^A_{\mathrm{cat}}$
B	**CAT Exports**	0	0	$\hat{q}^B_{\mathrm{cat}}$	$\hat{q}^B_{\mathrm{cat}}$
A	**MAN Exports**	0	ε_{man}	$\hat{q}^A_{\mathrm{man}}$	$\hat{q}^A_{\mathrm{man}}$
B	**MAN Exports**	0	0	$\hat{q}^B_{\mathrm{man}}$	$\hat{q}^B_{\mathrm{man}}$

$\hat{q}^j_{\mathrm{man}} = \left(\frac{\mathrm{E}\mu_{man} - \tau^j}{2}\right)$ *and* $\hat{q}^j_{\mathrm{cat}} = \left(\frac{\mathrm{E}\mu_{cat} - j}{2}\right)$ *where* $\hat{q}^j_{\mathrm{man}} > \hat{q}^j_{\mathrm{cat}}$ *and* $\varepsilon_{cat} = \varepsilon_{man} = \varepsilon$

These findings translate into following facts:

- New exporters' intensive margin growth will be remarkable.
- First-time exporters' intensive margin growth will be observed in the second period (second-year of exporting) at their first export market.

Additionally, findings for CAT and MAN exports translate into following facts:

- First-time exporters' CAT and MAN intensive margin growth will be remarkable.
- However, the surviving firms export growth with MAN products will be higher than the surviving firms export growth with CAT products in the second-period (t=2)

Hence, to observe any export growth with MAN or CAT products, the firms need to test the market with the same product type even if the initial sales value is trivial (ε).[14] The original and the adjusted intensive margin predictions are summarizing these facts below.

[14] Experimental sales value ε is equal across MAN and CAT exports however we need the firms to export by the same type of products to observe any export growth in the second period.

<u>Original Intensive Margin Growth Prediction:</u> Conditional on survival, intensive margin growth of a first-time (new) exporter is higher in its first export market (test market) at its initial years of activity than in subsequent markets or later years of activity.

<u>Adjusted Intensive Margin Growth Prediction:</u> Conditional on survival, new exporters' MAN intensive margin growth is higher than a new exporters' CAT intensive margin growth in their first export market (test market) in their initial years of activity than in subsequent markets or later years of activity.

2.3 Firms' Entry Strategy

In *Figure 2,* the variable trade costs of market A (τ^A), is larger than the export margin ($E\mu < \tau^A$). As mentioned earlier, if each cost structure belongs to a particular product, the firms would test the markets with the least costly product. Firms first consider the sunk costs of each product type. If the sunk cost of two products is equal, they consider the marginal costs of each product type. In this setting, if the MAN products cost structure is similar to the third cost structure, (first from the right in *Figure 2* and if the CAT products' cost structure is similar to the original cost structure (first from the left in *Figure 2*),so it is possible that both MAN and CAT firms to become sequential exporters.

Now, we will try to figure out how firms' sequential and simultaneous entry strategies might change by different cost structures. As previously explained, simultaneous exporters are more able and informed about themselves and foreign markets. So, they enter more than one market initially which is a rather a "confident" action. On the other hand, sequential exporters need to find out whether or not they are able to profit in foreign markets by experimenting with small initial sales to minimize the risk. If the firms find themselves to be profitable at the experimentation market at the first-period, they need to choose either a simultaneous or a sequential entry in the second-period.

Adjusted model characterize firms' sequential and simultaneous entry decisions with different product types as outlined below.

Firm's net profit from sequential exporting is, Π_{Sq}^{p} ,

$$\Pi_p^{Sq} = \Psi_p(\tau^A) + W_p(\tau^B; F_p) - F_p. \quad (17)$$

Where firm's net profit from simultaneous exporting is, Π_{Sm}^{p} ,

$$\Pi_p^{Sm} = \Psi_p(\tau^A) + \Psi_p(\tau^B) - 2F_p. \quad (18)$$

The firm only becomes a simultaneous exporter if the profit from simultaneous exporting is larger than the profit from sequential exporting, provided the simultaneous export delivers profits and vice-versa.

The representative firm becomes a simultaneous entrant only under constraints:

$$\Pi_p^{Sm} > \Pi_p^{Sq} and\ \Pi_p^{Sm} \geq 0. \quad (19)$$

The representative firm becomes a sequential entrant under conditions;

$$\Pi_p^{Sq} \geq \Pi_p^{Sm}\ and\ \Pi_p^{Sq} \geq 0. \quad (20)$$

Figure 3 below illustrates the entry decision of firms with the original cost structure and second cost structure.[15] The x-axis in *Figure 3* indicates a nominal value of sunk costs and the y-axis indicates a nominal value of profits. The solid red line indicates the profit curve of simultaneous exporting from the original cost structure $\left(\left(\Pi_{Orj}^{Sm}\right)\right)$ and the solid blue line indicates the profit curve of sequential exporting $\left(\Pi_{Orj}^{Sq}\right)$ with the original cost structure. The dashed red line indicates the profit curve of simultaneous exporting $\left(\Pi_2^S\right)$ with the second cost structure and the blue line indicates the profit curve of sequential exporting $\left(\Pi_2^{Sq}\right)$ the second cost structure in *Figure 3.*

[15] The sunk costs of the second cost structure(F) is equal to the sunk costs of original cost structure (F) but the marginal costs of the original cost structure (c) is larger than the marginal costs of the second cost structure (c^*) , $(c) > (c^*)$.

$\left(F_{Orj}^{Sm}\right)(\tau^{B})$ indicates the sunk cost threshold for the firm to become a simultaneous exporter with the original cost structure and $\left(F_{Orj}^{Sq}\right)(\tau^{\text{A}},\tau^{B})$ indicates the sunk cost threshold for the firm to become a sequential exporter with the original cost structure. Both thresholds are marked by a round shape on the x-axis from left to right respectively in *Figure 3.*

F_{2}^{*Sm} (τ^{B}) represents the sunk cost threshold for the firm to become a simultaneous exporter with the second cost structure and F_{2}^{*Sq} $(\tau^{\text{A}},\tau^{B})$ is the sunk cost threshold for the firm to become a sequential exporter with the second cost structure. Both thresholds are marked by a star shape on the x-axis from left to right respectively in *Figure 3.*

Figure 3 illustrates that firms do not enter foreign markets until the sunk costs are lower or equal to the sunk cost threshold of sequential entry for each cost structure. These cases are illustrated by the solid black "$NO\ Entry_{\ Orj}$", arrow and the black and white diagonal "$NO\ Entry_{\ 2}$", arrows for the original and the second cost structure respectively. It is observed that firms do enter markets with higher entry level sunk cost thresholds in the case of the second cost structure.

Figure 3 also illustrates that firms do not become a simultaneous exporter or sequential exporter until the sunk costs are lower or equal to the sunk cost threshold of the simultaneous entry and the sequential entry in each cost structure. Solid black arrows in *Figure 3* illustrates firms' no entry, sequential entry, and simultaneous entry decisions with the original cost structure, by "$NO\ Entry_{\ Orj}$", "$SEQ.\ Entry_{\ Orj}$", and "$SIM.\ Entry_{\ Orj}$" respectively. The black and white diagonal arrows in *Figure 3* illustrate firms' no entry, sequential entry, and simultaneous entry decisions with the second cost structure, ("$NO\ Entry_{\ 2}$", "$SEQ.\ Entry_{\ 2}$" ,and "$SIM.\ Entry_{\ 2}$") with the second structure in *Figure 3.*

When the sunk costs are identical, it is observed that lower marginal costs of the second cost structure shifts both sequential and simultaneous entry thresholds to the right-hand side on the x-axis in *Figure 3.* Although both thresholds for sequential and simultaneous entry moves on the right-hand side of the x-axis, their effect counteracts each other in terms of increasing and decreasing the sequential exporters' share respectively. Even though, the thresholds of sequential and simultaneous entry shifting to the right-hand side of the x-axis counteract each other's effects, the sequential entry threshold shifts more than the simultaneous entry threshold. Owing to the fact that, the additional export quantities in the market A is larger than the additional export quantities in the market B.

From equations (5), (7), (8), and (10), the optimal quantity for the original cost structure is delivered as: $\widehat{q}^{j}_{1\mathrm{orj}} = \frac{1}{2}\left(d^{j} - \tau^{j} - c^{j}\right)$. The optimal quantity for the second cost structure is: $\hat{q}^{j}_{12} = \frac{1}{2}\left(d^{j} - \tau^{j} - c^{*\,j}\right)$.

It can be seen that the optimal quantity and the marginal costs are inversely correlated. Also, the marginal costs of the second cost structure is lower than the marginal costs of the original cost structure $c^{*j} < c^{j}$. This lower marginal costs of the second cost structure creates the additional quantities in each market that lead to additional profits in those markets.

The variable trade costs in market A is smaller than the variable trade costs in market B $\tau^{A} < \tau^{B}$, which indicates that the additional profits in market A is larger than the additional profits in market B. Therefore, the larger additional profits in market A means that the share of sequential exporters in the second cost structure is larger than the share of sequential exporters in the original cost structure. [16]

The thresholds of sequential and simultaneous entry thresholds shifting to the right-hand side of the x-axis indicate that firms are able to become sequential and simultaneous exporters under higher sunk costs. This illustration shows that there are more firms[17] that are able to enter markets, and there are more simultaneous firms in the second cost structure compared the original cost structure.

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[16] Assuming that the firms are uniformly distributed.
[17] Assuming that the firms are uniformly distributed.

Keeping in mind that CAT products' cost structure resembles the original cost structure, and MAN products' cost structure resembles the third cost structure. The similarity between the second and the third cost structure is having the same low marginal costs compared to the sunk costs of the original cost structure. However, the third cost structure has higher sunk costs when compared to the second and the original cost structure.

Figure 3 illustrates how the changes in marginal costs affect the firms' entry strategies. As the second and the third cost structures have the similar marginal costs, it is expected that the lower marginal costs of MAN products to have the same affect as the second cost structure illustrated in *Figure 2* if the sunk costs of MAN and CAT products not being too different from each other. This expectation is summarized by the adjusted entry prediction below:

Adjusted Entry Prediction: Conditional on survival, new exporters, are more likely to enter new markets with MAN[18] products.

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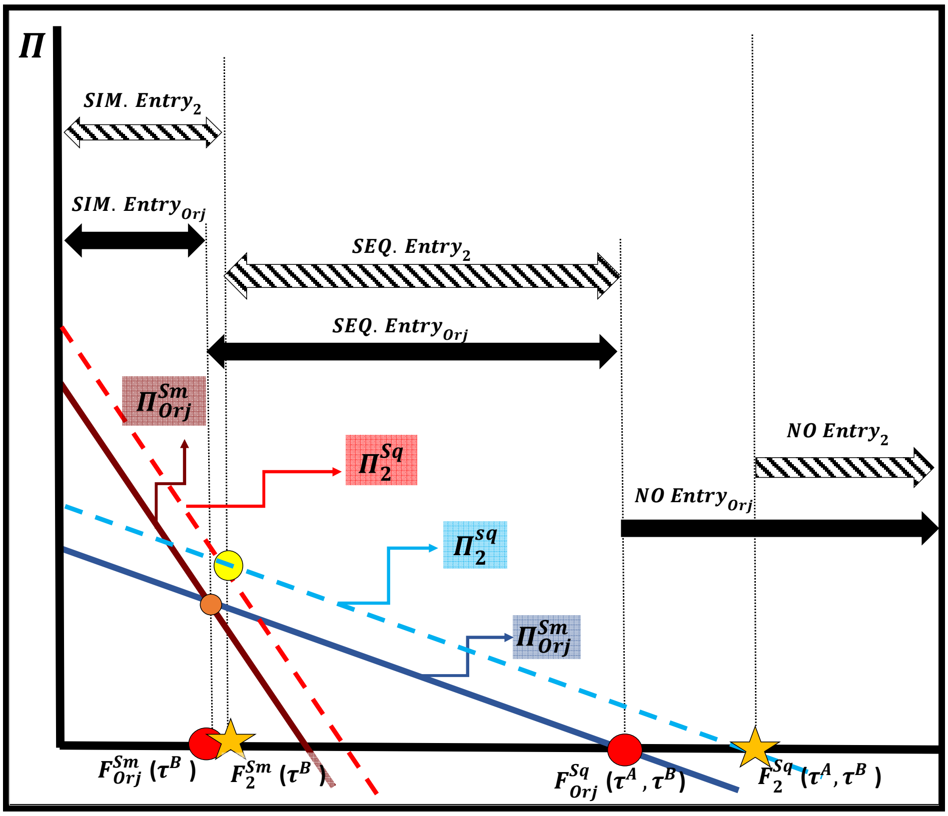
[18] If the sunk costs of MAN and CAT products not being too different from each other.

Figure 3: Optimal Entry Strategy of the Firm with the Second Cost Structure where Firm Finds Exporting Profitable $E\,\mu_p > \tau^B$.



The rest of this paper aims to test these predictions using Turkish firm-level data for the period 2005-2011.

Table 3: CAT and MAN Products Differences and the Predictions of Adjusted Framework.

<table>
<tr><th colspan="2" rowspan="3"></th><th colspan="4">Differences between CAT and MAN Products</th><th colspan="3" rowspan="2">PREDICTIONS</th></tr>
<tr><th colspan="4">Costs</th></tr>
<tr><th colspan="2">Sunk Costs</th><th colspan="2">Marginal Costs</th><th>Experimentation (Testing)</th><th>Intensive Margin Growth at the First Market</th><th>Entry to a New Market (Different From the First Market)</th></tr>
<tr><td rowspan="2">PRODUCT TYPE</td><td>CAT</td><td>Trade-related sunk costs.</td><td>☒</td><td>Unit production costs.</td><td>Some profit payment to purchase the product from the producer.</td><td rowspan="2">New exporters are expected to experiment with CAT products.</td><td rowspan="2">Conditional on survival, new exporters’ MAN intensive margin growth is expected to be faster than the new exporters’ CAT intensive margin growth.</td><td rowspan="2">Conditional on survival, new exporters are expected to enter new markets with MAN exports.</td></tr>
<tr><td>MAN</td><td>Trade-related sunk costs.</td><td>Production adjustment related sunk costs.</td><td>Unit production costs.</td><td>☒</td></tr>
</table>

3. Data and Analysis

In this section, I will describe the datasets, provide descriptive statistics about CAT and MAN prevalence. Later on, I will explain how I test and tackle the models' predictions considering the challenges about separating CAT and MAN products and firms, and I will discuss the results for the 2005-2011 period.

3.1. Data

This thesis combines three firm-level databases for the period 2005-2011. The first database is the Structural Business Statistics (SBS) that covers the firms' number of employees, income, input costs, investment activity, ownership information and the primary four-digit NACE-Code.[19] The second database is the Foreign Trade Database (FTS) that covers firms' import and export activities over 100 USD distinguished by country, quantity, and value of the transaction in Turkish Lira (TL) with 12 digit national product classification (Customs Tariff Statistics Positions GTIP) code.[20] The third database is the Annual Industrial Product Statistics Database (AIPS) that covers the firms' production activities[21] distinguished by volume, value, quantity and total sales with 10-digit PRODTR national product classification (PRODTR) Code.[22]

To match trade and production datasets, a uniform code over time and across datasets is needed. The product classification of trade dataset changes over time, production and

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[19] SBS covers the whole population of firms with more than 19 employees that are operating in NACE sections C to K, and from M to O.

[20] The first six digits of GTIP corresponds to six digit international HS Nomenclature. The first eight digits of GTIP corresponds to Combined Nomenclature (CN). 9th and 10th digits of GTIP correspond to national subheadings, and 11th and 12th digits correspond to national statistical position.

[21] AIPS covers the whole population of firms with more than 19 employees that are operating in NACE sections B or C in NACE Rev.2. AIPS also covers all firms' production activities if the produced products are in NACE sections B or C in NACE Rev.2 categories.

[22] AIPS database collects the firms' production information with a similar survey to PRODCOM database. PRODCOM survey is obligatory for all EU member states and some EFTA countries which are bound by PRODCOM regulation. The EU adaptation process agreements bonds Turkey to obey PRODCOM regulations. Therefore, the first eight digits of PRODTR code corresponds to PRODCOM code.

trade datasets are registered with different product classifications. Therefore, I harmonize all the trade codes for the period 2005-2011 by basically tracking the changed codes backwards.[23] Later on, I use a correspondence table between trade and product classifications to push all the harmonized trade codes towards the production codes.[24] These harmonization processes deliver a uniform code classification that will enable us to merge production and trade databases in order to track produced and exported products (MAN) and not produced but exported products (CAT) of each firm. CAT and MAN exports are classified by tracking the firms' production, and export activities with a single uniform code (product/products) across the relevant databases. All the exports of a firm are considered as MAN exports even if the firm produces a small amount from a particular product that is exported in a year, to overcome the bias of overestimating the role of CAT exports.

Finally, to account all the firm, product and trade characteristics, Structural Business Statistics, Production and Trade databases are merged with a unique firm identifier. There are three conditions for any firm to be covered by the final estimation sample. The first condition is to employ more than nineteen employees according to Structural Business Statistics database. The second condition is to be a new exporter by not exporting in the year 2005 and start exporting in subsequent years according to Trade database.[25] The third condition is to export a MAN and a CAT product least once during the 2005-2011 period according to Production and Trade databases.[26] Therefore, the final estimation sample consists all the new exporters that employ more than nineteen employees that export a MAN and a CAT product least once during the period 2005-2011. during the data creation process, more than 22% of trade and more than 20% of production data is lost.[27] During the data creation process, more than 22% of trade and more than 20% of production data is lost and mostly small-sized only MAN exporters are excluded.

[23] Appendix-1 presents the details of the procedure.
[24] Appendix-3 presents the details of the procedure.
[25] In this thesis, all firms that start exporting after the year 2005 is considered as new exporters.
[26] Firms do not need to export CAT and MAN products in a certain year or to a certain market. If a firm exports these two type of products during the 2005-2011 period then that firm is included in the estimation sample.
[27] Please refer to Appendix 1, Appendix 2 and Appendix 3 for details.

3.3.2 Descriptive Statistics

In this subsection, I will present descriptive statistics about the share of experimenting firms in each market, CAT and MAN experimentation values by firm types and markets, different experimentation bundles, and the experimentation and second-year bundle changes of firms. Then, additional descriptive statistics will provide the export shares of CAT and MAN exports, according to firm size and foreign ownership and by HS Chapters (for the export shares over 1% of total trade). In order to do so, I need to define new exporters, sequential exporters, simultaneous exporters, markets and CAT and MAN products.

Firstly, I classify the firms that do not export in the year 2005 and start exporting in subsequent years as new exporters. There are 3483 new exporters in the sample that do not export in 2005 and start exporting to a country in consecutive years. However, it is not possible to identify each country as an individual market for these new exporters due to computational reasons.[28] Considering these aspects, I group the countries that Turkish firms export to in ten relatively homogeneous country groups (markets) as outlined below.

I create ten relatively homogeneous country groups from all the export destinations due to computational reasons.[29] *Table 4* documents how new exporters' export value is distributed across each country group and year. The first column in *Table 4* shows the country groups and the rest of the columns show the years. The first country group consists all the EU-15 members except for Germany, France, Italy, and the UK. The

[28] Documenting the export values or export value shares of each country produces very long tables that is hard to manage and interpret.
[29] All Turkish firms export to 206 countries in the year 2005 and 216 countries in the year 2011. Turkish manufacturers exported to in 180 countries at 2005 and number raised to 201 at 2011.

second country group consists Germany, the main migration destination for Turkish migrants. The third country group consists France, Italy, and the UK, the oldest trade partners of Turkey before the EU. The fourth country group consists Turkic Republics that share a common ethnic language and history with Turkey.[30] The fifth country group consists countries that have contiguity with Turkey and that are not in the previous country groups. The sixth country group consists Russia, Baltic Republics, and East-Central Europe. The seventh country group consists all the member countries of the African Union. The eighth country group consists the countries that are in North America Country group nine consists United Arab Emirates, Saudi Arabia, Israel, and Algeria. The tenth country group represents all the countries that are not represented by the preceding country groups.

Table 4 below shows that the first, the second and the third country groups' export value share have a decline over the period. The export value share of the fourth country group has a slight and steady increase during the period. The fifth country groups' export value share increases after the year 2008. The sixth country groups' export share increase until the year 2009 and has a sharp decline in the year 2009 then it rises steadily. The seventh country groups' export value share has a dramatic pick in the year 2009 which is followed by a steady decline after that. The eighth country groups' export value share declined between the years 2005-2009 where it halves in the year 2009 and has a slight increase thereafter. The ninth country group has quite a stationary export value share except for the pick in the year 2008 and the tenth country groups' export value share increase between the years 2005-2009 and declines thereafter.

