Firms' heterogeneity and comparative advantage: an empirical analysis

PRELIMINARY AND INCOMPLETE

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Abstract

The aim of this paper is to conduct an empirical analysis of the effect of Turkey-EU Customs Union on French exporting structure, allowing for firms' heterogeneity within sectors and comparative advantage between sectors in the two countries.

Neoclassical comparative advantage models predict that when trade costs fall each country begins to export its comparative advantage sector goods. While, recent firm heterogeneity models, combining consumer taste of variety, increasing return to scale, firm heterogeneity in productivity and fixed and variable costs to export, show that, as trade costs fall, resources are reshuffled from less to more productive firms.

In this paper I try to put together firm and sector heterogeneity. I first build a partial equilibrium model in which trade costs, endowment comparative advantage at sector level and productivity heterogeneity at firm level interact together in an open economy environment. The model shows that falling trade costs asymmetrically affect intensive (exported quantity by firm) and extensive margin (number of exporters) in different sectors.

The empirical analysis confirms model main result in the extensive margin since firms in comparative disadvantage sectors are more reactive to the formation of Customs Union.

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Introduction

In this paper I analyze how different sectors adjust their trade extensive and intensive margin when tariffs decrease.

Using French firm data collected by INSEE, I find that French firms react to the entrance of Turkey in European Customs Union [CU] in an asymmetric way depending from the sector they belong to. In particular the probability to export to Turkey after it reduced import tariffs has increased more for less capital intensive sectors, which are the ones in which France has a comparative disadvantage with respect to Turkey.

Even if one of the main questions of international trade is how do economies respond to trade liberalization, we still know very little about the adjustment on different margins when we consider both firms' and sectors' heterogeneity.

Neoclassical theory explains the effect of trade liberalization considering the heterogeneity across industries in terms of their factor intensity and the heterogeneity among countries in terms of their factor endowments. When economies open up to trade each country, via a change in factors' rewards, begins to export its abundant factor. In these models firms are homogeneous within each sector. Nevertheless firms' characteristics have proved to be empirically important in explaining facts regarding trade, like the exporting behaviour (in each country only the most productive firms export) or the effects of trade liberalization (effects are asymmetric among firms even in the same industry). A new wave of theoretical papers has then incorporated firms' heterogeneity in trade models, trying to explain these facts. A recent paper by Bernard-Redding and Schott (2004) [BRS] addresses the question of trade liberalization considering both the firm level and sector level margin. Their paper analyzes a general equilibrium model using a standard Heckscher-Ohlin world with two countries, two factors and two sectors and introducing firms' heterogeneity as in Melitz (2003). The framework is very rich at the expense of very complicated algebra and closed form solutions are not reached, thus complicating the interpretation of results in the simulation.

If from theoretical point of view we have a general equilibrium model that gives us some directions to address our main question, from the empirical point of view there is basically no paper, as far as I know, that analyzes it.

In the empirical literature we have three different branches that in a sense refer to my paper but no one really answers to the same question.

The first branch is a group of papers that analyze firm level reaction to trade liberalization looking either at the entry exit of firms from domestic and exporting market (Pavnick (2003), Schor (2004), in a sense Trefler (2001)) either at skill upgrade and technology adoption (Bustos (2005)). These papers are similar to mine because they study how firms in a country react when trade is liberalized but they don't look at the same point.

There is also another interesting paper in this group that is the one by Bernard, Jensen and Schott (2003) who test the common predictions of models with heterogeneity among firms in the case of US economy. They found that predictions are supported by data only for some sub-sectors of US economy, mainly for that sectors whose penetration ratio (in terms of imports and exports) toward countries in the European Union is higher. This result points to an interaction between heterogeneity at firm level in each industry and heterogeneity among industries.