After creating ten country groups and documenting the yearly export value shares in each country group, I focus on defining new exporters according to their initial (experimenting) exporting strategy.

[30] Contiguity and common language variables are traditionally used in the gravity equations, and linear regressions, and a positive correlation observed between the trade, contiguity and common language.

Previously, I identified the firms that do not export in the year 2005 and start exporting in subsequent years as new exporters. Now, I define surviving new exporters and re-entrants. Firms that do not export consecutively through the period (do not survive) are classified as re-entrants and the firms that export consecutively through the period are classified as the surviving new exporters. There are 14% of all new exporters new exporters among that do not survive; these exporters are re-entrants that stop their exporting activities in a year and re-enter to the world of exporting again in consecutive years. Later on, I separate the surviving new exporters into two categories according to their initial exporting strategy. Surviving new exporters that start exporting to only one country group (market) are classified as sequential exporters. Surviving new exporters that start exporting to more than one country group (market) are classified as simultaneous exporters. According to this classification, there are 1,424 sequential exporters, and 1,582 simultaneous exporters in the sample. The model describes sequential exporters' and simultaneous exporters' exporting strategies in a two market world. In this world, a new exporter becomes a sequential exporter if it enters only one market initially, and a new exporter becomes a simultaneous exporter if it enters two markets (all markets) initially. In the real world, it is not common to observe a new exporter, serving more than 200 foreign countries initially.[31]

Additionally, all the sequential exporters enter only one country group to experiment. Whilst, the median simultaneous exporter, enters three country groups, and the mean simultaneous exporter enters four country groups to experiment. The larger mean than the median is a result of three very large simultaneous multinationals exporting to nine country groups and few other large exporters entering more than six country groups initially.

[31] None of the Turkish new exporters are exporting to all countries during the 2005-2011 period. Therefore, according to the theory all the new exporters in my estimation sample are sequential exporters.

In *Table 4* it is observed that the export value shares change across the country groups and years. *Table 5* analyzes how the experimenting re-entrants, sequential exporters and simultaneous exporters' are distributed among ten country groups.

These entry shares in each country group translate into the count-share of sequential exporters in *Table 5*. However, these entry shares do not represent the count-share of simultaneous exporters in each country group. Because simultaneous exporters enter at least two country groups initially and a simultaneous exporter is counted as many times as the number of its initial country groups. Therefore, the shares in *Table 5* only represent the share of all simultaneous exporters' entries in a particular country group.

Table 4: New exporters' Export Value Share in Each Country Group by Years.

	Country Group	2005	2006	2007	2008	2009	2010	2011
		Year						
1	**EU-15 (Except Germany, France, Italy, UK)**	15.7	16.0	15.5	12.6	11.5	11.7	11.5
2	**Germany**	13.7	11.8	11.6	10.1	9.8	10.4	10.3
3	**France, Italy, UK**	21.6	22.1	21.4	17.7	18.3	18.0	17.2
4	**TURKIC REPUBLICS (Azerbaijan, Turkmenistan, Uzbekistan, Kazakhstan, Kyrgyzstan, Northern Cyprus)**	3.2	3.6	3.8	3.9	4.4	4.6	4.8
5	**NEIGHBOURS THAT ARE NOT EU NOR TURKIC REPUBLIC (Bulgaria, Georgia, Armenia, Iran, Syria, Iraq)**	8.4	7.7	7.6	8.1	10.5	11.8	12.2
6	**RUSSIA, BALTIC COUNTRIES, AND EAST-CENTRAL EUROPE (Russia, Estonia, Latvia, Lithuania, Belarus, Ukraine, Moldova)**	3.5	4.0	4.6	5.1	2.9	3.9	4.1
7	**AFRICAN UNION**	3.5	3.6	3.9	5.2	8.1	6.6	6.4
8	**NORTH AMERICA**	8.0	7.0	4.7	4.2	3.8	4.1	4.3
9	**UAE, Saudi Arabia, Israel, Algeria**	7.2	6.9	7.6	11.1	8.3	8.5	9.2
10	**REST OF THE WORLD**	15.3	17.2	19.3	22.0	22.5	20.7	19.9

Table 5 shows re-entrants', sequential exporters' and simultaneous exporters' experimenting entry shares in each country group where the highest and lowest shares are shown by the overlined and underlined numbers respectively. The first row shows the re-entrants', the second row shows the sequential exporters,' the third row shows the simultaneous exporters' entry shares in each country group where the country groups are shown by the relevant columns in *Table 5*.

It can be observed that the highest entry share of sequential exporters and re-entrants are in the fifth country group, which represents the neighboring countries that are not in the EU or a Turkic republic. Additionally, ignoring the share in the tenth country group, representing the rest of the world, the highest experimentation entry share of simultaneous exporters is in the first country group representing the EU-15, except Germany, France, Italy, the UK. On the other hand, the eighth country group, representing North America, seems to attract the least share of re-entrants', sequential exporters' and simultaneous exporters' experimentation entries.

The above finding is consistent with the theory, which predicts that firms export to a neighboring country to benefit from lower shipment costs, reduce a possible loss from exporting and avoid distant markets due to the higher shipment costs and the possible higher loss. Especially, re-entrants and sequential exporters are assumed to be less able to export compared to simultaneous exporters in the model.

In terms of choosing the easiest (less costly) market, re-entrants and sequential exporters are different from the simultaneous exporters as seen in *Table 5*. On the other hand, all three firm types show the same loss avoidance pattern by having the least share of exporters in the eighth country group, representing North America, a distant market.[32]

[32] From now on, the highest and the lowest highlighted shares in country groups six, seven and eight in Table 5 will be ignored due to comparatively very low entry shares of firms in these country groups as shown in Table 4.

Finally, the first five country groups are nearly equally attractive for all three firm types, and the sixth, seventh, eighth and ninth country groups are less attractive for all three firm types compared to the attractiveness of the first five country groups.

Table 5: Exporters Types' Number of Entry Shares in Country Groups.

Firm Type	**Experimentation Country Group**										**Total**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
RE	13	13	13	11	**17**	3	3	**3**	7	17	100
SEQ	10	11	12	13	**22**	4	5	**2**	5	16	100
SIM	**16**	12	13	8	11	5	6	**4**	7	18	100

After analysing the experimenting entry shares of re-entrant exporters, sequential exporters and simultaneous exporters in each country group in *Table 5* above, the focus is now on documenting the experimentation export value of any exports, of CAT exports and of MAN exports in each country group is shared among Re-entrant exporters, sequential exporters, and simultaneous exporters. I cluster exporters' exports into two categories; CAT exports and MAN exports where the MAN exports are produced by the exporter and CAT exports are not produced by the exporter to any extent in a particular year. The preliminary findings show that on average, the re-entrant exporters' any export value share is less than 2% where simultaneous exporters export value share is above 83% and sequential exporters any export value share is 15% in a country group. Approximately, three-quarters of the sequential exporters' any export value and two-thirds of simultaneous exporters' any export value share is achieved by their CAT exports in a country group. Apart from the above findings, there are only two important findings for the sequential and simultaneous exporters' export value shares in each country group. Simultaneous exporters' has the highest MAN export value share with 44% the second country group (Germany) compared to their MAN export value share in other country

groups. Sequential exporters have their highest CAT and MAN export value shares in the fifth country group (Turkic Republics) with 27% and 9% respectively.[33]
These findings guide us in saying that both sequential and simultaneous exporters' experimentation sales are mostly CAT exports. Additionally, sequential exporters export value share is highest in the fifth country group (Turkic Republics) even if most of that is achieved by their CAT experimentation sales. Simultaneous exporters' highest MAN export value share is in the second country group (Germany). Therefore, we might think that the common language and being the main migration destination is definitely important for sequential and simultaneous exporter's experimentation sales.

However, the prediction of the adjusted theory that suggests the experimenting with CAT exports is the rational and less costly move for the new exporters cannot be proven by only focusing the average or country group specific CAT and MAN experimentation sales share. Therefore, I focus on the new exporters' experimentation export bundle choices to highlight if this prediction holds.

To explain the number of exporters share with different experimentation bundles in each country group, exporters' experimentation exports are clustered into two categories - CAT exports and MAN exports. Secondly, the exporters' experimentation export bundles are separated into three categories - CAT Only, MAN Only and MIXED experimentation export bundles. There are three categories that a firm can fall into according to what product(s) it has exported when experimenting in its first export market(s). If a firm experiments only with CAT products in a country group, then exporters' experimentation export bundle in that country group is CAT Only. If a firm experiments only with MAN products in a country group, then exporters' experimentation export bundle in that country group is MAN Only. Finally, if a firm experiments with both CAT and MAN products in a country group then exporters' experimentation export bundle in that country group is MIXED.

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[33] Compared to other country groups.

Sequential exporters experiment in one market, and simultaneous exporters experiment in multiple markets. Therefore, simultaneous exporters might have different experimentation export bundles in each of initial markets they enter. So, the simultaneous exporters' multiple entries into different experimentation markets are counted and considered similar to the method in *Table 5*

Table 6 below shows the firms' entry shares in each country group with their experimentation CAT Only, MAN OnlygroupIXED export bundles in each country groups. The first column in *Table 6* shows the firms' experimentation bundles and the subsequent columns show the relevant country groups. The last column in *Table 6* shows the average share of firms' entries with CAT Only, MAN Only and MIXED export bundles in general. In *Table 6* shows that the entry share of exporters with CAT only export bundle, MAN only export bundle and the MIXED export bundle is highest in ninth, eighth, and second country group respectively and shown by the over lined numbers.Additionally, the entry share of exporters with CAT only export bundle, MAN only export bundle and the MIXED export bundle is lowest in eighth, fourth, and ninth country group respectively and shown by underlined numbers[34] in *Table 6*. If experimenting with a MIXED bundle were to be defined as a bold move, it is observed in the second country group, representing Germany (the main migration destination of Turkey), has the highest share of exporters with the bold exporting strategy. It is possible that new exporters are more confident in the main migration market due to the information flow about acquired tastes and requirements for the produced i.e. MAN products via the knowledge accumulation or better trade connections. On the other hand, in the ninth country group (UAE, Saudi Arabia, Israel, and Algeria) has the highest share of exporters with the CAT Only experimenting export bundle and the lowest share of exporters with the MIXED experimenting export bundle

[34] Combining the findings of *Table 4*and *Table 5* I ignore the highlighted findings about country group eight in *Table 5* because this finding might be dominated by small number of firms as seen in *Table 4.*

<u>Adjusted Experimentation Prediction:</u> New exporters will experiment with CAT products.

This prediction is tested using the last column of *Table 6*, where on average 60% of the new exporters are experimenting with CAT Only bundle followed by MIXED and MAN Only bundles with the shares of 23.5% and 16.5% respectively. Decomposing the average shares of CAT Only, MIXED and MAN Only experimentation bundles by sequential and simultaneous exporters does not change the CAT Only, MIXED, and MAN Only bundles' high to low share order. Because, average of 58 % of sequential exporters and 59 % of simultaneous exporters experiment with CAT Only export bundle, 12 % of sequential exporters and 17 % of simultaneous exporters experiment with MAN Only export bundle and 30 % of sequential exporters and 24 % of simultaneous exporters experiment with MIXED export bundle in a country group. This validates the adjusted experimentation prediction i.e. new exporters will experiment with CAT products.

Recall that simultaneous exporters' had the highest MAN export value share with 44% in the second country group. It can be seen that the second country group also has the highest share of exporters that experiment with the MIXED export bundle, which is a bold startup move. These two findings relating to the second county group (Germany), reveal that a mature migration destination allows the first exporting experience to be more confident especially for more confident exporters, in terms product diversification and it becomes easier to start exporting with MAN products.

Table 6: Exporters' Entry Shares with CAT Only, MAN Only and MIXED Experimentation Bundles in Each Country Group.

Experimentation Bundle Type	Experimentation Country Group										Avg.
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
CAT ONLY	58	57	56	63	61	61	63	**<u>55</u>**	**64**	62	60.0
MAN ONLY	16	15	17	**<u>13</u>**	14	17	19	**21**	19	15	16.5
MIXED	26	**28**	27	24	25	22	18	24	**<u>17</u>**	23	23.5
Total	100	100	100	100	100	100	100	100	100	100	100

Table 6 examined the share of exporters with different experimentation export bundles. However, exporters' export bundles are neither static through the years nor across country groups. Exporters can start with CAT Only, MIXED and MAN Only experimentation bundles in their experimentation market and in consecutive can continue with CAT Only, MIXED and MAN Only second-year export bundles at their experimentation market. Therefore, an additional table is created that accounts for all the possible changes in exporters' experimentation bundles in the consecutive year (second-year of exporting) in their respective experimentation market(s).

Table 7 shows sequential and simultaneous exporters' average share of full year export bundles in each experimentation bundle category respectively. *Table 6* revealed the shares of CAT Only, MIXED and MAN Only experimentation bundles [35] are quite different from each other. Therefore, the percentages in *Table 7* are calculated to observe the share of exporters' second-year export bundles within an experimentation export bundle category without accounting the share of exporters in the each experimentation export bundle category.

The first column in *Table 7* below shows the exporters' experimentation bundles; the second column shows the exporters' second-year export bundles. The third and the fourth columns show the average share of second-year export bundles in each experimentation bundle category for sequential and simultaneous exporters' respectively.

Table 7 shows that 64% of sequential exporters' CAT Only experimentations and 68% of simultaneous exporters' CAT Only experimentations are continued by CAT Only export bundle in their second year at their first-market. 46% of sequential exporters' MAN Only experimentations and 54% of simultaneous exporters' MAN Only experimentations are continued by MAN Only export bundle in their second year at their first-market. Finally,

[35] On average 60% of exporters experiment with CAT Only export bundle, 23.5% experiment with MIXED bundle and 16.5 % experiment with MAN Only export bundle.

54% of sequential exporters' MIXED export bundle experimentations and 66% of simultaneous exporters' MIXED export bundle experimentations are followed by the MIXED export bundle in the second year at their first-market. Overall, *Table 7* shows that more simultaneous exporters are keeping their initial bundles unchanged in their second year at their first-market compared to sequential exporters.

Table 7: Sequential and Simultaneous Exporters' Second Year Bundle Shares within Their Experimentation Bundle Category in Their Experimentation Market.

Experimentation Export Bundle	**Second Year Export Bundle (in the Experimentation Market)**	**% of Sequential Exporters' Entries**	**% of Simultaneous Exporters' Entries**
1) CAT Only	**1.A) Only CAT**	**64**	**68**
	1.B) Only MAN	13	11
	1.C) MIXED	23	21
	ALL BUNDLES (1.A+1.B+1.C)	100	100
2) MAN Only	**2.A) Only CAT**	24	15
	2.B) Only MAN	**46**	**54**
	2.C) MIXED	30	31
	ALL BUNDLES (2.A+2.B+2.C)	100	100
3) MIXED (Both CAT & MAN)	**3.A) Only CAT**	32	23
	3.B) Only MAN	14	11
	1.C) MIXED	**54**	**66**
	ALL BUNDLES (3.A+3.B+3.C)	100	100

Table 8 below shows the export share of CAT and MAN exports across small, medium and large firms with some foreign ownership share (FDI=1) and without any foreign ownership share (FDI=0). Firms employing between 19 and 49 employees, firms with 50 and 249 employees and firms with more than 250 employees are classified as small-sized, medium-sized, and large-sized firms respectively.

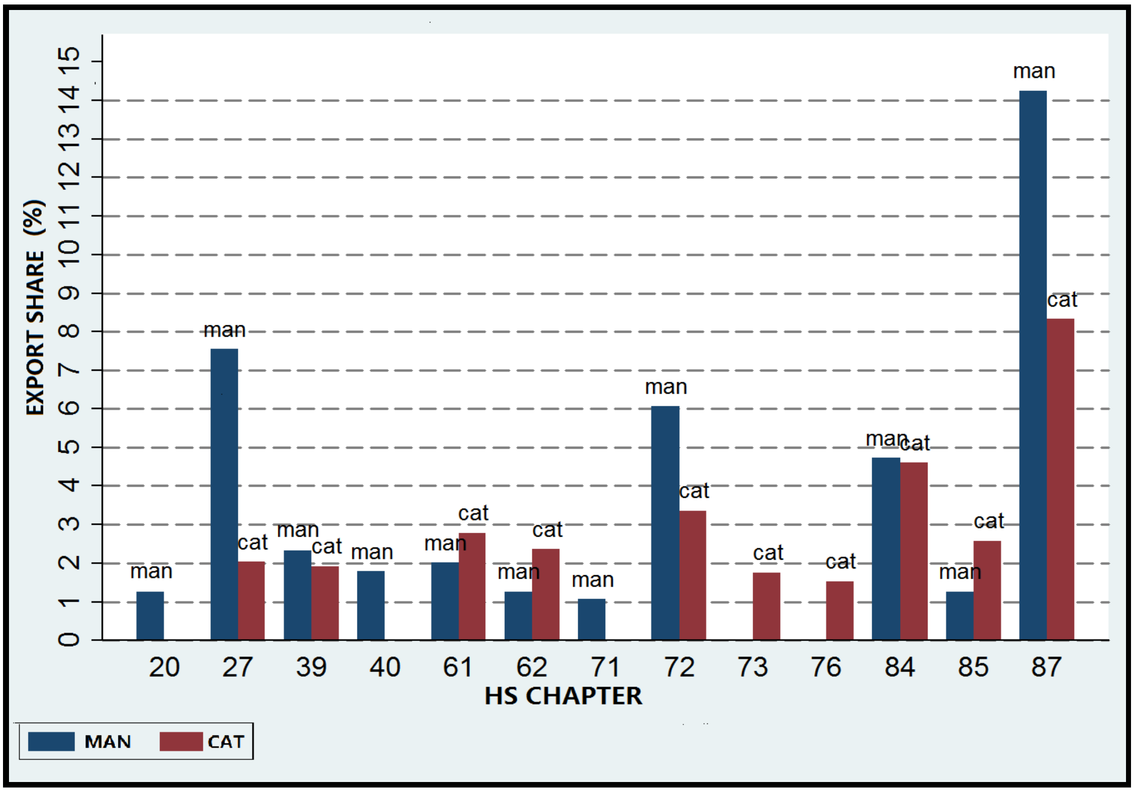
Table 8 below shows that foreign ownership has a very small positive effect on CAT and MAN export shares of large sized firms. On the other hand, foreign ownership has a substantial positive effect on the small, and medium-sized firms. Because it is observed that small-sized and medium-sized firms with some foreign ownership have considerably more CAT and MAN export share compared to the firms without any foreign ownership of the same size.

Table 8: Export Shares of CAT and MAN Exports According to Firm Size and Foreign Investment Status.

Export Type	FDI STATUS	Export Share of Firm Size			Row Total
		Small	Medium	Large	
CAT	FDI=0	0	1.4	14.0	15.4
	FDI=1	2.4	9.5	14.3	26.2
MAN	FDI=0	0	1.5	23.4	24.9
	FDI=1	0.2	9.5	23.8	33.5

Figure 4 below shows the HS Chapters where the MAN export share and CAT export share in a particular chapter is above 1% of all exports. MAN exports share exceed CAT exports share in the HS Chapters 20 (Preparations of vegetables, fruit, nuts or other parts of plants.), 27 (Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes), 39 (Plastics and articles thereof.), 40 (Rubber and articles thereof.), 71 (Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin.), 72(Iron and steel.), 84 (Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.), 87 (Vehicles other than railway or tramway rolling stock, and parts and accessories thereof.). On the other hand, CAT exports share exceed MAN exports share in the HS Chapters 61 (Articles of apparel and clothing accessories, knitted or crocheted.), 62 (Articles of apparel and clothing accessories, not knitted or crocheted.), 73 (Articles of iron or steel.), 76 (Aluminium and articles thereof.) and 85 (Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.)

Figure 4: CAT MAN Export Shares over 1% of Total Trade by HS Chapters.



20 Preparations of vegetables, fruit, nuts or other parts of plants.
27 Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.
39 Plastics and articles thereof.
40 Rubber and articles thereof.
61 Articles of apparel and clothing accessories, knitted or crocheted.
62 Articles of apparel and clothing accessories, not knitted or crocheted.
71 Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewelry; coin.
72 Iron and steel.
73 Articles of iron or steel.
76 Aluminum and articles thereof.
84 Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.
85 Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.
87 Vehicles other than railway or tramway rolling stock, and parts and accessories thereof.

3.3. Empirical Results

In this section, the (i) original and adjusted intensive margin growth predictions and (ii) original and adjusted entry predictions of the sequential exporting theory are tested. Linear regression (OLS) are used to examine the original and adjusted intensive margin growth predictions and Linear probability model (LPM) to analyze the original entry prediction. Later on, two additional set of estimates are included, firstly to test how foreign ownership and labor productivity alter the results secondly, to test how operating in non-credit constrained sectors alter the results.

3.3.1. Intensive Margin Growth

In this subsection, the original and adjusted intensive margin growth predictions that are listed below are examined.

- ***Original Intensive Margin Growth Prediction:*** Conditional on survival, intensive margin growth of a first-time (new) exporter is higher in their first export market (experimentation market) at their initial years of activity than in subsequent markets or later years of activity.

- ***Adjusted Intensive Margin Growth Prediction:*** Conditional on survival, new exporters' MAN intensive margin growth is higher than the new exporters' CAT intensive margin growth in their first export market (experimentation market) in their initial years of activity than in subsequent markets or later years of activity.

To test these predictions, the previously defined exporter categories - new exporters, surviving new exporters, sequential exporters, and simultaneous exporters- are used. Empirically, new exporters are defined as firms that do not export in the year 2005 and start exporting in the subsequent years. Surviving new exporters are defined as firms that are continuously exporting in consecutive years. Finally, the new exporters that stop exporting in a point in time and restart exporting in subsequent years are classified as re-entrants. Even though re-entrants are not among the survivors, some of them do export for two consecutive years before stopping all of their exporting activities. Therefore, the prediction that is conditional on surviving is tested without the condition to survive and with the condition to survive.

In the first set of estimations, all firms' (all new exporters') likelihood of entering a new market is estimated without the condition to survive. In the second set of estimations, the surviving new exporters' likelihood of entering a new market is studied by separating the surviving firms into two categories- sequential exporters and simultaneous exporters based on their initial entry strategy. Sequential exporters are defined as the new exporters that continue to export in consecutive years and started exporting to one country group initially. Simultaneous exporters are defined as the new exporters that continue to export in consecutive years and started exporting to more than one country group initially.

Finally, a firm's export growth are categorized as CAT and MAN export growth for the first and second set of estimations respectively. Empirically a firm's exports are defined as MAN exports if the firm produces even a small amount of the exported product in that year. A firm's exports are categorized as CAT exports if the firm does not produce the exported product to any extent.[36] However, defining CAT and MAN exports do not delineate the firms as CAT and MAN firms. In *Table 7* it was seen that firms have different initial bundles to experiment and they change their experimentation export bundle by adding or dropping CAT and MAN products at their second year of exporting. The nine different combinations in two consecutive (the first and the second) years of exporting are previously presented in *Table 7*.

The changes in the initial export bundle in the second year of exporting creates a challenge in accounting for the exporters' CAT and MAN export growth in their experimentation

[36] Please note that all the products (for example; office equipment, shoes and automobiles) are clustered under the MAN product/export type if firm produce a small amount of that product and rest of the exported products (for example; textiles, computers and hair extensions) are clustered under CAT product/export type. The firms' all exported products are classified as MAN exports even if the export value is higher than the produced value of the product in that year, The firms' all exported products are classified as CAT exports if firm does not produce the exported product to any extend at all in that year.

market. However, this challenge is not to the extent that will change my estimation results due to accounting for a small share of my sample. It is prudent to note here that firms' export bundles are neither static from the experimentation year to second-year of exporting nor after their second-year of exporting to the next year. Therefore, it is not reasonable to account export growth through the estimation period by categorizing the firms, according to their export bundles at a certain point in time.

Therefore, it is useful to consider what can be measured in the current setting. The product type specific export growth in the experimentation market/markets can be measured for the product types that the initial export bundle comprises and the firm keeps on exporting in the following year. For example, it is possible to measure the CAT export growth for the firms that either experiment with CAT Only bundle or MIXED bundle, if their second year bundle is not MAN Only but either CAT Only or MIXED in the second year of exporting at their first export market.[37] On the other hand, it is not possible to measure the export growth of firms experimenting with CAT Only bundle at their first year-first market that chooses to export MAN Only second-year bundle in the next year to their first-market, using the available data set.[38]

Bearing these considerations, the analysis is carried out by focusing on the export growth of any exports, MAN exports, and CAT exports by using the equation below.

<u>The equation for intensive margin growth:</u>

$$\Delta log\, X_{p(ijt)} = \alpha_1\left(FY_{(ij,t-1)} \times FM_{(ij)}\right) + \alpha_2 FY_{(ij,t-1)} + \alpha_3 FM_{(ij)} + \{FE_{Firm}\} + \{FE_{Year-Dest}\} + u_{ijt}$$

[37] Please refer to Table 7, I can measure 87% of CAT Only sequential experimenters CAT export growth (64+23) and I can measure 86% of MIXED sequential experimenters CAT export growth (32+54). Therefore, the CAT and MAN export growth results reflect the majority of the export growth in the experimentation market.

[38] Please refer to Table 7 for the documentation and explanation of experimenting and second year export bundles.

The dependent variable $\Delta log\ X_{p(ijt)}$ denotes the export growth rate of firm *i* in market *j* between time $t-1$ and *t* with exports *p* (p=1 for any exports, p=2 for MAN exports and p=3 for CAT exports). For example, $\Delta log\ X_{1(\mathrm{i}j,t)}$ denotes the firm's export growth rate with any exports in destination *j*, $\Delta log\ X_{2(\mathrm{i}j,t)}$ denotes the firm's MAN export value growth rate in destination *j* and $\Delta log\ X_{3(\mathrm{i}j,t)}$ denotes the firm's CAT export growth rate in destination *j*.

Variable $FY_{(ij,t-1)}$ takes value 1 when firm *i* exports to market *j* at $t-1$ for the first time. In other words, firm *i* is exporting to market *j* for the second time at time t which translates in to the first informed experience (second export experience) of firm *i* in market *j* after firm experimented at $t-1$.

Variable FM_{ij} takes value 1 if market *j* is the experimentation market of the firm *i* in any year.

Interaction term $\left(FY_{(ij,t-1)} \times FM_{(ij)}\right)$ takes value one, when firm *i* is having the second year export experience (exporting after the experimentation year) in the experimentation market (the very first export market) *j*. In other words, firm *i* is a first-time exporter at time $t-1$. α_1 indicates if first-time exporters export growth is different at their experimentation market j with exports *p* denoted by the dependent variable (p=1 for any exports, p=2 for MAN exports and p=3 for CAT exports). α_p indicates the export growth with exports *p* denoted by the dependent variable (p=1 for any exports, p=2 for MAN exports and p=3 for CAT exports) when exporters are new in market *j*. α_3 indicates the exporters export growth at their experimentation market with exports *p* denoted by the dependent variable (p=1 for any exports, p=2 for MAN exports and p=3 for CAT exports).

To control the other factors that might affect a firms' export growth to a particular market, year-destination fixed-effects (denoted by $\{FE_{Year-Dest}\}$) are included in the model. These other factors include general conditions of the destination country and demand shocks. In order to control for firm specific characteristics firm fixed effects (denoted by $\{FE_{Firm}\}$) are included, industry/sector, size and foreign ownership share of the firm.

The original prediction of sequential exporting theory suggests that conditional on survival, first-time (new) exporters export value growth is higher at their experimentation market in the second-year of exporting as they just acquired information about their export capability. This means $\alpha_{1p} > 0$, which indicates export growth for new exporters after they tested themselves at their experimentation market in the previous period.

The adjusted prediction of the sequential exporting theory suggests that conditional on survival, first-time (new) exporters' export growth is higher with MAN products than their export growth with CAT products in their experimentation year- experimentation market compared to consecutive years and consecutive markets. I use two sets of samples in order to test this prediction. The first sample consists all the new exporters that do not export in the year 2005 and start exporting in subsequent years. The second sample consists surviving new exporters that continue to export in consecutive years. I test this prediction by using dependent variable $log\ X_{1(\mathrm{i}j,t)}$ which denotes the firm's any export value growth rate in destination *j*. I test this prediction by using dependent variable $log\ X_{2(\mathrm{i}j,t)}$ which denotes the firm's MAN export value growth rate in destination *j* and $log\ X_{3(\mathrm{i}j,t)}$ which denotes the firm's CAT export value growth rate in destination *j* while independent variables $(FY_{(ij,t-1)} \times FM_{(ij)})$, $FY_{(ij,t-1)}$ and FM_{ij} are firm specific variables.

Table 9 below displays the results of the regressions. The export value growth (intensive margin growth) of the firms in the first sample that consists all new exporters (the first set of estimations)[39] are shown in columns 1-3. The first column shows any export growth; the second column displays the MAN export growth, and the third column displays the CAT export growth of all new exporters.

[39] Not conditional on survival. However, this does not necessarily bias the results in a positive way as the export growth of re-entrants might have negative export growth if they stop exporting in their second year of exporting.

The columns 4-9 of *Table 9* display the surviving firms' export value growth (intensive margin growth). Firms that export at *t - 1* but did not export in *t* and export again at *t +1* are excluded from the second sample as they do not export continuously. I cluster the surviving firms according to their initial exporting strategy, as there might be a difference across firms with different start-up strategies. Surviving firms that start exporting to only one country group at time t are classified as sequential exporters and denoted by abbreviation "SEQ." Surviving firms that start exporting at least two country groups at *t*, are classified as simultaneous exporters and denoted by the abbreviation "SIM."

The columns 4-6 of *Table 9* shows any export growth, MAN export growth and CAT export growth of sequential exporters respectively. The columns 7-9 of *Table 9* shows any export growth, MAN export growth and CAT export growth of simultaneous exporters respectively.

The sum of the number of observations and the sum of the number of firms in the columns 2-3 of *Table 9* would have been equal to the number of observations and the number of firms in in the first column if all the new exporters experimented with a CAT Only or MAN Only export bundle that they continue to export in consecutive years. However, previously we observed that the firms' export bundles are not static in a market through the estimation period and we also know that some firms have MIXED export bundles.

The sum of the number of firms and number of observations in columns 2-3 is larger than the first rows' number of firms and number of observations. This difference indicates that some firms have MIXED export bundle, and their export growth is accounted in both CAT and MAN columns. We will observe the same pattern in the columns 4-6 for sequential exporters and in columns 7-9 for the simultaneous exporters.

When we sum the number of firms and number of observations in CAT and MAN columns and subtract any exports' number of firms and number of observations from that for all new exporters[40], sequential exporters[41] and simultaneous exporters[42], we obtain the number of firms and observations created by their MIXED export bundles.

Columns 1-3 of *Table 9* indicates that new exporters' export growth is faster in their first year-first market compared to their any export growth in their first-market at other years and to their any export growth in other markets. However, we observe that only any export growth and CAT export growth is significant in the first year-first market. Additionally, we observe that new exporters' any export growth, CAT export growth and MAN export growth are faster in their early years of activity. Again the CAT export growth is larger compared to their MAN export growth in their early years of activity. However, we do not observe significant coefficients for any export growth or CAT export growth at their first-market. On the other hand, we observe that there is a negative coefficient for the MAN export growth at their first-market. The negative coefficient of MAN export growth at the first-market might indicate that new exporters dominate the market with their MAN exports rather quickly and experience a demand decline thereafter. This could either be a result of sharing the demand in their first-market with other firms or by losing the contact with their business partners by time as Lejour, (2015) shows that only 25% of all trade relationships survive after a year.

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[40] Sum of number of observations in columns 2-3 is equal to 18806 and sum of number of firms in columns 2-3 is equal to 3961. The difference between the sum of number of observations in columns 2-3 and number of observations in the first column is 1872 and the difference between the sum of number of firms in columns 2-3 and number of firms in the first column is 1223. This finding indicates that there are 1223 new exporters in the sample that have MIXED export bundle in a year that account for 1672 observations.

[41] Sum of number of observations in columns 5-6 is equal to 5580 and sum of number of firms in columns 5-6 is equal to 1571. The difference between the sum of number of observations in columns 5-6 and number of observations in the fourth column is 537 and the difference between the sum of number of firms in columns 5-6 and number of firms in the first column is 404. This finding indicates that there are 404 new exporters in the sample that have MIXED export bundle in a year that account for 537 observations.

[42] Sum of number of observations in columns 8-9 is equal to 2034 and sum of number of firms in columns 8-9 is equal to 12647. The difference between the sum of number of observations in columns 8-9 and number of observations in the sixth column is 1561 and the difference between the sum of number of firms in columns 8-9 and number of firms in the first column is 667. This finding indicates that there are 667 new exporters in the sample that have MIXED export bundle in a year that account for 1561 observations.

In columns 4-6 of *Table 9*, I observe sequential exporters have the same pattern of any export and CAT export growth as we found in the columns 1-3. Sequential exporters' any export growth and CAT export growth is faster in their first year-first market. However, I do not observe a significant coefficient for the sequential exporters' MAN export growth either in their first-year or at their first-market or for their first year – first market. Moreover, sequential exporters' any export growth and CAT export growth is faster in their early years of activity but not in their first-market. Just like sequential exporters' export growth at their first year-first market, sequential exporters' CAT export growth is faster than their any export growth in the early years of their activity.

The columns 7-9 of *Table 9* show that simultaneous exporters' any export growth is faster at their first-market[43], and this over any export growth is balanced by CAT and MAN export growth.[44] Additionally, we observe that simultaneous exporters' any export growth and CAT export growth are faster in their early years of activity but not in their first-market. Simultaneous exporters' CAT export growth is larger compared to their MAN export growth in their early years of activity. However, we do not observe significant coefficients for any export growth or CAT export growth at their first-market. On the other hand, we observe that there is a negative coefficient for the MAN export growth at their first-market. Previously in columns 1-3 of *Table 9,* we observed the same pattern, and now we know that it is driven by the negative MAN export growth of simultaneous exporters in their first-market.

These results show that both sequential and simultaneous exporters do grow fast in their first year-first market. However, sequential exporters any export growth is driven by their

[43] Simultaneous exporters' first markets are all the markets they experiment initially, so their export growth in the second year is calculated in all of their experimentation markets.

[44] Please note that; I am only able to measure the MAN export growth of a firm if the firm experiments a market either with MAN Only or with MIXED export bundle and continues with MAN Only or MIXED export bundle in the second year of exporting. Additionally, I am only able to measure the CAT export growth of a firm if the firm experiments a market either with CAT Only or with MIXED export bundle and continues with CAT Only or MIXED export bundle in the second year of exporting. Finally, I can measure both CAT and MAN export growth if a firm experiments with MIXED bundle and continues with MIXED bundle in the second year of exporting.

CAT export growth at their first year-first market. On the other hand, simultaneous exporters' any export growth is equally achieved by both MAN and CAT export growth at their first year-first market. These results indicate that MAN export growth is only faster for simultaneous exporters at their first-market. The original prediction of the sequential exporting model is accepted for all the new exporters, and for all the surviving new exporters in my sample as they do grow faster at their first year-first market with any exports. The adjusted prediction of the sequential exporting model suggests a higher export growth with MAN exports. The adjusted prediction is rejected for the sequential exporters, and for all the new exporters. However, the prediction is only accepted for simultaneous exporters which are assumed to be more "confident" to start with, and they are the only exporters that achieve significant MAN export growth in their experimentation markets in their early years of activity.

Although the previous findings show that most of the firms are experimenting with CAT products, which is in line with the suggestion of the model, when it comes to making a strong comment that states exporting CAT products are definitely easier than exporting MAN products, one shall not do so. Because exporters do not have static export bundles, and only 80% - 90% of all the exporters are accounted due to the restrictions in the bundle changes. Additionally, if I was able to comment that exporting CAT products are definitely easier than exporting MAN products, it might have been related to the higher production-related sunk costs of MAN products as the model suggests. However, the CAT and MAN export growth of a firm in its experimentation market/markets can be only measured if the firm continues to export CAT and/or MAN products to its experimentation market/markets, in its second year of exporting. Therefore, the CAT and MAN export growth results in *Table 9* reflects the experimentation bundle choice of firms and their export bundle changes in a consecutive year. Even if the additional analysis are done by accounting for product-market specific independent variables, that new analysis will also reflect these bundle changes.

Furthermore, the model assumes that the simultaneous exporters are "confident" about foreign markets' demand and tastes, so their initial sales are large in the model. This prediction is tested, and the findings indicate that simultaneous exporters' average experimentation sales with any exports in all of their experimentation markets are three times of the sequential exporters' all experimentation sales in their only experimentation market.[45] Additionally, I test if simultaneous exporters' CAT and MAN experimentation sales are larger than the sequential exporters' CAT and MAN experimentation sales. The average CAT and MAN experimentation sales of simultaneous exporters are four times and three times of the sequential exporters CAT and MAN experimentation sales respectively.[46] Even though, any exports, CAT exports, and MAN exports experimentation sales of simultaneous exporters are larger than the sequential exporters' experimentation sales, simultaneous exporters could be classified as more "CAT confident" than "MAN confident" in their experimentation sales still, in general simultaneous exporters are more "confident" compared to sequential exporters.

Despite simultaneous exporters' having larger experimentation sales, still, a fast export growth is observed in simultaneous exporters' first year-first market with any exports, CAT exports, and MAN exports. The empirical results are consistent with the model in terms of simultaneous exporters being "more confident" by having larger initial sales and being the only one that is able to increase its MAN sales in their second-year of exporting. The model assumes that simultaneous exporters enter all the markets in a two market, two-period world, and in the real world, we observe that none of the new exporters are entering all the country groups initially. As previously mentioned all the new exporters are sequential exporters if we think that a simultaneous exporter needs to enter all the country groups in the real world. However, the empirical results are consistent with the initial entry in more than one market in an n>2 market world is still a distinguishing and a confident move to make.

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[45] Even if I consider the Simultaneous exporters' average any exports experimentation value in only one market by dividing the multiple experimentation markets' average sales by the average number of markets, Simultaneous exporters' sales are 1.2 times of the sequential exporters' experimentation sales in one market.

[46] When I consider the Simultaneous exporters' average CAT and MAN exports experimentation value in only one market by dividing the multiple experimentation markets' average sales by the average number of markets, Simultaneous exporters' average CAT and MAN experimentation sales are 1.5 times and 1.1 times of the sequential exporters' CAT and MAN experimentation sales respectively.

Table 9: Intensive Margin Growth (dependent variable: $\Delta log\ X_{p(ijt)}$).

OLS	1	2	3	4	5	6	7	8	9
	Non-Conditional on Survival			**Conditional on Survival**					
	All Firms (Any exports)	**All Firms (MAN)**	**All Firms (CAT)**	**SEQ (Any exports)**	**SEQ (MAN)**	**SEQ (CAT)**	**SIM (Any exports)**	**SIM (MAN)**	**SIM (CAT)**
$\boldsymbol{FY_{(ij,t-1)}} \times \boldsymbol{FM_{(ij)}}$	0.225***	0.217	0.299***	0.241**	0.043	0.399**	0.254**	0.299*	0.263*
	[0.073]	[0.152]	[0.104]	[0.112]	[0.247]	[0.166]	[0.099]	[0.180]	[0.140]
$\boldsymbol{FY_{(ij,t-1)}}$	0.459***	0.249***	0.504***	0.484***	0.185	0.439***	0.388***	0.175	0.491***
	[0.052]	[0.094]	[0.076]	[0.078]	[0.132]	[0.121]	[0.075]	[0.108]	[0.111]
$\boldsymbol{FM_{(ij)}}$	-0.007	-0.056	0.018	-0.052	-0.168	-0.005	-0.023	-0.122*	-0.009
	[0.039]	[0.055]	[0.057]	[0.068]	[0.107]	[0.101]	[0.050]	[0.064]	[0.077]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year-destination FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of Firms	2838	1536	2425	1167	586	985	1367	812	1222
R-squared	0.045	0.034	0.051	0.067	0.067	0.073	0.042	0.037	0.049
Number of Observations	16934	6395	12411	5043	1879	3701	11086	4453	8194

Robust standard errors adjusted for clusters in firms. *** Significant at 1%., ** Significant at 5%., * Significant at 10%. Firms that export continuously and only export one market at time t, are classified as sequential exporters and denoted by abbreviation “SEQ.” Firms that start exporting more than one market at t, are classified as simultaneous exporters and denoted by the abbreviation “SIM.” Firms that export at t - 1 but did not export in t and export again at t +1 are non-surviving firms (re-entrants). Re-entrants are included in the regressions that are Non-Conditional on Survival.