The second branch is the literature that analyses intensive and extensive margin at aggregate level. Felbermayr and Kohler (2006) provide an empirical dissection of last 50 years trade growth between aggregate extensive margin (the number of newly formed bilateral relations among countries) and aggregate intensive one (the quantity each country shipped to another country to which it were previously exporting). However aggregate definitions of extensive and intensive margins are different from firm level ones.

The third group of papers is the one in which extensive and intensive margin is analyzed by itself from a firm level perspective but without any mention to trade liberalization. Third group is actually made by only one paper by Eaton-Kortum-Kramarz (2004) that using French firm level data find that in a single year the extensive margin accounts on average for 88% of French market share in a destination.

In this paper I will first show a partial equilibrium model with two countries which differ in endowments, a continuum of sectors which differ in factor intensity and a continuum of firms which differ in productivity. The model is similar to [BRS] but it relies on a continuum of sectors and it abstracts from entry exit in domestic market and from skill premium adjustment after reduction of tariffs. These hypothesis are intended to fit the model to the empirical case I will turn to analyze in the second part of the paper.

Like in Romalis (2004) consumers have a Cobb Douglas utility function over the goods of different sectors and a CES utility function for every variety inside each sector. There is monopolistic competition and firms produce using two factors, skilled and unskilled workers (but one can think also at labour and capital), and according to an exogenous productivity level. All firms in each sector, however, use the same factor intensity and the continuum of sectors is characterized by an index which ranks them according to their intensity in the use of factors.

Since the two countries have different endowments there will be sectors which have comparative advantage [CA] in each country and these will be the ones which use more intensively the factor its country is more endowed with[1] . Finally there are fixed costs both to produce for domestic market and to export and variable trade costs to export modelled as standard iceberg ones.

Assuming that Price Index in each country does not depend on the tariff reduction and abstracting form entry and exit of firms in each market, I obtain a close form solution for the minimum level of productivity a firm needs to have to export (export threshold) and for both firm level export sales and aggregate sales. The three variables depend on tariffs as well as comparative advantage index.

Basic predictions on extensive margins are the following: probability to be an exporter is higher when tariffs decrease (standard heterogeneous firm literature result), higher for firms in comparative advantage sectors (comparative advantage Heckscher-Ohlin kind-of result) and reacts more in comparative disadvantage sectors as tariffs change.

On the intensive margin I find that exported sales increase when tariffs decrease or when a firm with the same characteristics belong to a sector with higher CA index. Finally the effect of tariffs on sales is higher for firms in CA sectors (that is they increase their sales more when tariffs decrease).

I also try to decompose the total effect of tariffs decrease on aggregate sales change in its components: change in sales from already exporting firms (intensive margin), number of net entry firms (extensive margin) and sales form newly entered firms (a sort of intensive margin given by the extensive margin).

Predictions of the model are then tested considering the effect of the entrance of Turkey in European Customs Union on French firms.

I measure tariffs reduction after CU using “effectively applied rates” from Turkey to France taken from TRAINS-WTO dataset, while firm level data comes from BRN and DOUANE dataset based at INSEE (Institute Nationale de la Statistique et des Etudes Economiques).

I find that extensive margin predictions are confirmed by data trying different specifications as well as productivity and CA measures.

As regards intensive margin predictions I find that the direct effect of tariffs change is as expected while the interaction term with CA has the opposite sign for continuously exporting firms.

[1] Appendix provides a simpler version of the model with ricardian kind of comparative advantage.

Finally, dividing firms into continuously exporters and newly net entered I show that the total sales growth to Turkey is more explained by last ones.

The paper is organized as follows: in next section I will briefly analyze the extent of the EU-Turkey Customs Union of 1996, in section 2 I will present a preliminary statistic analysis on the impact of the EU-Turkey Customs Union of 1996 on French firms; section 3 deals with the partial equilibrium model; section 4 will describes data and the variables' construction; in section 5 I present the econometric framework and the results; section 6 concludes.