3.3.2 Entry

In this subsection, the original and adjusted entry predictions predictions that are listed below are examined are tested by using a linear probability model.

The predictions under test are:

- ***Original Entry Prediction:*** Conditional on survival, new exporters, are more likely to enter new markets immediately after the year of their experimentation than consecutive years.
- ***Adjusted Entry Prediction:*** Conditional on survival, new exporters, are more likely to enter new markets with MAN products immediately after the year of their experimentation.

The manner in which the key variables are defined is similar to the previous sub-section. To re-iterate, new exporters are defined as firms that do not export in the year 2005 and start exporting after the year 2005. Surviving new exporters are defined as firms that are continuously export in consecutive years. It is important to note here that the prediction for new exporters requires that they survive. Even so, the prediction is tested with the condition to survive and without the condition to survive.

In the first set of estimations, all firms' (new exporters') likelihood of entering a new market is analyzed without the condition to survive. In the second set of estimations, the surviving new exporter firms' likelihood of entering a new market is examined by separating the surviving firms into two categories - sequential exporters and simultaneous exporters respectively based on their initial entry strategy. Sequential exporters are defined as the new exporters that continue to export in consecutive years and started exporting to one country group initially. Simultaneous exporters are defined as the new exporters that continue to export in consecutive years and started exporting to more than one country group initially.

Finally, the firms' entries are separated as CAT and MAN entries for the first and second set of estimations respectively. Similar to the previous sub-section, firms' exports are defined as MAN exports, if the firm produces even a small amount of the exported product in that year, and a firms' exports are considered as CAT exports if the firm does not produce the exported product to any extent. However, defining CAT and MAN exports do not define the firms as CAT and MAN firms as seen in the previous sub-section.

Some further challenges arise as these firms do not enter new export markets with the same export bundle they entered in their experimentation market though the estimation period. Also, when they enter their experimentation markets with CAT or MAN products that they did not use in their experimentation phase, that entry is not counted as a new market entry. As earlier observed, firms mostly experiment with CAT products, so the analysis does not account the first time MAN entry to the experimentation market as a new market entry.

The analysis below are carried out by using the entry equation below that do not account for a new market for a particular product type for the sake of simplicity.

<u>The equation for the entry:</u> $\text{Entry}_{\text{p(ijt)}} = \alpha_1 FY_{(i,t-1)} + \{FE_{Firm}\} + \{FE_{Year-Dest}\} + u_{int}$

The dependent variable $\text{Entry}_{\text{p(int)}}$ takes value one if firm *i* enters to destination *n* which is different from the first export market of the firm *i*, at time *t* with exports *p* (p=1 for any exports, p=2 for MAN exports and p=3 for CAT exports). For example, $\text{Entry}_{1\text{(ijt)}} = 1$ denotes that firm *i*, enters a different market than its first-market (destination *j)* with any exports at time *t*. $\text{Entry}_{2\text{(ijt)}} = 1$ denotes that firm *i*, enters a different market than its first-market (destination *n)* with its MAN exports at time *t*. $\text{Entry}_{3\text{(ijt)}} = 1$ denotes that firm *i*, enters a different market than its first-market (destination *n)* with its CAT exports at time *t.* The first-markets of new exporters that are not experimenting with a MIXED bundle (both with CAT and MAN products) are not considered as a new market in consecutive years for their new CAT or new MAN exports that were not in their experimentation bundle. Therefore, when the firm experiments with CAT Only export bundle in market A, in the later periods even if the firm exports MAN products to market A for the first time, market A is not accounted as a new market for the firm, vice versa for MAN Only export bundle.

The independent variable $FY_{(i,t-1)}$ indicates whether the firm *i*, started exporting at time *t-1* or not. In other words, when $FY_{(i,t-1)} = 1$, if firm *i* is exporting for a second time at time *t*.

Firm fixed effects (denoted by $\{FE_{Firm}\}$) are included to control for the characteristic differences across firms that do not vary over time and affect entry patterns. Also year destination fixed effects (denoted by $\{FE_{Year-Dest}\}$) are included to control for the yearly changes in entry such as; demand, political changes, exchange rate variations in a specific export destination which might make the said destination less attractive or more appealing for the firms.

The original prediction suggests that new exporters are more likely to enter new markets immediately after the year of their experimentation when compared to consecutive years. To accept the original entry prediction, the evidence of the regression for the independent variable $FY_{(i,t-1)}$ should indicate a positive and significant coefficient for new exporters i.e. $\alpha_1 > 0$, which will suggest that new exporters are more likely to enter new markets at their second year of exporting rather than consecutive years with any exports.

In order to test the adjusted entry prediction, CAT and MAN entry variables are employed as dependent variables to identify if there is any difference in the entry pattern of new exporters according to CAT and MAN entry separation. $\text{Entry}_{2(\text{int})}$ takes value one if firm *i* enters to destination *n* which is different from the first export market of the firm *i*, at time *t* with MAN exports. $\text{Entry}_{3(\text{int})}$ takes value one if firm *i* enters to destination *n* which is different from the first export market of the firm *i*, at time *t* with CAT exports. To accept the adjusted entry prediction, the second regression results should indicate a positive and significant coefficient for new exporters with i.e. $\alpha_1 > 0$, which is larger than the coefficient in the third regression.

Table 10 displays the regressions results. Columns 1-3 of *Table 10*, show that the probability of entering a new market for all firms in the sample (all new exporters). The first column displays the probability of entering a new market with any exports; the second column shows the probability of entering a new market with MAN exports and the third column shows the probability of entering a new market with CAT exports for all firms without the condition to survive.

In the columns 4-9 of *Table 10*, continuous exporters (surviving firms) are clustered according to their initial exporting strategy, firms that start exporting to only one market are classified as sequential exporters and denoted by abbreviation "SEQ." Firms that start exporting to more than one market are classified as simultaneous exporters and denoted by the abbreviation "SIM." The fourth column shows the entry probability of sequential exporters with any exports; the fifth column shows entry probability of sequential exporters with MAN exports and the sixth column shows entry probability of sequential exporters with CAT exports. Simultaneous exporters' probability of entering a new market with any exports, with MAN exports, and with CAT exports are shown in the seventh, the eighth and the ninth columns respectively.

Columns 1-3 of *Table 10* shows that new exporters are 0.8 percentage points more likely to enter a new market that is different from their first-market with any exports. The coefficient in column 2 reveals that all the new exporters are 1.2 percentage points more likely to enter a new market with CAT exports. The coefficient for MAN exports in column 3 is not significant. These results show us that in general, all new exporters are more likely to enter new markets with CAT products.

According to the theory, markets are symmetric, however, in the reality demands and tastes in markets might be less than perfectly correlated. The first set of results is consistent with firms being risk-averse towards facing any possible variation in demand, taste or policies in a new market. Therefore, new exporters prefer experimenting and entering new markets with CAT exports rather than MAN exports (without the condition to survive).

Columns 4-6 of *Table 10* show that no inferences can be drawn on sequential exporters' probability of entering a new market, as all the coefficients are not significant.

Columns 7-9 of *Table 10* does not show a positive and significant coefficient for $FY_{(i,t-1)}$ for MAN entries of sequential exporters and simultaneous exporters. In *Table 10* the only positive and significant coefficient for $FY_{(i,t-1)}$ is observed for simultaneous exporters which indicates that they are 1.1 percentage points more likely to enter a new market with CAT exports.[47] Therefore, the adjusted entry prediction is rejected for both sequential and simultaneous exporters.

Combining the findings for simultaneous exporters from *Table 9* and *Table 10* it can be pointed out that, simultaneous exporters experiment with both CAT and MAN products, and they are more likely to enter new markets with CAT products. However, simultaneous exporters export growth with MAN products indicates that once they experiment with MAN products their export value grows fast in the second year of exporting in their first-market.

Combining the findings for sequential exporters from *Table 9* and *Table 10* does not provide us such a clear picture for sequential exporters. Sequential exporters grow fast with CAT exports in their experimentation market in the following year of the experimentation, but it is not possible to comment on their likelihood of entering a new market with CAT exports, given that the coefficient is not significant. This may be attributed to high heterogeneity among this group which needs further investigation.

Several inferences can be drawn based on these findings. First of all, in the model the trial is essential for sequential exporters, but not for "confident" simultaneous exporters but simultaneous firms' enter into new markets with CAT products rather than MAN products. Akhmetova, (2010) highlights that firms continue testing the foreign markets because not all products will be favored equally by different export markets. These

[47] Please note that all the products (for example; office equipment, shoes and automobiles) are clustered under the MAN product/export type if firm produce a small amount of that product and rest of the exported products (for example; textiles, computers and hair extensions) are clustered under CAT product/export type.

findings might indicate that either simultaneous exporters are acting as intermediaries by exploiting their newly gained exporting skills in their second-year of exporting or they are making extended experimentations with CAT products to learn about market-specific demand and tastes before entering the same market with their MAN products.[48] as the markets might be less than perfectly correlated in the real world. Additionally, Nguyen, (2012) shows that many firms are experimenting in more than one foreign market even if they encounter loss in some of the foreign markets it increases their chance of surviving in one of them.

On the other hand, Álvarez et al., (2013) show that firms are more likely to enter a new market different than their previous market with the same product they used to export or firms are more likely to export a different product than they used to export in the previous period, to their previous market in the next period. Therefore, additional analysis are repeated by defining a new market according to being a new market for each particular product type, and the results are intact.[49]

[48] Assuming that producing MAN products require large sunk costs to adjust the production according to tastes and regulations of the the new market.

[49] Firms' experimentation markets are treated as as new markets with in the second year of exporting when firm enters with a different product than it used to experiment with, which even stronger results compared to the results in *Table 10.*

Table 10: Probability of Exporting to a New Market (dependent variable: $Entry_{p(ijt)}$*).*

LPM	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	Non-Conditional on Survival			**Conditional on Survival**					
	All Firms (Any exports)	**All Firms (MAN)**	**All Firms (CAT)**	**SEQ (Any exports)**	**SEQ (MAN)**	**SEQ (CAT)**	**SIM (Any exports)**	**SIM (MAN)**	**SIM (CAT)**
$\boldsymbol{FY_{(i,t-1)}}$	0.008*	-0.005	0.012***	0.007	-0.002	0.006	0.003	-0.016***	0.011*
	[0.004]	[0.003]	[0.004]	[0.006]	[0.005]	[0.005]	[0.007]	[0.006]	[0.007]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year-destination FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of Firms	3303	3303	3303	1341	1341	1341	1485	1485	1485
R-squared	0.030	0.015	0.024	0.035	0.015	0.030	0.037	0.018	0.027
Number of Observations	74974	74974	74974	32523	32523	32523	31803	31803	31803

Robust standard errors adjusted for clusters in firms. *** Significant at 1%., ** Significant at 5%., * Significant at 10%. Firms that export continuously and only export one market at time t, are classified as sequential exporters and denoted by abbreviation “SEQ.” Firms that start exporting more than one market at t, are classified as simultaneous exporters and denoted by the abbreviation “SIM.” Firms that export at t - 1 but did not export in t and export again at t +1 are non-surviving firms (re-entrants). Re-entrants are included in the regressions that are Non-Conditional on Survival.

3.3.3 First Robustness Checks

This section explores if the previous findings are driven by some omitted variables that are strongly correlated with the independent variables of our interest. The first alternative estimation set considers the findings of Bernard et al., (2012); Damijan et al., (2013); De Nardis and Pappalardo, (2011); Di Nino, (2015); Turco and Maggioni, (2013) that find the positive relationship between CAT exports, higher productivity, and foreign ownership. Therefore, the log of labor productivity ***logLP*** (measured as the log of value added per worker) and foreign ownership dummy ***FDI*** (dummy taking value one for firms with some foreign ownership, zero otherwise) is included in the export growth and entry equations below.

<u>The equation for intensive margin growth:</u>

$$\Delta log\ X_{p(ijt)} = \alpha_1\big(FY_{(ij,t-1)} \times FM_{(ij)}\big) + \alpha_2 FY_{(ij,t-1)} + \alpha_3 FM_{(ij)} + \alpha_4 logLP + \alpha_5 FDI + \{FE_{Firm}\} + \{FE_{Year-Dest}\} + u_{ijt}$$

<u>The equation for the entry:</u>

$$\text{Entry}_{\text{p(int)}} = \alpha_1 FY_{(i,t-1)} + \alpha_2 logLP + \alpha_3 FDI + \{FE_{Firm}\} + \{FE_{Year-Dest}\} + u_{int}$$

Estimation results for the regressions including ***logLP*** and ***FDI*** as additional independent variables are shown in *Table 11* and *Table 12* for intensive margin growth and for the probability of exporting to a new market respectively.

The original intensive margin growth prediction suggests that new exporters' export value growth is higher at their experimentation market in their second-year of exporting compared to their subsequent markets or later years of activity. The adjusted prediction suggests that new exporters' MAN intensive margin growth is higher than the new exporters' CAT intensive margin growth in their first year-first market than in subsequent markets or later years of activity. To accept original prediction, we should observe a positive and significant coefficient for $\boldsymbol{FY_{(ij,t-1)}} \times \boldsymbol{FM_{(ij)}}$ for any exports in *Table 11.*

To accept adjusted prediction, we should observe a positive and significant coefficient of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})} \times \boldsymbol{FM}_{(\boldsymbol{ij})}$ for MAN exports which is larger than the coefficient of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})} \times \boldsymbol{FM}_{(\boldsymbol{ij})}$ for CAT exports in *Table 11.*

In *Table 11* the coefficient of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})} \times \boldsymbol{FM}_{(\boldsymbol{ij})}$ shows new exporters' export growth in their first year-first market, and it is significant in all columns except the second column and the fifth column. Therefore, original intensive margin growth prediction is accepted for all exporters, sequential exporters, and simultaneous exporters. The adjusted intensive margin growth prediction only holds for simultaneous exporters, and it is rejected for the sequential exporters, and for all new exporters. In *Table 11* coefficient of ***logLP*** is positive and significant in all columns and the coefficient of ***FDI*** is positive and significant in the fiftt column. Therefore, we observe a positive relationship between the labor productivity and new exporters' any, CAT and MAN export growth in general and we observe a positive relationship between the ***FDI*** and sequential exporters' MAN export growth in general. The positive relationship between labor productivity and first year-first market export growth is observed for any exports and CAT exports of all firms, and sequential exporters. The positive relationship between labor productivity and first year-first market export growth is observed for any exports, CAT exports, and MAN exports of simultaneous exporters.

The original entry prediction suggests that new exporters are more likely to enter new markets immediately after the year of their experimentation, compared to consecutive years. Adjusted entry prediction suggests that new exporters are more likely to enter new markets with MAN products immediately after the year of their experimentation. To accept the original entry prediction, the coefficient of $\boldsymbol{FY}_{(\boldsymbol{i},\boldsymbol{t-1})}$ should be positive and significant for any exports. To accept the adjusted entry prediction, the coefficient of $\boldsymbol{FY}_{(\boldsymbol{i},\boldsymbol{t-1})}$ should be significant and larger for MAN exports compared to CAT exports. In *Table 12* the coefficient of $\boldsymbol{FY}_{(\boldsymbol{i},\boldsymbol{t-1})}$ indicates the new exporters' probability of entering a new market in their early years of activity, and it is not significant in any of the columns. Therefore, both predictions are rejected. Previously it is mentioned that entering a new market is a rare incident. Therefore, it is not surprising that the coefficients of

$\boldsymbol{FY}_{(i,t-1)}$ became insignificant after adding the additional independent variables ***logLP*** and ***FDI.***

In *Table 12* coefficients of ***logLP*** are found positive and significant in all columns except the fourth column and the fifth column, and coefficients of ***FDI*** are found to be insignificant in all the columns. Therefore, we observe a positive relationship between labor productivity and probability of entering a new market except for the sequential exporters' any exports and CAT exports in general.

Table 11: Intensive Margin Growth (dependent variable: $\Delta log\ X_{p(ijt)}$) – with additional variables logLP and FDI.

OLS	1	2	3	4	5	6	7	8	9
	Non-Conditional on Survival			Conditional on Survival					
	All Firms (Any exports)	All Firms (MAN)	All Firms (CAT)	SEQ (Any exports)	SEQ (MAN)	SEQ (CAT)	SIM (Any exports)	SIM (MAN)	SIM (CAT)
$FY_{(ij,t-1)} \times FM_{(ij)}$	0.209**	0.157	0.222*	0.259**	0.197	0.519**	0.254**	0.299*	0.043
	[0.074]	[0.140]	[0.132]	[0.117]	[0.204]	[0.212]	[0.099]	[0.180]	[0.247]
$FY_{(ij,t-1)}$	0.390***	0.249***	0.406***	0.470***	0.214*	0.279**	0.388***	0.175	0.429***
	[0.058]	[0.094]	[0.088]	[0.090]	[0.112]	[0.141]	[0.075]	[0.108]	[0.122]
$FM_{(ij)}$	--0.016	-0.056	0.018	-0.052	-0.168	[0.202]	-0.023	-0.042	-0.009
	[0.041]	[0.055]	[0.057]	[0.068]	[0.107]	[0.101]	[0.050]	[0.070]	[0.077]
logLP	0.097***	0.228***	0.214**	0.166***	0.300***	0.212**	0.214***	0.190***	0.215***
	[0.018]	[0.055]	[0.097]	[0.058]	[0.102]	[0.092]	[0.048]	[0.073]	[0.079]
FDI	-0.048	0.221	0.712	-0.126	0.263*	-0.252	0.078	-0.061	-0.393
	[0.069]	[0.218]	[0.578]	[0.112]	[0.137]	[0.667]	[0.558]	[0.045]	[1.230]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year-destination FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of Firms	2838	1536	2425	1167	586	985	1367	812	1222
R-squared	0.038	0.084	0.044	0.074	0.034	0.059	0.045	0.042	0.038
Number of Observations	16934	6395	12411	5043	1879	3701	11086	4453	8194

Table 12: Probability of Exporting to a New Market (dependent variable: $Entry_{p(ijt)}$) – with additional variables logLP and FDI.

LPM	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	Non-Conditional on Survival			**Conditional on Survival**					
	All Firms (Any exports)	**All Firms (MAN)**	**All Firms (CAT)**	**SEQ (Any exports)**	**SEQ (MAN)**	**SEQ (CAT)**	**SIM (Any exports)**	**SIM (MAN)**	**SIM (CAT)**
$FY_{(i,t-1)}$	0.001	-0.004	0.003	0.001	-0.013	0.006	-0.004	0.007	0.009
	[0.006]	[0.009]	[0.005]	[0.008]	[0.009]	[0.005]	[0.009]	[0.009]	[0.009]
logLP	0.035***	0.033***	0.035***	0.028	0.021	0.023**	0.038**	0.017**	0.062***
	[0.012]	[0.011]	[0.011]	[0.020]	[0.006]	[0.014]	[0.015]	[0.007]	[0.017]
FDI	-0.039	-0.034	-0.048	-0.115	0.102	-0.068	-0.003	0.009	0.022
	[0.046]	[0.034]	[0.030]	[0.142]	[0.148]	[0.061]	[0.035]	[0.059]	[0.055]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year-destination FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of Firms	3303	3303	3303	1341	1341	1341	1485	1485	1485
R-squared	0.037	0.022	0.027	0.038	0.034	0.029	0.041	0.042	0.032
Number of Observations	74974	74974	74974	32523	32523	32523	31803	31803	31803

Robust standard errors adjusted for clusters in firms. *** Significant at 1%., ** Significant at 5%., * Significant at 10%. Firms that export continuously and only export one market at time t, are classified as sequential exporters and denoted by abbreviation "SEQ." Firms that start exporting more than one market at t, are classified as simultaneous exporters and denoted by the abbreviation "SIM." Firms that export at t - 1 but did not export in t and export again at t +1 are non-surviving firms (re-entrants). Re-entrants are included in the regressions that are Non-Conditional on Survival.

3.3.4 Second Robustness Checks

Further robustness checks are done by considering the findings of Besedeš et al., (2014); Egger and Kesina, (2013); Halldin, (2012); Manova, (2008) by restricting the estimation sample with the firms operating in non-credit constrained sectors.

Halldin, (2012) shows that there is a strong relationship with firms` collateralizable assets and their decision to enter export markets. Besedeš et al., (2014) highlight that there is a positive correlation between firms` initial export growth and being non-credit constrained. Egger and Kesina, (2013) find that firms' extensive and intensive margins of exporting have a negative relationship with being credit constrained as they highlight that firms are less likely to become exporters and if they become exporters, they have lower export values. As the literature highlights that new exporters are mostly more vulnerable compared to the experienced exporters, focusing on the non-credit constrained new exporters might change our initial findings. The third set of estimations only consist firms operating in non-credit constrained sectors where the asset tangibility calculations of Manova, (2008) is used to identify them.[50] Therefore, a dummy variable $D_{\text{Non-Credit}}$ that takes value one if the sector is non-credit constrained, is included in the export growth and entry equations below.

<u>The equation for intensive margin growth:</u>

$$\Delta log\ X_{p(ijt)} = \alpha_1\left(FY_{(ij,t-1)} \times FM_{(ij)}\right) + \alpha_2 FY_{(ij,t-1)} + \alpha_3 FM_{(ij)} + \alpha_4 D_{\text{Non-Credit}} + \{FE_{Firm}\} + \{FE_{Year-Dest}\} + u_{ijt}$$

<u>The equation for the entry:</u>

$$\text{Entry}_{\text{p(int)}} = \alpha_1 FY_{(i,t-1)} + \alpha_2 D_{\text{Non-Credit}} + \{FE_{Firm}\} + \{FE_{Year-Dest}\} + u_{int}$$

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[50] Appendix 4 shows the asset tangibility of each ISIC sector. The ISIC sectors are classified as non-credit constrained sectors if the asset tangibility of an ISIC sector is above the median asset tangibility for the whole manufacturing industry. The ISIC sectors are classified as credit constrained sectors if the asset tangibility of an ISIC sector is below the median asset tangibility for the whole manufacturing industry. Please refer to Appendix 4 for the list of ISIC sectors listed as credit constrained and non-credit constrained.

Estimation results for the non-credit-constrained new exporters are shown in *Table 13* and *Table 14* for intensive margin growth and for the probability of exporting to a new market respectively.

The original intensive margin growth prediction suggests that new exporters' export value growth is higher at their experimentation market in their second-year of exporting compared to their subsequent markets or later years of activity. The adjusted prediction suggests that new exporters' MAN intensive margin growth is higher than the new exporters' CAT intensive margin growth in their first year-first market than in subsequent markets or later years of activity. To accept original prediction, we should observe a positive and significant coefficient for $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})} \times \boldsymbol{FM}_{(\boldsymbol{ij})}$ for any exports in *Table 13.* To accept adjusted prediction, we should observe a positive and significant coefficient of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})} \times \boldsymbol{FM}_{(\boldsymbol{ij})}$ for MAN exports which is larger than the coefficient of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})} \times \boldsymbol{FM}_{(\boldsymbol{ij})}$ for CAT exports in *Table 13.*

In *Table 13* the coefficients of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})} \times \boldsymbol{FM}_{(\boldsymbol{ij})}$ shows non-credit-constrained new exporters' export growth in their first year-first market, and they are significant and larger than the coefficients of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})} \times \boldsymbol{FM}_{(\boldsymbol{ij})}$ in *Table 9*. In *Table 13* the coefficients of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})}$ shows the non-credit-constrained exporters' export growth in their early years of activity, and it is significant and larger compared to the coefficients of $\boldsymbol{FY}_{(\boldsymbol{ij},\boldsymbol{t-1})}$ in *Table 9*.

Combining the findings of *Table 9* and *Table 13* show that all new exporters' export growth in their first year-first market and in their early years of activity, is larger if they operate in non-credit constrained sectors in general. Therefore, the original prediction is accepted for any exports of all the new exporters, sequential exporters, and for simultaneous exporters operating in non-credit constrained sectors. However, only the simultaneous exporters' MAN export growth is larger compared to their CAT export growth in their first year-first market. Different than the results of *Table 9* we find that operating in non-credit constrained sectors is enabling the sequential exporters' MAN exports to grow in their first year-first market, but their MAN export growth is not larger than their CAT export growth as observed in *Table 13*. Therefore, the adjusted prediction is rejected for all the new exporters and sequential exporters operating in non-credit constrained sectors, except for simultaneous exporters that achieve significant MAN export growth in their in their first year-first market.

In *Table 14* the coefficient of $\boldsymbol{FY}_{(\boldsymbol{i},\boldsymbol{t-1})}$ indicates the new exporters' probability of entering a new market in their early years of activity.

The original entry prediction suggests that, new exporters are more likely to enter new markets immediately after the year of their experimentation compared to consecutive years. Adjusted entry prediction suggests that, new exporters are more likely to enter new markets with MAN products immediately after the year of their experimentation. To accept the original entry prediction, for the new exporters operating in non-credit constrained sectors, the coefficient of $\boldsymbol{FY}_{(\boldsymbol{i},\boldsymbol{t-1})}$ should be positive and significant for any exports. To accept the adjusted entry prediction, for the new exporters operating in non-credit constrained sectors, the coefficient of $\boldsymbol{FY}_{(\boldsymbol{i},\boldsymbol{t-1})}$ should be significant and larger for MAN exports compared to CAT exports.

Table 14 shows that all new exporters are 0.9 percentage points more likely to enter a new market, and simultaneous exporters are 1.1 percentage points more likely to enter a new market with any exports. Therefore, the original prediction is accepted for all new exporters, and simultaneous exporters, however, it is rejected for sequential exporters.

Table 14 does not show a significant coefficient for all new exporters', sequential exporters' and simultaneous exporters' likelihood of entering a new market with MAN exports in their second-year. Therefore the adjusted prediction is rejected.

Table 14 shows that all new exporters are 1.1 percentage points more likely to enter a new market, sequential exporters are one percentage point more likely to enter a new market and simultaneous exporters are 1.5 percentage points more likely to enter a new market with their CAT exports.

Combining the findings of *Table 10* and *Table 14* show that sequential exporters operating in non-credit constrained sectors are one percentage point more likely to enter a new market with CAT exports where no inference can be drawn for all sequential exporters in *Table 10*.

In general, our findings for intensive margin growth and the probability of entering new markets of new exporters operating in non-credit constrained sectors, are in line with the findings of Besedeš et al., (2014); Egger and Kesina, (2013); Halldin, (2012); Manova, (2008).

Table 13: Intensive Margin Growth (dependent variable: $\Delta log\ X_{p(ijt)}$) - *Non-Credit Constrained Sectors.*

OLS	1	2	3	4	5	6	7	8	9
Non-Credit Constrained Sectors	**Non-Conditional on Survival**			**Conditional on Survival**					
	All Firms (Any exports)	**All Firms (MAN)**	**All Firms (CAT)**	**SEQ (Any exports)**	**SEQ (MAN)**	**SEQ (CAT)**	**SIM (Any exports)**	**SIM (MAN)**	**SIM (CAT)**
$\boldsymbol{FY_{(ij,t-1)} \times FM_{(ij)}}$	0.269**	0.221	0.342**	0.267**	0.199**	0.423**	0.301**	0.357**	0.301*
	[0.125]	[0.139]	[0.130]	[0.118]	[0.089]	[0.187]	[0.169]	[0.180]	[0.171]
$\boldsymbol{FY_{(ij,t-1)}}$	0.479***	0.326**	0.538***	0.485***	0.076	0.482***	0.397***	0.203	0.512**
	[0.087]	[0.132]	[0.163]	[0.078]	[0.321]	[0.121]	[0.082]	[0.307]	[0.242]
$\boldsymbol{FM_{(ij)}}$	0.006	0.001	0.039	0.021	-0.116	-0.012	-0.051	-0.019	0.017
	[0.065]	[0.087]	[0.108]	[0.043]	[0.134]	[0.65]	[0.065]	[0.089]	[0.056]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year-destination FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of Firms	974	434	754	377	172	268	523	204	438
R-squared	0.056	0.071	0.064	0.064	0.067	0.073	0.042	0.037	0.049
Number of Observations	5484	2203	3366	1555	471	1167	3719	1701	2106

Robust standard errors adjusted for clusters in firms. *** Significant at 1%., ** Significant at 5%., * Significant at 10%. Firms that export continuously and only export one market at time t, are classified as sequential exporters and denoted by abbreviation “SEQ.” Firms that start exporting more than one market at t, are classified as simultaneous exporters and denoted by the abbreviation “SIM.” Firms that export at t - 1 but did not export in t and export again at t +1 are non-surviving firms (re-entrants). Re-entrants are included in the regressions that are Non-Conditional on Survival.

Table 14: Probability of Exporting to a New Market (dependent variable: $Entry_{p(ijt)}$) - *Non-Credit Constrained Sectors*.

LPM	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Non-Credit Constrained Sectors	**Non-Conditional on Survival**			**Conditional on Survival**					
	All Firms (Any exports)	**All Firms (MAN)**	**All Firms (CAT)**	**SEQ (Any exports)**	**SEQ (MAN)**	**SEQ (CAT)**	**SIM (Any exports)**	**SIM (MAN)**	**SIM (CAT)**
$\boldsymbol{FY_{(i,t-1)}}$	0.009**	0.007	0.011**	0.004	-0.015	0.010*	0.011*	-0.010*	0.015**
	[0.004]	[0.006]	[0.005]	[0.006]	[0.019]	[0.006]	[0.007]	[0.006]	[0.007]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year-destination FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of Firms	1045	1045	1045	376	376	376	622	622	622
R-squared	0.042	0.028	0.033	0.035	0.015	0.029	0.027	0.018	0.027
Number of Observations	23858	23858	23858	9115	9115	9115	11005	11005	11005

Robust standard errors adjusted for clusters in firms. *** Significant at 1%., ** Significant at 5%., * Significant at 10%. Firms that export continuously and only export one market at time t, are classified as sequential exporters and denoted by abbreviation "SEQ." Firms that start exporting more than one market at t, are classified as simultaneous exporters and denoted by the abbreviation "SIM." Firms that export at t - 1 but did not export in t and export again at t +1 are non-surviving firms (re-entrants). Re-entrants are included in the regressions that are Non-Conditional on Survival.

4. Conclusion

Recent research on international trade shows that firms start exporting with small initial sales into a neighboring country or a country with close proximity to minimize their exporting costs and to unveil if they are capable of exporting. This exporting pattern is known as "Sequential exporting." On the other hand, important and limited research highlights that manufacturing exporters do not produce all of their exports, and this phenomenon is known as CAT (Carry-along Trade). Whereas most of the existing literature assumes that manufacturing exporters produce all of their exports, and construct their model and empirical strategy while analyzing for the firms' exporting strategies, they neglected the CAT prevalence among the manufacturers' exports.

These two different strands of literature are incorporated by slightly adjusting the Sequential exporting model of Albornoz et al., (2012) according to the two different product types CAT (purchased/not self-produced) products, and MAN (self-produced) products. This thesis contributes to the literature by shedding insight on the CAT exports role for new manufacturing exporters' experimentation, intensive margin growth, and the probability of entry into new markets.

Adjusting the sequential exporting model delivers three adjusted predictions. These predictions are tested by employing three firm-level Turkish micro datasets that provide information on production, trade and firm characteristics. Simple descriptive statistics, linear probability estimates and ordinary least squares regression analysis are used to explore the CAT exports role in Turkish firms' Sequential exporting strategy for the 2005-2011 period.

The empirical results contribute to the new and still limited literature by showing that accounting for the new exporters' CAT exports leads to a different set of conclusions compared to existing evidence. The findings of this thesis are fourfold, (i) Most of the new exporters are testing the foreign markets with CAT products, (ii) Only simultaneous exporters are able to increase their MAN export growth in the second-year at their experimentation market. In general, all new exporters' and sequential exporters' intensive margin growth is achieved with their CAT export growth, and (iii) simultaneous exporters are more likely to enter new markets which are different from their experimentation market with CAT exports in their second-year of exporting. (iv) alternative estimates show that operating in non-credit constrained sectors accentuates the previous findings of first year-first market export growth and the probability of second-year entry to new markets. Findings of first year-first market export growth are intact for added specifications of labor productivity and foreign ownership. However, no inferences can be drawn for the probability of entering new markets in the second-year of exporting with the added specifications of labor productivity and foreign ownership.

Manufacturers' CAT exports are mostly explained as being complementary products that are exported with a self-produced (MAN) product to the same market in order to serve the full package to the final customer. This study shows that one-third of the CAT export value is composed of CAT products that are exported to different markets than MAN products. New exporters' CAT exports that are shipped to different markets than their MAN exports might be related to their two different activities. Either the new exporters' are experimenting with CAT products, or new exporters' are able to use their newly gained exporting skills to become an intermediary for other firms that are not able to export their production.

However, Di Nino, (2015) shows that only using the production and trade data can overestimate CAT whenever a firm under-reports or does not report the production of a product that is counted among firms' exports. Additionally, she underlines the fact that some of the CAT products are subcontracted, and some CAT products are rebranded. In fact, her study outlines that 60% of CAT products are exported under the final seller's trademark. Previous findings of De Angelis et. al (2011), reported that 95% of all exporters exported at least one CAT product and CAT exports created 66% of the aggregate Italian export value in 2006. However, Di Nino, (2015) provides contradicting evidence by accounting for the branding activities and her findings documented that 36% of all exporters engage in CAT trade and CAT export value accounts for 22% of the total export value in Italy. Therefore, we cannot argue that all CAT exports are non-value added products as they can be value added products through branding activities of the exporter firm. However, due to lack of data in identifying such an activity, it is not possible to identify those CAT products, which possibly inflated the measure of CAT exports' role in the estimations. Additionally, to conduct this research a panel data created and, during the data creation process, more than 22% of trade and more than 20% of production data is lost.[51] Estimation samples are small and only consists the new exporters that export one CAT, and one MAN product through the 2005-2011 period. Therefore, the presented results are not valid for all firms and CAT results might have been stronger than it should be due to unobserved branding activities and non-included small-sized only MAN exporters. Additionally, the estimation period includes the 2008-2009 crisis, and if these years were treated differently, results might have been different.

Still, further research is needed to fully understand if and how the manufacturing firms benefit from their CAT exports. For instance, in some countries, it is found that firms learn how to and what to export from their neighbors. Therefore, research on CAT products' role in learning what to produce and export in a particular market might be a question for further research.

[51] Please refer to Appendix 1, Appendix 2 and Appendix 3 for details.

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Appendix 1 Concording Trade Data Over the 2005-2011 period.

This appendix summarizes the trade codes' concordance steps for the 2005-2011 period. The aim of this concordance is to cluster all the trade codes that belong to different years under a new code if the codes are related to each other, and are changed at some point in the 2005-2011 period. Clustering all the trade codes that are related to each other, and are changed at some point in the 2005-2011 period creates families of codes. This concordance is unique in terms of dealing with the complicated changes and revisions made in the trade codes. I will briefly explain the different trade classifications and the reasons for the changes in these trade classifications.

The Turkish trade dataset is registered with national GTIP product classification which is revised and/or updated yearly by the Turkish authorities. GTIP is one of the most disaggregated national product classifications with twelve digits. First six digits of GTIP corresponds to HS, and first eight digits of GTIP corresponds to CN. Therefore, the changes and updates of GTIP are synced with the changes and revisions to Combined Nomenclature (CN) and Harmonized System (HS).

For this study, I am going to harmonize CN codes for the 2005-2011 period. CN codes are synced with HS, and first six digits of CN corresponds to HS. Table 15 summarizes the hierarchical logic of classification systems.

Table 15: Hierarchical Logic of Product Classifications.

Level of Classification	Classification
XX	HS Chapter
XX.XX	HS Heading
XX.XX.XX	HS Subheading
XX.XX.XX.YY	CN
XX.XX.XX.YY.TT.ZZ	GTIP

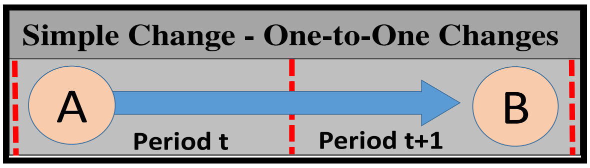
Source: TUIK

European Community needs codes that have greater detail than the HS codes either for statistical or tariff reasons. So, eight-digit CN codes are used to satisfy Common Customs Tariff and EU external trade requirements. European Commission changes CN codes yearly and reproduces a completely new version. However, these changes are greatly affected by the changes and revisions of HS.

The World Customs Organization (WCO) revises HS in every four to six years. The revisions change the codes of Harmonized System. These revisions include deletion of some old HS codes due to the low volume of trade with those codes. The WCO adds some new HS codes in order to define a newly invented product. New codes appear in two different ways. Firstly by adding new codes to the HS Nomenclature and secondly by adding new subheadings to a previous HS code. The revisions also include replacements of codes with another code to re-align the HS.

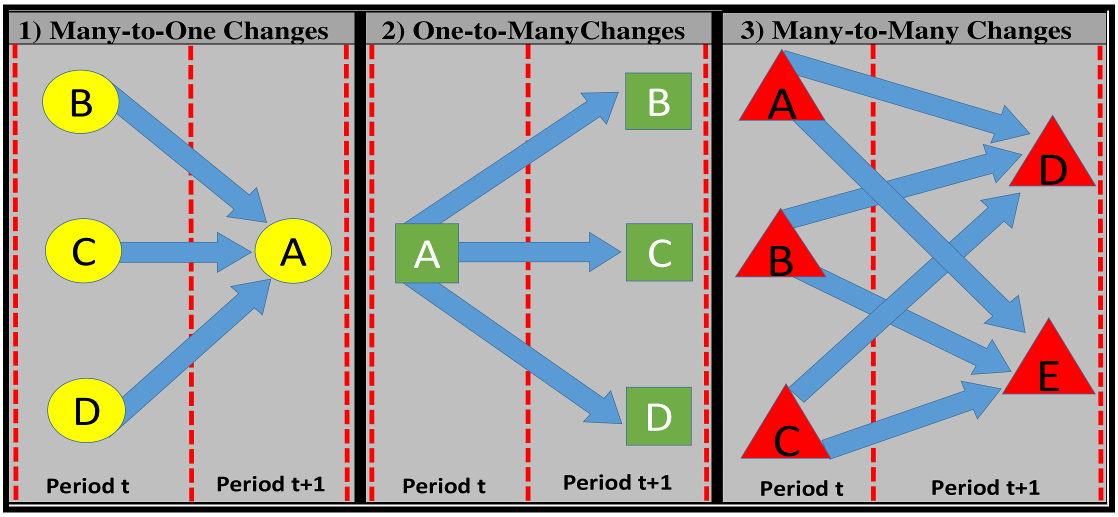
There are two main types of product code changes in every classification system. The first type of product code change is called simple change where one old product code is replaced with one new product code, so the change is ‘one-to-one.' *Figure 5* illustrates the simple change of codes.

Figure 5: Simple Changes.



The second type of code change is called complex change and has three subcategories. If one old code is replaced by many new codes, the change is one-to-many, if many old codes are replaced by one new code, the change is many-to-one, and if many old codes are replaced by many new codes, the change is many-to-many. *Figure 6* below shows the three types of complex changes.

Figure 6: Complex Changes.



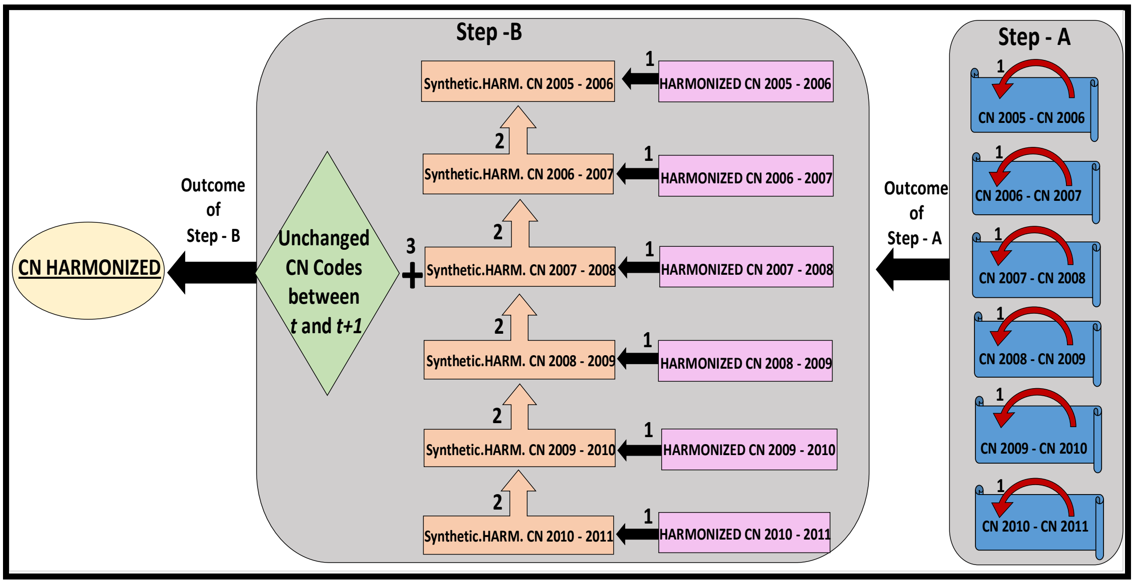
Both simple and complex changes create a hardship to follow one CN code through the years. Furthermore, a code that had many-to-one change from period *t* to *t+1* can be changed at the next periods, and this change can either be simple, one-to-many or many to many. These dynamic code changes create an additional hardship to follow one CN code through periods.