1. EU-Turkey Customs union.

Turkey and European Economic Community (EEC) relation goes back to 1963 with the signing of Ankara Agreement that specify the three stages through which prepare Turkey to full membership to the Community. In the preparatory stage, lasted five years, the EEC gave unilateral concessions to Turkey in the form of agricultural tariff quotas and direct financial aid. During this stage Turkey did not have to change its trade regime. During the transition stage the Additional Protocol to the Ankara Agreement was signed in 1970, becoming effective in 1973. The aim of this protocol was to set a timetable to reach the Customs Union by 1996. After the Additional Protocol was signed, the EEC abolished tariffs and equivalent taxes on industrial imports from Turkey, with the exception of some sensitive products such as machine woven carpets, cotton yarn and cotton textiles. The EEC also removed all quantitative restrictions on industrial import from Turkey with the exception of imports of cocoons and raw silk. However, it did continue to apply quotas and minimum import price which were within the framework of the Common Agricultural Policy and also non-tariff barriers against some goods (e.g. textiles, iron and steel, raisins, fresh fruit and vegetables) remained high. During the transitional stage some problems arose regarding the inability of Turkey to abolish tariffs as planned. However, on March 1995 it was agreed at the Association Council meeting in Brussels that Turkey would enter the European Customs Union, starting on January the 1st, 1996: this step has been considered very important by both parties for the increasing in their integration.

The basic points of the CU regarding trade with EU are the following[2]:

- Turkey has to eliminate all customs duties, quantitative restrictions, charges having equivalent effect to customs duties and all measures having equivalent effect to quantitative restrictions in trade of industrial goods with EU by January 1, 1996;

[2] This section borrows from Togan (1995), Togan (1997), Ulgen and Zahariais (2004).

- Turkey has to adopt the Common Customs Tariff (CCT) against third country imports by the same date and adopt all the EU preferential agreements with third countries by 2001;
- Common agricultural policy (CAP) is not included in the CUD (even if processed components of agricultural products, considered as industrial products are part of the CUD): articles 22-25 declare that Turkey has to adjust its agricultural policy in order to adopt CAP and let its agricultural products to circulate freely (however on this point there are important issues still under discussion, regarding principally financial aids);
- the " European Coal and Steel Community" (ECSC) products, basically iron and steel, are exempted from the CU. However in 1996 a "Free Trade Agreement" between Turkey and EU implies that also these goods will circulate freely after three years;
- Turkey will finally work toward the harmonization of commercial legislation concerning competition policy, state aids, intellectual and industrial property rights, adoption of new rules on customs classification, valuation, rules of origin, technical regulations, standards and government procurements;
- The CUD (Customs Union Decision) does not face important issues like the supply of service, the establishment and movement of capital, the movement of labour.

What is the real extent on the elimination of trade barriers provided by EU-Turkey CU? Table 0 provides the Nominal Protection Rate (NPR)[3] for different sectors before (1994) and after (2001)[4] the formation of the CU. It is clear that for all industrial goods tariffs went down to 0, but the effect has been asymmetric between sectors since some of them where quite heavily protected (like "non-alcoholic beverages", "processes tobacco", "cement" and "motor vehicles"). Simple mean among tariffs on goods object of the CU was 13.13%, while the relative standard deviation amounted to 12.67% revealing a quite high differentiation among tariffs between sectors. By 1996 both mean and standard deviation get down to 0.

Nominal Protection Rate gives us an indication of the tariffs reduction but the right way to measure it is using the "effectively applied rates" from Turkey to France taken from TRAINS-WTO dataset which is a more reliable measure of tariffs themselves. According to this database

[3] The NPR for a sector *i* is defined as an average of the NPR for each good in that sector. $NPR_j = \left(\frac{p_j}{p_j^*} - 1 \right) * 100$, where p_j refers to the domestic price of good j, while p_j^* to its border equivalent price.