Even though changing CN codes create problems, these changes are essential. As the changes aim to add new codes to define a newly invented product/increased product variety. Deletion of a trade code is either due to the low volume of trade, or to re-align the codes (usually the result of another code being broken out), or to maintain the level of statistical detail in CN after a revision of the HS.

I use the algorithm of Van Beveren et al., (2012) to concord trade codes for the 2005-2011 period. The concording procedure of Van Beveren et al., (2012) deals with simple changes and sub-categories of complex changes (many-to-one, one-to-many, and many-to-many changes).

This appendix shows the steps to concord 2005-2011 CN codes to obtain consistent product codes for this period. The algorithm of Van Beveren et al., (2012) aims to reverse the changes made by the authorities from *t* to *t+1*. The algorithm deals with the code changes by reversing the mappings of these codes (from *t+1* to *t*). The algorithm follows the code changes from *t+2* to *t+1* and from t+1 to t. If a code in year *t+2 or* in year *t+1* is changed and is related to a code at year *t* then, algorithm clusters all these codes under a new code. This new code represents the codes that belong to the same family which origins from the code in the year *t* for all the years of the concordance period. The outcome of this concordance procedure creates a uniform CN HARMONIZED code that represents all the CN codes that belong to the same family with one code throughout the concordance period 2005-2011. The concorded CN codes will be called as CN HARMONIZED from now on. There are two steps of the concordance and illustrated by the rectangular shapes in *Figure 7* below.

Figure 7: Shema of Concording CN Codes over 2005-2011.



Steps of the concording procedure

- **Step A:** The first step of the concording process (Step-A) addresses the official revisions and product code changes of CN codes of consecutive years (*t*, *t+1*). The first rectangular shape at the right-hand side of *Figure 7* represents Step-A. Step-A uses the CN *t* and CN *t+1* correspondence tables as input.[52] Correspondence tables include all the CN codes for year *t* and year *t+1*.[53] To distinguish the changed codes and unchanged codes in the correspondence table *t - t+1,* a new variable "year of the code change" is created for all the codes. This new variable takes the numerical value of the year *(t+1)* if a code has been changed, and the variable is left as a missing value if the code is not changed at *t+1.* Later on a new numerical variable is created to capture the changed codes of year *t+1,* which belong to the same family with the changed codes of year *t.* This new variable is named as "family identification number." As I want to harmonize the CN codes for more than two consecutive years, I need to identify when the "family identification number" is created so algorithm keeps the year of the code change *(t+1).* Family identification numbers (synthetic codes) are integers starting from 1 ,and given by order of changed CN codes in that year. *Figure 8* shows an example of code changes through the 2005-2011 period. Each rectangular box in *Figure 8* contains the CN codes of that year, and the arrows show the changes of the codes in consecutive years. *Figure 8* provides an example for one-to-many, many-to-one and simple code changes over time. *Figure 8* shows that the CN-2005 code "*29053980*", is replaced with CN-2006 codes "*29053925"* and *"29053985"* at the year 2006 and CN-2008 codes "*29053985"*, *"29053910"* are replaced with CN-2009 code "29053995", in the year 2009. *Table 16* below shows an example of how CN- *t*, CN- *t +1,* year of the code change and family identification number (synthetic code) variables are used to identify the code changes shown in *Figure 8* below. *Table 16* shows that the CN 2005 and CN 2006 codes "*29053980*", "*29053985"* and*"29053910"* are clustered under family identification number (synthetic code) "1" and CN 2008 and CN 2009 codes "*29053985"* ,*"29053910" and* "*29053995*"are clustered under family identification number (synthetic code) "29."

[52] The CN-2005 - CN-2006 correspondence table is obtained by collapsing the GTIP codes at the GTIP-2005 - GTIP -2006 correspondence table provided by TUIK Trade Department.

[53] Some CN-*t* codes are not changed and repeated (used) at year *t+1*. However some CN-*t* codes are changed at year *t+1*.

Figure 8: Example of Code Changes through the 2005-2011 period.

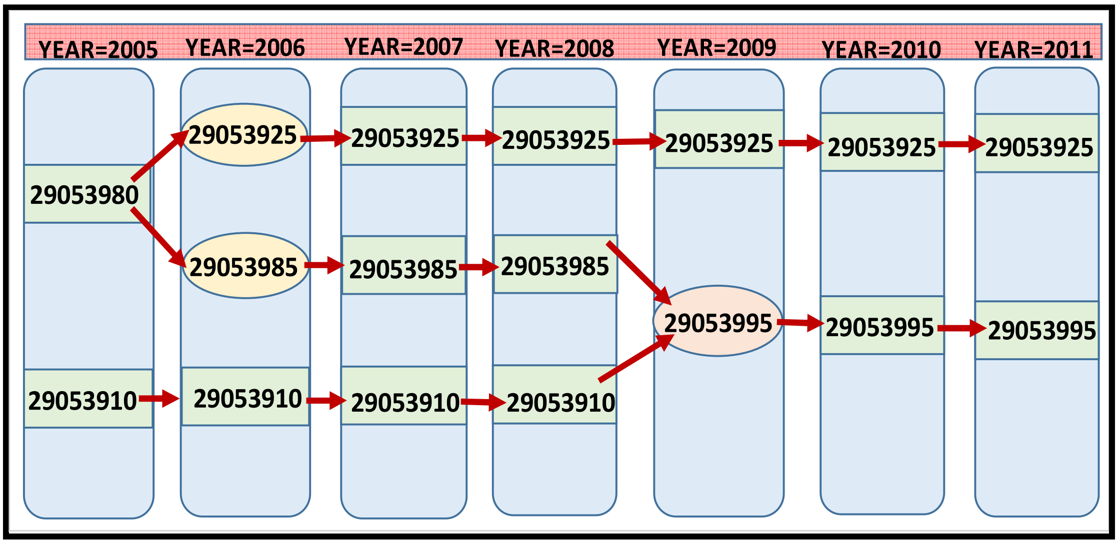


Table 16: An Example of the Step-A Outcome.

Year of the Code Change	CN- *t*	CN- *t+1*	Family Identification Number
2006	29053980	29053925	1
2006	29053980	29053985	1
2009	29053985	29053995	29
2009	29053910	29053995	29

- **Step B:** This second step of the concordance procedure (Step-B) is illustrated by the rectangular shape in the middle of *Figure 7*. Step-B carries out three tasks shown by the relevant numbers in *Figure 7*. The first task of Step-B uses the outcome of Step-A as an input and only keeps the codes that have been changed between year *t* and year *t+1*. The second task of Step-B chains the previously harmonized CN codes of t+*1* and *t+2* with previously harmonized CN codes of *t* and *t+1*. If the harmonized code of year *t* has been changed in later years, the algorithm assigns the first (earliest) family identification number (Synthetic code) of the code/codes to the other harmonized CN codes of years *t+2* , *t+3*…etc. After chaining the previously harmonized codes of consecutive years, unchanged CN codes are added to this new list of codes. If any of these unchanged CN codes in a particular year, belong to the same family with a changed code in other years (Code with a family identification number/Synthetic code) then they are replaced with the earliest family identification number that is identified in the second task.[54] This final task creates the final set of CN harmonized codes. The third task of the Step-B is represented by the plus symbol at the rectangular shape in the middle of *Figure 7*. The example in *Figure 7* shows that CN-2005 code "*29053980*" is changed in the year 2006 and replaced with CN-2006 codes "*29053925*" and "*29053985*."[55] Step-A harmonized the CN CN-2005 and CN-2006 codes, and these harmonized codes are represented by a family identification number "1" in the year 2006.[56] CN-2008 code "*29053910*" and "*29053985*" is changed in the year 2009, and these harmonized codes obtained family identification number "29" in the year 2009.[57] The first step of Step-B drops all the codes that have not been changed at year *t* and year *t+1,* so the outcome of Step-A is reduced to the years where the codes are changed. The second task of Step-B assigns the earliest family identification number (synthetic code "1") to the other harmonized codes that are related to one or more of the changed codes in the year 2008-2009. The third task of Step-B shows that all the CN codes "*29053980*", "*29053925*", "*29053985*" and "*29053910*" at years 2005-2011 is replaced with their first (earliest) family identification number "1." For the family identification number (Synthetic code) "1" the disaggregation level is six digits. However, this disaggregation level is not standard across all synthetic codes.[58] *Table 17* shows that all the codes that are connected to CN-2005 codes "29053980" and "*29053910*" are assigned to synthetic CN HARMONIZED code (family identification number) "1."

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[54] The algorithm drops the codes that do not have a corresponding code in the subsequent year of the concordance table. Codes that do not have a corresponding code in the subsequent year refers to the deleted codes during revisions and their export value is trivial as seen at *Table 20*. This part of the concordance algorithm overcomes possible bias of product adding and dropping observed in other concording techniques. Other concording techniques do not take complex changes in to account so the new and deleted codes are accounted as firms' product churning.
[55] One-to-many change of CN-2005 code"*29053980*."
[56] Please refer to *Figure 10* for the outcome of Step-A.
[57] Many-to-one change of CN-2008 code "*29053910*" and "*29053985*."
[58] If a CN Harmonized code is not synthetic, then the CN Harmonized code is 8 digit and indicates that those CN code has not been changed through 2005-2011 period.

Table 17: An Example of the Step-B Outcome.

Year	CN	CN HARMONIZED
2005	29053910	1
2005	29053980	1
2006	29053910	1
2006	29053925	1
2006	29053985	1
2007	29053910	1
2007	29053925	1
2007	29053985	1
2008	29053910	1
2008	29053925	1
2008	29053985	1
2009	29053925	1
2009	29053995	1
2010	29053925	1
2010	29053995	1
2011	29053925	1
2011	29053995	1

Table 18 below shows the number of changed CN codes in a particular year and shows the number of family identification numbers (synthetic codes) created to deal with these changes. The first column of *Table 18* displays the year *t+1* of the code change. The second column of *Table 18* displays the number of changed codes (number of old codes that are changed) at year *t*. The third column of *Table 18* displays the number of new codes at *t+1* that correspond to the old codes (number of changed codes at year *t*) that are changed at year *t+1*. The fourth column of *Table 18* displays the number of CN HARMONIZED codes with all family identification numbers at year *t+1* (number of all synthetic CN HARMONIZED codes at year *t+1*). The fifth column of *Table 18* displays the number of CN HARMONIZED codes with family identification numbers where the family is created due to one-to-one changes at year *t+1* (number of synthetic CN HARMONIZED codes with simple changes).

The first row of *Table 18* can be interpreted as follow; 749 CN-2005 codes are replaced by 504 CN-2006 codes. To concord these changes 358 synthetic CN HARMONIZED codes are created in which 85 of them are created due to simple changes. I observe that more family identification numbers are created in the year 2007. As CN codes are synced with HS codes at all times, and more family identification numbers in the year 2007 is a result of major HS revision in the year 2007.

Table 18: Composition of CN Codes CN HARMONIZED Codes for the 2005-2011 period.

1	2	3	4	5
Year of the Code Change (*t+1*)	**Number of Changed CN-*t* codes**	**Number of corresponding CN-*t*+1 codes to changed CN-*t* codes**	**CN HARMONIZED Codes with family identification numbers (including simple changes)**	**Number of simple (one-to-one) changes**
2006	749	504	358	85
2007	1,067	984	751	508
2008	96	76	61	14
2009	259	130	116	5
2010	314	157	152	27
2011	283	134	131	9

I obtain the changes in the CN classification over time by collapsing the GTIP classification changes that are provided by TUIK Trade Department.

Table 19 below shows the disaggregation levels of synthetic CN HARMONIZED codes (codes with family identification numbers). Please note that there are more than one synthetic CN HARMONIZED code in every HS Chapter. Even there are 90 CN HARMONIZED codes with a two digit disaggregation levels, most of these codes are a result of the major changes in 2007 and the realignment of CN codes in that year.[59] The number of synthetic CN HARMONIZED codes in HS chapters do not indicate that the whole HS chapter in *Table 19* below is represented by one synthetic CN HARMONIZED code.[60]

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[59] The same HS Chapters of these 90 codes with 2 digit disagregation are also represented by many other synthetic and non- synthetic CN HARMONIZED codes.

[60] There are eight HS Chapters that are not affected by the changes and revisions through the 2005-2011 period. In other words, all CN-2005 codes in these eight Hs Chapters are valid and repeated in other years through the concordance period. HS Chapters without synthetic codes; 10- Cereals, 18- Cocoa and cocoa preparations, 19- Preparations of cereals, flour, starch or milk; pastrycooks' products, 36- Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations, 67- Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair, 75- Nickel and articles thereof, 97- Works of art, collectors' pieces and antiques and, 98-Agricultural, construction, transportation, electric/ gas/ sanitary, engineering & management & environmental and quality services.

Table 19: Disaggregation Levels of Synthetic CN HARMONIZED Codes.

Nature of CN HARMONIZED Codes	Disaggregation Level			Total Number of Synthetic CN HARMONIZED Codes
	2 Digit Disaggregation	4 Digit Disaggregation	6 Digit Disaggregation	
Synthetic	90	519	789	1398

Table 20 below summarizes the Turkish exports before and after the concordance procedure. Columns 2-3 of *Table 20* show the number of original CN codes that are used by Turkish firms to export related products and the export value in a particular year in the unconcorded dataset respectively. Columns 4-5 of *Table 20* shows the number of CN HARMONIZED codes that are used by Turkish firms to export related products and the export value in a particular year in the concorded dataset respectively. Columns 6-7 of *Table 20* show the export value of the synthetic CN HARMONIZED codes and the export value share of the synthetic CN HARMONIZED codes respectively. Columns 8-9-10 of *Table 20* show the number of original CN codes replaced by synthetic CN HARMONIZED codes, the number of synthetic CN HARMONIZED codes and share of synthetic CN HARMONIZED codes among all CN HARMONIZED codes respectively. Column 11 shows the total number of CN HARMONIZED codes in the concorded export dataset by concording one more consecutive year. Column 12 shows the total number of synthetic CN HARMONIZED codes in the concorded export dataset by concording one more consecutive year. The second row of columns 11 and 12 show that there are 8029 CN HARMONIZED codes when the concordance period is 2005-2006, and 349 of these CN HARMONIZED codes are synthetic.[61]

[61] The number of synthetic CN HARMONIZED codes in *Table 20* is different than the number of synthetic CN HARMONIZED codes (CN HARMONIZED Codes with family identification numbers) in *Table 18*. Because *Table 20* only captures the synthetic CN HARMONIZED codes if Turkish firms export products registered under these codes. Therefore, the difference between the number in the first row of column 4 in *Table 18* and the second row of column 12 in *Table 20* indicates that there are 9 synthetic CN HARMONIZED codes (358-349=9) that Turkish firms do not use these 9 codes in exporting products.

Table 20: Summary of Turkish Exports Before and After the Concordance for the 2005-2011 period.

	UNCONCORDED EXPORT DATA		**CONCORDED EXPORT DATA**							**GRADUAL CONCORDANCE**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Year	**The Number of Original CN Codes in the Unconcorded Export Dataset**	**The Value of Exports (1000 TL)**	**The Number of CN Harmonized Codes in the Concorded Export Dataset**	**The Value of Exports (1000 TL)**	**Export Value in Synthetic Codes (1000 TL)**	**Export Value Share of Synthetic Codes (%)**	**The Number of CN Codes Replaced by Synthetic Codes**	**The Number of Synthetic Codes**	**Synthetic Codes among CN Harmonized Codes (%)**	**Total Number of CN Harmonized Codes in the Concorded Export Dataset by Concording One More Consecutive Year**	**Total Number of Synthetic Codes in the Concorded Export Dataset by Concording One More Consecutive Year**
2005	7,860	99,039,094	7,005	99,039,094	19,831,321	20.02	2,066	1,211	17.29	7,860	0
2006	7,756	123,341,871	7,001	123,341,871	24,117,174	19.55	1,995	1,240	17.71	8,029	349
2007	7,723	139,340,197	7,055	139,311,159	26,688,430	19.16	1,905	1,237	17.53	8,024	978
2008	7,694	170,513,070	7,040	170,358,468	30,544,215	17.93	1,874	1,221	17.34	8,146	1,034
2009	7,672	158,481,951	7,078	158,481,951	29,416,389	18.56	1,823	1,229	17.36	8,173	1,139
2010	7,594	171,343,213	7,119	171,343,213	34,921,433	20.38	1,703	1,228	17.25	8,134	1,256
2011	7,505	227,011,122	7,157	227,011,122	45,750,908	20.15	1,571	1,223	17.09	8,063	1,335

I obtain the changes between the CN-*t* and CN-*t+1* for the 2005-2011 period by collapsing the codes at the GTIP -*t* GTIP -*t+1* correspondence tables that are provided by TUIK Trade Department. 10, 679 unique CN codes are replaced by 8,063 unique CN Harmonized codes for 2005-2011 concorded Export dataset. 6,728 unique CN codes are not changed through the 2005-2011 period.

Figure 9 below shows the export value share of synthetic and non-synthetic CN HARMONIZED codes in particular HS Chapters. The x-axis in *Figure 9* shows HS Chapters codes and the y-axis shows the total export value share for the 2005-2011 period. The solid line with a circle represents the export value share of Non-Synthetic CN HARMONIZED codes, and the dashed line with a diamond shape represents the export value share of Synthetic CN HARMONIZED codes in *Figure 9*. Labels on the solid and dashed lines show the HS Chapters where the export value share of Synthetic or Non-Synthetic codes exceed 1% of the total export value.

In *Figure 9* we observe that the export value distribution of Synthetic codes is similar to the export value distribution of Non-Synthetic codes in most of the HS Chapters. Only in Hs Chapters 30, 44, 57, 68 and 85 the export value share of Synthetic codes is more than the export value share of Non-Synthetic codes.

Figure 9: Distribution of Export Value Share among Synthetic and Non-Synthetic CN HARMONIZED Codes by HS Chapters.

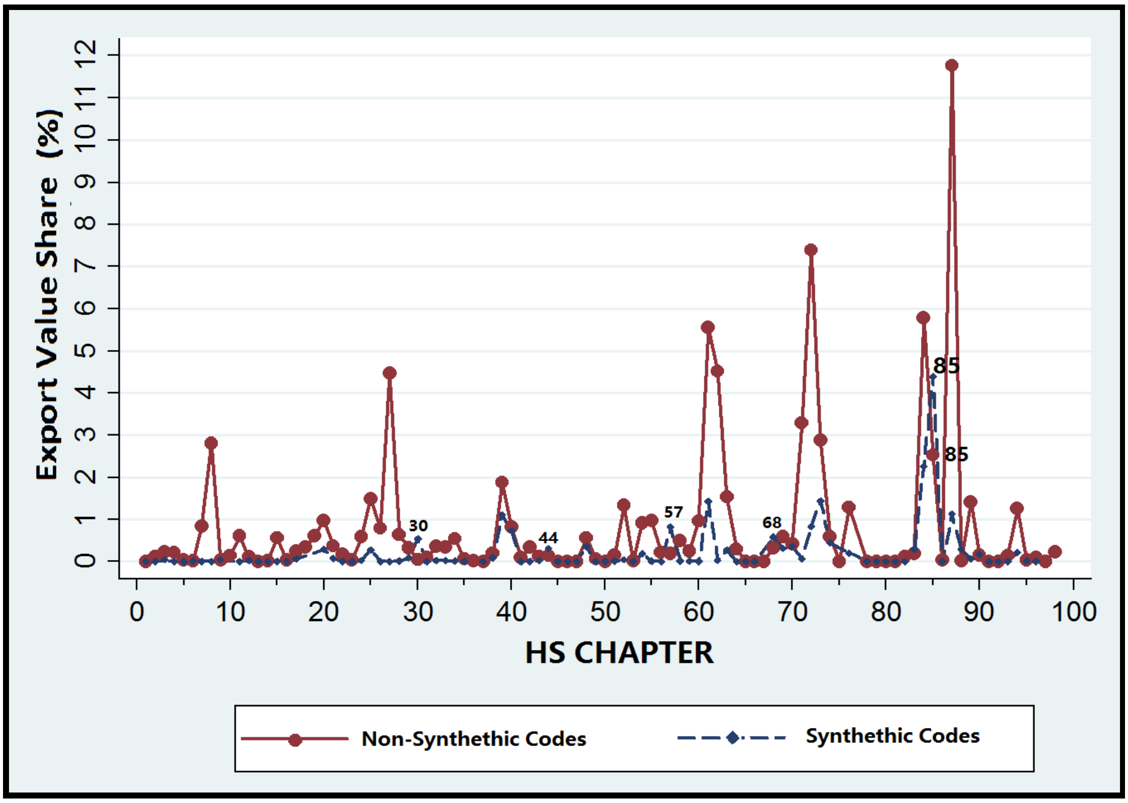

Table 21 below shows fifteen HS chapters where the share of the number of synthetic CN HARMONIZED codes in an HS Chapter is higher than 30%. The HS chapters in *Table 21* are sorted by the share of the number of synthetic CN HARMONIZED codes in an HS Chapter in descending order.

The first column of *Table 21* shows the HS chapters, the second column shows the total number of original CN codes for the 2005-2011 period, the third column shows the total number of original CN codes represented by synthetic CN HARMONIZED codes. The fourth column shows the total number of CN HARMONIZED codes, and the fifth column shows the total number of synthetic CN HARMONIZED codes. The sixth column shows the share of synthetic CN HARMONIZED codes. The seventh column shows the total number of non-synthetic CN HARMONIZED codes (original CN Codes). The eighth column shows the maximum number of original CN codes represented by one synthetic CN HARMONIZED code. The ninth column shows the minimum number of original CN codes represented by one synthetic CN HARMONIZED code.

Combining the observations in *Figure 9* and *Table 21* we observe that the export value distribution of Synthetic codes in HS Chapter 85 is 51%, and it is the only HS Chapter where we observe higher export value share with synthetic codes than with non-synthetic codes. Where the reason might be the high share of synthetic codes among CN HARMONIZED codes. Because in Table 16 we observe that in HS Chapter 85 there are 759 original CN codes and only 225 of the CN HARMONIZED codes are original CN codes which indicate that 504 original CN codes are represented by 230 synthetic CN HARMONIZED codes.

As *Table 21* might be difficult to interpret, I provide the interpretation of the first row of *Table 21* below. The first row of *Table 21* shows that the HS Chapter 46 has 33 original CN codes for the 2005-2011 period, and 29 these original CN codes are represented by synthetic codes. There is a total of 11 CN HARMONIZED codes. 64 of the original CN codes are represented by 17 synthetic CN HARMONIZED codes, and 7 of these CN HARMONIZED codes are synthetic. 64% of all CN HARMONIZED codes are synthetic, and there are 4 non-synthetic CN HARMONIZED codes. Maximum 7 original CN codes are represented by one synthetic CN HARMONIZED code. Minimum 2 original CN codes are represented by one synthetic CN HARMONIZED code.

Table 21: Detailed CN and CN HARMONIZED Code Composition of HS Chapters.

1	2	3	4	5	6	7	8	9
HS Chapter	**Total # of Original CN Codes for the period 2005-2011**	**Total # of Original CN Codes Represented by Synthetic CN Harmonized Codes**	**Total # of CN Harmonized Codes**	**Total # of Synthetic CN Harmonized Codes**	**Share of Synthetic CN Harmonized Codes**	**Total # of Non-Synthetic CN Harmonized Codes**	**One Synthetic CN Harmonized Code Corresponding to MAX Number of CN Original Codes**	**One Synthetic CN Harmonized Code Corresponding to MIN Number of CN Original Codes**
46	33	29	11	7	64	4	7	2
88	50	40	21	11	52	10	10	3
85	984	759	455	230	51	225	18	1
57	57	37	37	17	46	20	3	2
66	12	7	8	3	38	5	3	2
30	76	46	47	17	36	30	5	1
95	101	61	62	22	35	40	5	2
80	13	9	6	2	33	4	7	2
68	103	65	55	17	31	38	9	2
44	241	133	155	47	30	108	9	2
24	36	22	20	6	30	14	4	3
90	386	222	230	66	29	164	10	1
86	48	27	29	8	28	21	4	3
83	63	34	40	11	28	29	4	3

Chapter 46 -Manufactures of straw, of esparto or of other plaiting materials; basket ware and wickerwork, Chapter 88- Aircraft, spacecraft and parts thereof. Chapter 85- Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles, Chapter 57- Carpets and other textile floor covering, Chapter 66- Umbrellas, sun umbrellas, walking-sticks, seat sticks, whips, riding crops and parts thereof, Chapter 30- Pharmaceutical products, Chapter 95- Toys, games and sports requisites; parts and accessories thereof, Chapter 80- Tin and articles thereof, Chapter 68- Articles of stone, plaster, cement, asbestos, mica or similar materials, Chapter 44- Wood and articles of wood; wood charcoal, Chapter 24- Chapter 90- Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof, Chapter 86- Railway or tramway locomotives,

rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (incl. electro-mechanical) traffic signalling equipment of all kinds
Chapter 83- Miscellaneous articles of base metal.

Appendix 2 Converting Production dataset from 2010 PRODCOM Codes to 2006 PRODCOM Codes

This appendix summarizes the steps taken in order to convert Production dataset from PRODTR/PRODCOM-2010 codes to PRODTR/PRODCOM-2006 codes. Turkish Industrial Production dataset is recorded with PRODTR-2006 Codes for the 2005-2009 period. After 2009, PRODTR-2010 codes are used to record the Turkish firms' production. For years 2005- 2011 TUIK created a production dataset with PRODTR-2010 codes. I convert the production dataset for the 2005-2011 period from PRODTR-2010 codes to PRODTR-2006 codes by following the strategy below.

Firstly, I attach a common firm identifier (ID) into the Production dataset that is used in Structural Business Statistics dataset (SBS) and Trade dataset. By attaching the firm identifier (ID) to the Production dataset, I lose some of the production value. *Table 22* displays the value of production before and after applying the ID procedure. The first column of *Table 22* shows the years; the second and third columns show the production value before and after the ID procedure respectively. The fourth column shows the lost production value share due to ID procedure. *Table 22* below shows that the share of the lost production value of recorded, self-produced (MAN) products in the production dataset is less than 5% in any year.[62]

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[62] Lost share of production value rise from 0.72 % to 4.47% from year 2005 to year 2006.The rise of lost production value share is a result of the major change in firm identification strategy of SBS dataset at year 2006. The firm identification strategy of SBS dataset changed by updating the firms' firm identifiers (ID) by the legal business registries. Until the year 2006 firms' ID numbers were not checked with the legal business registries. Actual firm identifiers are the firms' tax numbers which are anonymized in the SBS dataset before providing the data to the researchers.

Table 22: Production dataset ID Procedure.

	Before ID Procedure	After ID Procedure	
Year	**Total Production Value (1000 TL)**	**Total Production Value (1000 TL)**	**Lost Production Value (%)**
2005	293,186,495	291,063,592	0.72
2006	358,296,699	342,281,349	4.47
2007	385,887,898	369,602,761	4.22
2008	439,956,469	420,894,800	4.33
2009	394,791,846	377,546,394	4.37
2010	499,437,036	478,486,857	4.19
2011	688,175,154	657,319,539	4.48

As the first eight digits of PRODTR codes correspond to the PRODCOM codes, I collapse PRODTR-2010 codes to obtain a production dataset with PRODCOM-2010 codes. After transforming the PRODTR-2010 codes into PRODCOM-2010 codes, I have to follow a two-step procedure for many-to-many and one-to-many mappings between PRODCOM-2010 codes and PRODCOM-2006 codes.

Initially, I drop the observations with PRODCOM-2006 codes that have many-to-many mappings with PRODCOM-2010 codes. Later on, I drop the observations in the harmonized trade dataset[63]that correspond to these dropped PRODCOM-2006 codes due to many-to-many mappings with PRODCOM-2010 codes. *Table 23* below shows the numbers and shares of one-to-many, many-to-one, many-to-many and simple mappings between PRODCOM-2010 codes and PRODCOM-2006 codes respectively.

[63] Harmonized trade dataset is registered with CN HARMONIZED codes.

Table 23: PRODCOM-2006 PRODCOM-2010 Mappings.

From To	# of One-to-Many Map.	% of One-to-Many Map.	# of Many-to-One Map.	% of Many-to-One Map.	# of Many-to-Many Map.	% of Many-to-Many Map.	# of Simple Map.	% of Simple Map.	# Total Map.
2010 -2006	1,096	22.36	106	2.16	529	10.79	3,170	64.68	4,901

Total commodity coverage of PRODCOM classification between years 2006 and 2010 has not been changed. The total number of PRODCOM codes change from one year to another, and it indicates that the same commodities are represented with more PRODCOM codes or fewer PRODCOM codes in that particular year. Between the years 2006 and 2010, I observe that the same commodities are represented with more PRODCOM codes in the year 2006 and represented by fewer PRODCOM codes in the year 2010. The high share of one-to-many mappings between PRODCOM-2010 codes and PRODCOM-2006 codes shown in *Table 23* above is a result of 4583 unique PRODCOM-2006 codes corresponding to 3888 unique PRODCOM-2010 codes. *Table 24* below shows the numbers and shares of PRODCOM-2006 codes and PRODCOM-2010 codes with simple mappings and complex mappings.

Table 24: PRODCOM-2006 PRODCOM-2010 Codes with Mapping Types.

Year of PRODCOM Codes	# of Codes with Simple Map.	% of Codes with Simple Map.	# of Codes with Complex Map.	% of Codes with Complex Map.	# of Total Codes
2006	3,170	81.50	718	18.50	3,888
2010	3,170	69.17	1413	30.83	4,583

In the first step, I drop the observations with 234 PRODCOM-2010 codes that have many-to-many mappings with PRODCOM-2006 codes from the production dataset.

In the second step, I drop the observations with 379 PRODCOM-2010 codes that have one-to-many mappings with PRODCOM-2006 codes from the production dataset.

Table 25 summarizes the lost production value, total lost production value share and lost observations from the production dataset. Columns 2-6 *Table 25*. *Table 34* shows the lost production value and lost production value share, and columns 7-11 show the number of lost observations and the lost observations share. The first column of *Table 25* shows the years, and the second column shows the total production value of the production dataset before converting the dataset from PRODCOM-2010 codes to PRODCOM-2006 codes. The third and the fourth columns of *Table 25* show lost production value due to many-to-many mappings and lost production value due to one-to-many mappings between PRODCOM-2010 codes and PRODCOM-2006 codes respectively. The fifth and the sixth columns of *Table 25* show the total lost production value in the conversion process and the share of the lost production value respectively. The seventh of column of *Table 25* shows the total number of observations in the production dataset before converting the dataset from PRODCOM-2010 codes to PRODCOM-2006 codes, the eighth and the ninth columns of show the lost number of observations in the production dataset due to many-to-many mappings and due to one-to-many mappings between PRODCOM-2010 codes and PRODCOM-2006 codes respectively. The tenth and the eleventh columns show the total number of lost observations in the conversion process and the share of the total lost observations respectively. *Table 25* shows that on average there is 16% of the production value is lost, and there is an average of 14% of observations are lost in the production dataset due to the conversion procedure.

Dropping the PRODCOM-2010 codes with many-to- many and one-to-many mappings with PRODCOM-2006 codes have implications on the trade dataset. Therefore, I drop the observations that correspond to these dropped codes from the Production dataset.

Firstly, I drop CN HARMONOZED codes that correspond to 274 PRODCOM-2006 codes that have many-to-many mappings with 234 PRODCOM-2010 codes. To drop the corresponding CN HARMONIZED codes, I use 274 PRODCOM-2006 codes with many-to-many mappings and use CN-2006 - PRODCOM-2006 correspondence table to obtain the corresponding CN codes in the year 2006. After that, I use CN-CN HARMONIZED correspondence table to drop the CN HARMONIED codes from the Trade dataset.[64]

Secondly, I drop CN HARMONOZED codes that correspond to 1096 PRODCOM-2006 codes that have many-to-one mappings with 379 PRODCOM-2010 codes. To drop the corresponding CN HARMONIZED codes, I use 1096 PRODCOM-2006 codes with many-to-one mappings and use CN-2006 - PRODCOM-2006 correspondence table to obtain the corresponding CN codes in the year 2006. After that, I use CN-CN HARMONIZED correspondence table to drop the CN HARMONIED codes from the Trade dataset.[65]

Table 26 summarizes the export value loss from the trade dataset. The first column of *Table 26* shows the years; the second column shows the total export value of the trade dataset after concording the CN codes though the 2005-2011 period.[66] The third and the fourth columns of *Table 26* how lost export value due to many-to-many mappings and lost export value due to many-to-one mappings between PRODCOM-2010 codes and PRODCOM-2006 codes respectively. The fifth and sixth columns of *Table 26* show the total lost export value in the conversion process and the share of the lost export value respectively. *Table 26* shows that on average 20% of the total export value is lost due to the converting Production dataset from PRODCOM-2010 codes to PRODCOM-2006 codes.

[64] Please refer to appendix 1 for the procedure of obtaining CN-“year” and CN HARMONIZED correspondence table.
[65] Please refer to appendix 1 for the procedure of obtaining CN-“year” and CN HARMONIZED correspondence table.
[66] The export value loss in concording the trade data for 2005-2011 period is trivial. For more information please refer to *Table 20* in Appendix-1.

Table 25: Value and Observation Loss in the Production Dataset.

Lost Production Value and Lost Production Value Share						Number of Lost Observations and Lost Observations Share				
1	2	3	4	5	6	7	8	9	10	11
Year	**Total Value of Production (1000 TL)**	**Lost Production Value (1000 TL)**	**Lost Production Value (1000 TL)**	**Total Lost Production Value (1000 TL)**	**Lost Production Value (%)**	**Total # of Obs. in the Production Dataset**	**Lost # of Obs. in the Production Dataset**	**Lost # of Obs. in the Production Dataset**	**Total # of Lost Obs. in the Production Dataset**	**% of Total Lost Obs. in the Production Dataset**
2005	291,063,592	18,011,596	31,167,057	49,178,653	16.90	31948	1521	2868	4,389	13.74
2006	342,281,349	21,682,575	34,336,112	56,018,688	16.37	32513	1678	2940	4,618	14.20
2007	369,602,761	24,559,427	36,007,015	60,566,442	16.39	32332	1712	2906	4,618	14.28
2008	420,894,800	30,223,232	37,662,173	67,885,406	16.13	32892	1816	2890	4,706	14.31
2009	377,546,394	26,612,931	34,784,234	61,397,165	16.26	34340	1871	3019	4,890	14.24
2010	478,486,857	32,446,565	43,206,513	75,653,078	15.81	38784	2104	3278	5,382	13.88
2011	657,319,539	43,237,231	57,095,500	100,332,730	15.26	42632	2414	3652	6,066	14.23
Avg.	419,599,327	28,110,508	39,179,801	67,290,309	**16.04**	35,063	1,874	3,079	4,953	**14.13**

Table 26: Export Value Loss in the Trade Dataset.

1	2	3	4	5	6
Year	**Total Export Value (1000TL)**	**Lost Export Value (with CN Codes) (1000TL)**	**Lost Export Value (with CN Codes) (1000TL)**	**Total Export Value Loss (1000TL)**	**Lost Export Value (%)**
2005	99,039,094	6,804,630	12,589,638	19,394,268	19.58
2006	123,341,871	8,625,681	15,899,246	24,524,927	19.88
2007	139,340,197	9,895,420	16,869,905	26,765,325	19.21
2008	170,513,070	13,785,146	19,132,663	32,917,809	19.31
2009	158,481,951	12,227,715	19,364,932	31,592,647	19.93
2010	171,343,213	13,025,616	20,121,216	33,146,832	19.35
2011	227,011,122	18,404,785	25,624,893	44,029,678	19.40
Avg.	155,581,503	11,824,142	18,514,642	30,338,784	**19.50**

Appendix 3 Concording Production and Trade Data for the 2005-2011 period.

In this section, I use the algorithm of Van Beveren et al., (2012) to concord harmonized trade codes (CN HARMONIZED) and uniform production codes (PRODCOM-2006) for the 2005-2011 period. To obtain a uniform harmonized classification across trade and production classifications I use previously created CN HARMONIZED - CN correspondence table, and CN 2006 - PRODCOM 2006 correspondence table.

This concording procedure requires two harmonization processes to obtain a uniform harmonized classification between CN HARMONIZED codes and PRODCOM-2006 codes and this two harmonization processes steps illustrated in *Figure 10* below.

The first harmonization process creates a new coding system where all the CN-2006 codes are represented either an original PRODCOM-2006 code or a family identification number (synthetic code) in the FAMILY-2006 classification system.

The second harmonization process creates a new coding system for the corresponding CN HARMONIZED codes that are represented by PRODCOM-2006 codes. This second harmonization process is needed as more than one CN-2006 codes are represented by one CN HARMONIZED code in the 2005-2011 period.

The first harmonization process identifies mapping types between CN-2006 and PRODCOM-2006 codes. Later on, a new variable called FAMILY-2006 is created. PRODCOM-2006 codes that have simple and one-to-many mappings with CN-2006 codes are directly assigned to the new classification FAMILY-2006. For the PRODCOM-2006 codes with many-to-many and many-to-one mappings with CN-2006 codes, a new family identification number (synthetic code) is created and are assigned to the FAMILY-2006. The square on the left-hand side of *Figure 10* illustrates the first harmonization process.

Table 27 shows the number and share of PRODCOM-2006 codes with mapping types with CN-2006 codes. *Table 27* shows that 62% of PRODCOM-2006 codes have simple mappings with CN-2006 codes[67] and 34% of PRODCOM-2006 codes have one-to-many mappings with CN-2006 codes and codes with these two mapping types account for 96% of total codes. Family identification numbers (synthetic codes) are only created for 185 PRODCOM-2006 codes, accounting for 4% of total codes that have many-to-many and many-to-one mappings with CN-2006 codes.[68]

The first harmonization process either assigns a PRODCOM-2006 code or a family identification number to FAMILY-2006 classification. So, FAMILY-2006 consists both family identification numbers (synthetic codes) and original PRODCOM-2006 codes. *Table 28* shows an example of the first harmonization process outcome.

Table 27: Number and Shares of PRODCOM-2006 Codes and Their Mapping Types with CN-2006 codes.

Year of CN and PRODCOM Codes	# of One-to-Many Map.	% of One-to-Many Map.	# of Many-to-One Map.	% of Many-to-One Map.	# of Many-to-Many Map.	% of Many-to-Many Map.	# of Simple Map.	% of Simple Map.	Total # of PRODCOM Codes.
2006	1471	33.68	40	0.92	145	3.32	2711	62.08	4367[69]

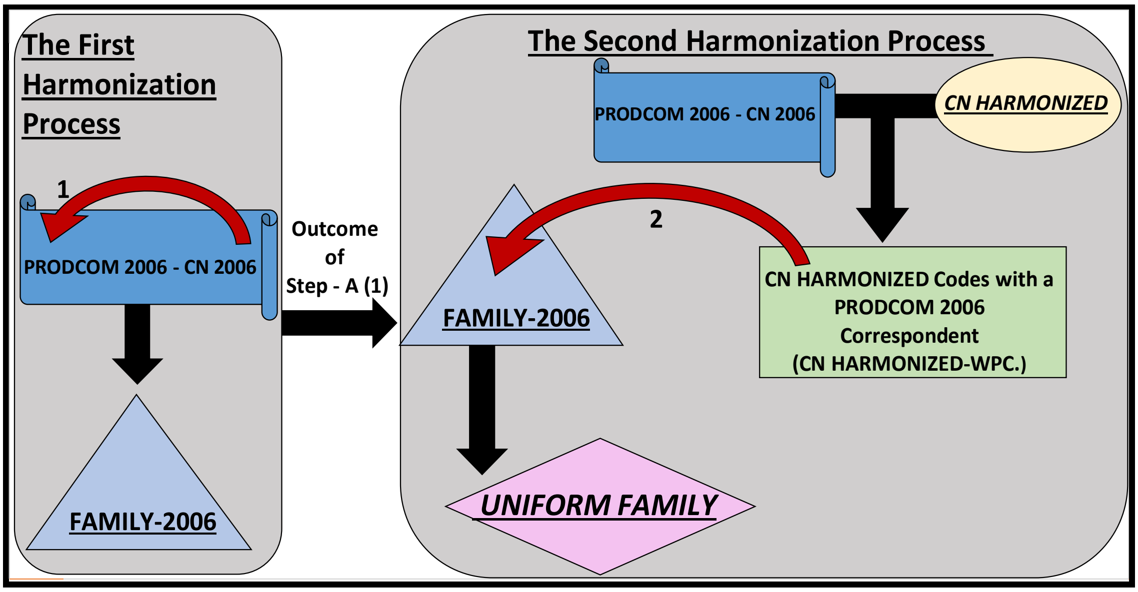
I obtain the CN-2006 - PRODCOM-2006 correspondence table by collapsing the codes at the GTIP-2006 - PRODTR-2006 correspondence table which is provided by TUIK Trade Department.