[4] Notice that except for "agricultural products" and "iron and steel" all tariff on industrial goods should be zero 0 already from 1996

tariffs have been effectively reduced after the CU without being completely eliminated. The variation of effectively applied tariffs is shown in Figure 1.

2. Preliminary statistic analysis

In this paragraph I will show some preliminary analysis that clarifies the motivation of the paper. The full description of different datasets I used is in paragraph 4. Main datasets come form INSEE. Data used in this section are mainly from DOUANE which is a dataset that contains for each reported French firm year, exported sales and exported destination and a code called SIREN which is useful to merge information for the same firm from other datasets.

The impact of the entrance of Turkey in European CU on French total export is very big as we see in Table 1. For different available years this table shows the aggregate growth rate of French exported sales to Turkey which can be divided into the part accounted by average quantities and the part accounted by the number of exporters according to the following formulation[5]:

$$\ln\left(\frac{\overline{Q_t} * N_t}{\overline{Q_{t-1}} * N_{t-1}}\right) = \ln\left(\frac{\overline{Q_t}}{\overline{Q_{t-1}}}\right) + \ln\left(\frac{N_t}{N_{t-1}}\right) \qquad \text{(Decomposition 1)}$$

where the log growth rate of average quantities can be considered a sort of intensive margin and the growth rate of the number of firms represents the extensive margin.

The total growth rate of export toward Turkey has increased of 0.40 between 1995 and 1996 and of 0.19 in 1997. This big increase can be divided into a 40% determined by the extensive margin and 60 % deriving by the log growth in average exported quantities. As we can notice this big increase in French export does not apply to the rest of the world, in fact between 1995 and 1996 the total French export toward all countries except Turkey has actually decreased by 0.01. French performance toward Turkey more over has not been followed by a similar performance toward other countries, like the table shows reporting the aggregate growth rate export toward Morocco which I will use in different part of the analysis as a control group, being a similar country to Turkey in dimension and distance from France. The huge Turkish import growth rate in 1996 has been documented in some case studies. Erdogdu (2002) for example noticed that "Since the EU had already abolished its tariffs from imports from Turkey, the Customs Union did not bring about a significant liberalization of Turkish exports to the EU.

[5] See Appendix A0 for all the calculus on the different Decompositions.

On the contrary, the dismantlement of trade barriers in favour of the EU led to a surge in imports from Europe, culminating in steep rise in Turkey's trade deficit with EU in 1996",

In table 2 the same numbers are presented at NES-2 sector level, where sectors have been ordered according to their increasing capital intensity[6].

The total export growth varies a lot among different sectors going from 0.02 for Motor vehicles and Equipment to 1.29 for Transportation Equipment. Decomposition between intensive and extensive margin gives new insight: while intensive margin seems uncorrelated with the capital intensity, we see that the extensive margin scores high growth rate in sectors that are less capital intensive as Apparel, Textile and leather Products or Furniture and Fixture. This finding on the change of the number of exporters is true also when we control for the total number of firms in each sector. Figure 2 shows for each available year in the dataset (1994-1999) the percentage of firms exporting to Turkey over the total number of active firms in each 2 digit sector. This graphs shows that even if the probability for a French firm to export to Turkey is on average higher when the firm is in a capital intensive sectors (Drugs and Soaps, Chemicals, Electric Components), the 1995-1996 tariffs reduction effected more firms in labour intensive sectors, changing by more their probability to export to Turkey.

What about quantities exported by new entrants? Decomposition 1 indicates the part of total growth rate coming from the change in average exported quantities as opposed to the change in the total number of firms. This decomposition however does not distinguish among the change of quantity derived by firms that were already exporting and quantities from newly entered firm. In particular we would like to know which share of quantities' change comes from entering/ exiting firms and from staying firms.