[67] One PRODCOM-2006 code corresponds to many CN-2006 codes.

[68] Both CN-2006 and PRODCOM-2006 codes are 8 digit, however they are created to serve different purposes. In other words, PRODCOM codes represent the same commodities with less codes at 8 digit level of disaggregation compared to CN codes. Therefore, 9073 CN-2006 codes are covered by 4367 PRODCOM-2006 codes.

[69] Please note that number of PRODCOM 2006 and PRODCOM 2010 codes in appendix 2 differ from the number of PRODCOM 2006 and PRODCOM 2010 codes in this section. This difference is due to the missing correspondent codes of each year (2006 and 2010) in the correspondence tables. In particular, a PRODCOM 2006 code might not correspond to any PRODCOM 2010 code and vice versa.

Figure 10: Shema of Concording Trade and Production Classifications for the 2005-2011 period.



After finding the mappings between PRODCOM-2006 and CN-2006 codes, a new variable called FAMILY-2006 is created. PRODCOM-2006 codes that have simple and one-to-many mappings with CN-2006 codes are assigned to the FAMILY-2006 as they are. Later on a family identification number (synthetic code) is created for the PRODCOM-2006 codes with many-to-many and many-to-one mappings with CN-2006 codes and are assigned to the FAMILY-2006. The curved arrow at the left square of *Figure 10* illustrates the creation of FAMILY-2006.

The first harmonization process either assigns a PRODCOM-2006 code or assigns a family identification number to FAMILY-2006 classification. At this point, FAMILY-2006 codes consist family identification numbers (synthetic codes) and original PRODCOM-2006 codes. *Table 28* below shows an example of the first harmonization process outcome. The outcome of the first harmonization process creates a harmonized code called FAMILY-2006 and a correspondence table between PRODCOM-2006 codes and FAMILY-2006. *Table 28* below shows examples of PRODCOM-2006 codes mappings with CN-2006 codes and the new code "FAMILY-2006" algorithm creates.

Table 28: Example of PRODCOM-2006, CN 2006 and FAMILY-2006 Codes.

PRODCOM-2006	CN-2006	One-to-Many Map.	Many-to-One Map.	Many -to-Many Map.	Simple	FAMILY -2006	Synthetic
27432600	79060000	0	0	0	1	27432600	0
28752765	79070000	0	0	0	1	28752765	0
27432860	80050000	0	0	0	1	27432860	0
28752766	80070000	0	0	0	1	28752766	0
27432900	80060000	0	0	0	1	27432900	0
10101130	27011210	0	0	0	1	10101130	0
10101150	27011110	1	0	0	0	10101150	0
10101150	27011190	1	0	0	0	10101150	0
10101150	27011290	1	0	0	0	10101150	0
10101150	27011900	1	0	0	0	10101150	0
40211003	27050000	0	1	0	0	1	1
40211007	27050000	0	1	0	0	1	1
40211008	27050000	0	1	0	0	1	1
40211005	27050000	0	1	0	0	1	1

Before the second harmonization procedure, first I need to find which CN HARMONIZED codes are covered by the PRODCOM-2006 classification. CN HARMONIZED codes that are covered by the PRODCOM-2006 classification are called CN HARMONIZED-WPC from now on. Finding CN HARMONIZED codes that are covered by the PRODCOM-2006 classification is illustrated on the top right of the square on the right-hand side of *Figure 10*. *Table 29* below shows the CN-2006 codes that are covered by the PRODCOM-2006 classification with different disaggregation levels.

Table 29: Number and Share of CN-2006 Codes Covered by the Production Classification (PRODCOM-2006) by Different Disaggregation Levels.

Disaggregation Level	Total Number of Covered Codes	Share of Covered Codes	Total Number of Codes
HS Chapter (2 Digit)	92	94.85	97
HS Heading (4 Digit)	1143	90.43	1264
HS Sub-Heading (6 Digit)	5086	92.46	5501
CN (8 Digit)	11153	92.75	12025

Table 29 shows that 92 HS Chapters are covered by PRODCOM-2006 classification among 97 HS Chapters.[70] Now, I use the correspondence table between CN codes, and CN HARMONIZED codes to obtain the CN HARMONIZED codes covered by the PRODCOM-2006 classification (CN HARMONIZED-WPC).

At this point, I merge one CN-2006 code with many CN codes in the correspondence table between CN codes and CN HARMONIZED codes. This merge provides a problem as many CN codes are represented by one CN HARMONIZED code. I need to harmonize CN HARMONIZED codes and FAMILY-2006 codes to obtain a new harmonized classification between CN HARMONIZED codes and FAMILY-2006 codes. The harmonization between CN HARMONIZED codes and FAMILY-2006 codes is illustrated by the right square at *Figure 10*.

The second harmonization process identifies mapping types between CN HARMONIZED codes covered in the PRODCOM classification (CN HARMONIZED-WPC) and PRODCOM-2006 codes. Later on, a new variable called UNIFORM FAMILY is created. PRODCOM-2006 codes that have simple and one-to-many mappings with CN HARMONIZED-WPC codes are directly assigned to the UNIFORM FAMILY. For the PRODCOM-2006 codes with many-to-many and many-to-one mappings with CN HARMONIZED-WPC codes, a new family identification number (synthetic code) is created and are assigned to the UNIFORM FAMILY. The second harmonization process is illustrated by the left square at *Figure 10*. *Table 30* shows the number and share of FAMILY-2006 codes mapping types with CN HARMONIZED-WPC codes. *Table 30* shows that 57% of FAMILY-2006 codes have simple mappings with CN HARMONIZED-WPC codes, and 9% of FAMILY-2006 codes have one-to-many mappings with CN HARMONIZED-WPC codes. These two mapping types account for 66% of total codes that will be directly assigned to the UNIFORM FAMILY as they are.

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[70] HS Chapters; 1-Live animals, 6-Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage, 13-Lac; gums, resins and other vegetable saps and extracts, 97-Works of art, collectors' pieces and antiques and 98-Agricultural, construction, transportation, electric/ gas/ sanitary, engineering & management & environmental and quality services, are not covered by the PRODCOM classification.

Table 30: Number and Share of FAMILY-2006 Codes and Their Mapping Types with CN HARMONIZED-WPC.

# of One-to-Many Map.	% of One-to-Many Map.	# of Many-to-One Map.	% of Many-to-One Map.	# of Many-to-Many Map.	% of Many-to-Many Map.	# of Simple Map.	% of Simple Map.	Total # of FAMILY-2006 Codes.
389	9.17	1241	29.27	180	4.25	2430	57.31	4240

Table 31 below shows an example of the second harmonization process outcome. As mentioned before, PRODCOM-2006 codes with many-to-one mappings with CN HARMONIZED-WPC codes have family identification numbers (synthetic codes) “5” and “6” in the UNIFORM FAMILY.[71] I harmonize[72] again to deal with the FAMILY-2006 codes that have complex mappings with CN HARMONIZED codes by producing a new code that clusters these codes with complex mappings under a new uniform code. This application creates synthetic codes for the FAMILY-2006 codes that have complex mappings with CN HARMONIZED codes and assigns the FAMILY-2006 codes that have simple mappings with CN HARMONIZED codes this new set of codes are “UNIFORM FAMILY” codes. The UNIFORM FAMILY codes are static across time and trade and production classifications.

Table 31 below shows examples of FAMILY-2006 codes with different mappings with CN HARMONIZED codes and the new static code “UNIFORM FAMILY” that the algorithm creates. As we observe that FAMILY-2006 codes “27432600” and “28752765” correspond to one CN Harmonized- WPC code “40” therefore the second harmonization

[71] Production value registered with codes “27432600” and “28752765” are represented under the UNIFORM FAMILY CODE “5.” Trade value, entry and exit registered with CN codes “78019990”, “78019991” and “78019999” represented with CN HARMONIZED code “40” in the harmonized trade dataset. Now all the trade value, entry and exit registered with CN HARMONIZED code “40” is represented under the UNIFORM FAMILY CODE “5.”
[72] Old codes are CN HARMONIZED codes and new codes are FAMILY-2006 codes and family identification number is created for UNIFORM FAMILY.

procedure creates family identification number “5” to cluster the FAMILY-2006 codes that correspond to one CN Harmonized- WPC code.

Table 31: Example of CN HARMONIZED, FAMILY-2006, and UNIFORM FAMILY Codes.

FAMILY-2006	CN Harmonized - WPC	One-to-many	Many-to-one	Many to Many	Simple	UNIFORM FAMILY	Synthetic
27432600	40	0	1	0	0	5	1
28752765	40	0	1	0	0	5	1
27432860	41	0	1	0	0	6	1
28752766	41	0	1	0	0	6	1
27432900	41	0	1	0	0	6	1
10101130	27011210	0	0	0	1	10101130	0
10101150	27011110	1	0	0	0	10101150	0
10101150	27011900	1	0	0	0	10101150	0
10101150	27011290	1	0	0	0	10101150	0

The final classification (UNIFORM FAMILY) has 3865 codes, and only 249 of them are representing families of codes (synthetic codes). 3616 codes accounting for 94% of all UNIFORM FAMILY are original PRODCOM-2006 codes. *Table 32* below shows the lost production registries associated with the PRODCOM 2006 codes that do not have any correspondence with UNIFORM FAMILY codes. Columns 2 and 3 of *Table 32* shows the lost production value and remaining production value respectively. Columns 4 and 5 of *Table 32* shows the lost export flows associated to with the CN HARMONIZED codes that have no correspondence with UNIFORM FAMILY and remaining export value respectively.

Table 32: Production and Trade Value Loss due to Codes without a Corresponding UNIFORM FAMILY.

Year	Lost Production Value (1000 TL)	Remaining Production Value (1000 TL)	Lost Export Value (1000 TL)	Remaining Export Value (1000 TL)
2005	15,200,102	236,213,387	6,244,630	73,400,197
2006	18,249,859	276,824,186	7,101,945	91,715,000
2007	19,491,565	296,762,007	6,750,391	105,795,443
2008	22,834,860	339,819,549	7,271,002	130,169,657
2009	17,109,961	304,004,198	8,986,748	117,902,557
2010	27,082,961	387,586,038	10,264,543	127,931,838
2011	39,869,344	549,099,699	12,884,255	170,097,188

I obtain the CN-2006 codes by collapsing the GTIP-2006 codes that are provided by TUIK Trade Department.

Table 33 below displays the number and trade value of synthetic UNIFORM FAMILY codes and non-synthetic UNIFORM FAMILY codes. The concordance procedure creates 3865 UNIFORM FAMILY codes, in which 249 of them are synthetic. However, I do not observe trade with all of these codes; Turkish firms do not trade with 67 synthetic and 282 non-synthetic UNIFORM FAMILY codes (original PRODCOM -2006 Codes) that algorithm created. *Table 33* below displays that 85% of the export value is represented by non-synthetic UNIFORM FAMILY codes and only 15% of the export value is represented by synthetic UNIFORM FAMILY codes. Also, we observe that the codes that Turkish firms trade with the rise the non-synthetic codes count-share to 95% from 94%.

Table 33: Number and Trade Value of Synthetic Codes and Non-Synthetic Codes of UNIFORM FAMILY.

Nature of UNIFORM FAMILY Codes	Export Value (1000 TL)	Exports Value Share (%)	Total Number of Codes (Where Trade Observed)	Count-Share of Synthetic and Non-Synthetic Codes (Where Trade Observed)	Total Number UNIFORM FAMILY Codes (Created)	Count-Share of Synthetic and Non-Synthetic Codes (Created)
Original PRODCOM -2006 Codes (Non-Synthetic Codes)	870,598	85	3334	95	3616	94
Codes with Family Identification Numbers (Synthetic Codes)	155,074	15	182	5	249	6
TOTAL	1,025,672	100	3516	100	3865	100

Figure 11 below shows the export value share of with synthetic and non-synthetic UNIFORM FAMILY codes, in particular, four-digit NACE Code. The x-axis in *Figure*

11 shows NACE Codes and the y-axis shows the total export value share for the 2005-2011 period. The solid line with a circle represents the export value share of Non-Synthetic UNIFORM FAMILY codes, and the dashed line with a diamond shape represents the export value share of Synthetic UNIFORM FAMILY codes in *Figure 11*. Labels on the solid and dashed lines show the NACE Codes where the export value share of Synthetic or Non-Synthetic codes exceed 3% of the total export value.

In *Figure 11* we observe that the export value distribution of Synthetic codes is similar to the export value distribution of Non-Synthetic codes in most of the NACE Codes. We observe that none of the Synthetic UNIFORM FAMILY codes exceed 3% of the total export value in a NACE Code. However, many Non-Synthetic UNIFORM FAMILY codes exceed 3% of the total export value in a NACE Code. *Figure 11* indicates that my final set of codes (UNIFORM FAMILY codes) does not alter the export value share distribution of the dataset because of the synthetic codes carrying too much trade in a particular NACE Code.

Figure 11: Distribution of Export Value Share among UNIFORM FAMILY Codes by NACE Codes.

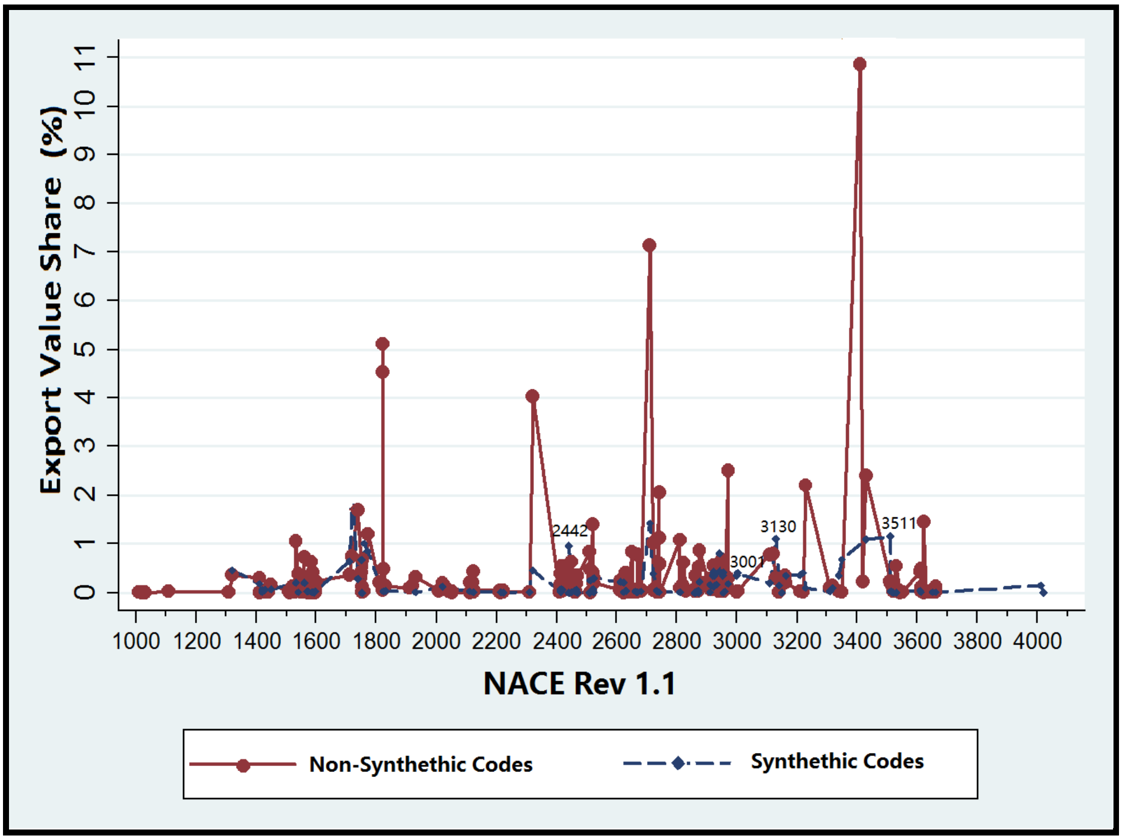

Table 34: Summarizing the Lost Production Value and the Lost Export Value Trough Conversion and Concordance Procedures.

Lost Production Value and Share of Lost Production Value					Lost Export Value and Share of Lost Export Value			
1	2	3	4	5	6	7	8	9
Year	**Total Value of Production (TL) (After ID Procedure)**	**Total Lost Production Value (TL) (In Converting Production Dataset from 2010 PRODCOM Codes to 2006 PRODCOM Codes)**	**Total Lost Production Value (TL) (In Concording Trade and Production Classifications)**	**Total Lost Production Value (%)**	**Total Export Value (TL) (After Concording CN Codes Through 2005-2011 period)**	**Total Export Value Lost (TL) (In Converting Production Dataset from 2010 PRODCOM Codes to 2006 PRODCOM Codes)**	**Total Export Value Lost (TL) (In Concording Trade and Production Classifications)**	**Total Lost Export Value (%)**
2005	291,063,592	49,178,652,905	15,200,102,052	22.12	99,039,094,220	19,394,267,675	6,244,629,935	25.89
2006	342,281,349	56,018,687,680	18,249,858,881	21.70	123,341,871,421	24,524,926,965	7,101,944,801	25.64
2007	369,602,761	60,566,442,451	19,491,564,593	21.60	139,340,197,147	26,765,325,468	6,750,390,541	24.05
2008	420,894,800	67,885,405,822	22,834,860,492	21.55	170,513,069,615	32,917,808,847	7,271,001,871	23.57
2009	377,546,394	61,397,165,341	17,109,961,167	20.79	158,481,951,496	31,592,646,967	8,986,747,676	25.61
2010	478,486,857	75,653,077,944	27,082,961,058	21.47	171,343,212,758	33,146,832,009	10,264,542,605	25.34
2011	657,319,539	100,332,730,472	39,869,344,477	21.33	227,011,121,898	44,029,678,349	12,884,255,420	25.07
Avg.	419,599,327	67,290,308,945	22,834,093,246	**21.48**	155,581,502,651	30,338,783,754	8,500,501,836	**24.96**

Appendix 4 Credit Constrained and Non-Credit Constrained Sectors

Table 35 below shows the credit constrained and non-credit constrained sectors from the study of (Manova, (2008). The sectors with the asset tangibility above the industry average are non-credit constrained sectors and sectors with the asset tangibility below the industry average are credit constrained sectors.

Table 35:Credit Constrained and Non-Credit Constrained Sectors (Manova, (2008)).

	ISIC code	Industry	Asset Tangibility
CREDIT CONSTRAINED SECTORS	361	Pottery, china, earthenware	0.0745
	323	Leather products	0.0906
	322	Wearing apparel, except footwear	0.1317
	385	Prof and scient equipment	0.1511
	382	Machinery, except electrical	0.1825
	390	Other manufactured products	0.1882
	352	Other chemicals	0.1973
	383	Machinery, electric	0.2133
	314	Tobacco	0.2208
	384	Transport equipment	0.2548
	332	Furniture, except metal	0.263
	313	Beverages	0.2794
	381	Fabricated metal products	0.2812
	342	Printing and publishing	0.3007
NON-CREDIT CONSTRAINED SECTORS	354	Misc. petroleum and coal products	0.3038
	362	Glass and products	0.3313
	356	Plastic products	0.3448
	321	Textiles	0.373
	311	Food products	0.3777
	355	Rubber products	0.379
	331	Wood products, except furniture	0.3796
	372	Non-ferrous metals	0.3832
	3511	Industrial chemicals	0.4116
	369	Other non-metallic products	0.42
	371	Iron and steel	0.4581
	341	Paper and products	0.5579
	353	Petroleum refineries	0.6708
	Industry Average		**0.3044**
	Industry Standard Deviation		**0.1372**

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