Decomposition 2 shows how difference in total sales between two years can be divided in two components: one due to "staying" firms and another due to "newly enter minus exit firms".

$$\frac{\Delta Q_t^{STAY}}{\Delta Q_t^{TOTAL}} + \frac{\Delta Q_t^{NET\_ENTRY}}{\Delta Q_t^{TOTAL}} = 1 \qquad \text{(Decomposition 2)}$$

Still this way to decompose combines "net entry extensive margin" (net number of new exporters) with "net entry intensive margin" (how much do newly entered firms export). Decomposition 3 provides to disentangle the last two effects:

[6] Capital Intensity is calculated from NBER-US data. As I will explain in further paragraph this refers to the "optimal capital intensity" of each sector and not to the actual capital intensity in French sectors even if the two measures are highly correlated.

$$\frac{N_{STAY}}{N_{t,TOTAL}}\frac{\Delta\overline{Q}_{t,STAY}}{\overline{\Delta Q}_{t,TOTAL}}+\frac{N_{t,NET\_ENTRY}}{N_{t,TOTAL}}\frac{\overline{Q}_{t,EXIT}}{\overline{\Delta Q}_{t,TOTAL}}+\frac{N_{t,ENTRY}}{N_{t,TOTAL}}\frac{\overline{Q}_{t,NET\_ENTRY}}{\overline{\Delta Q}_{t,TOTAL}}=1$$

(Decomposition 3)

Table 3 reports results for Decomposition 3 for different years while Table 3.bis reports results for Decomposition 3 in level for different years.

The change in total quantities exported between 1995 and 1996 was of 422 million of francs (almost 64 million of euros) which is a huge quantity compared to the change in other years. Almost 90% of this change was induced by change in quantities of firms already exporting to Turkey, while 17% was the quantities exported to Turkey by newly entered firms. Compared with the other years 1996 scores a huge increase of quantities derived by the extensive margin dynamic. The net-entry margin, given by the quantities shipped by the newly entered firms minus the quantities no more shipped by firms which exited the market, accounts for 10% of the total change in exported quantities, that is 42 million francs against 23 millions francs between 1994 and 1995, 21 million francs between 1996 and 1997 and 11 million francs between 1997 and 1999. While the net-entry margin has been negative (-18 million francs) between 1998 and 1999.

Table 4 shows the Decomposition 3 in percentage for the years 1995-1996 at 2digit level sectors. There is no clear pattern among change in quantity by firms that stay or by entry/exit firms and sector capital intensity. In particular net entry average quantities do vary a lot among sectors going from -10 in Paper and Allied Product to 2.46 of Electric and Electronic Equipment. There is instead a clear indication of the relation among the number of net entered firms and capital intensity at sector level, since 4 among the highest values refer to the first 4 sectors in term of less capital intensity. In fact the extensive margin in this table is usual growth rate so it's actually almost the same that the log growth rate showed in Decomposition 1.

Preliminary findings on the relation among extensive margin and capital intensity are supported in decompositions. However it may be that in the different years I am analyzing the productivity of French firms has changed in different sector thus explaining the high degree of entry in exporting market beside the capital intensity of the sector itself. Figure 3A-D shows how total factor productivity distribution[7] and estimated probability to export did change before and after

[7] TFP is calculated according to Olley-Pakes as I will explain in further paragraph

the CU for all the firms in some sectors. The kernel estimation of TFP distribution, which is drawn in the left hand side panel of each graph, shows that TFP for firms did not change very much before and after the formation of the CU. At the same time the estimated probability to export did increase a lot after the 1996 for firms in Apparel, Textile and Leather Products for each level of TFP, as the second panel of the graphs clearly shows. The same is not true for other sectors like Drugs & Cleaners or Electric and Electronic Equipment which are more capital intensive sectors.

How do existent models of trade explain this finding? What else do we know about the reaction of intensive and extensive trade margin to tariffs reduction?

I will start answering the second question. Well we don't know much about it, since there aren't empirical papers that analyze the change on firm level exporting structure of a country after a trade liberalization. The importance of intensive and extensive margin of trade by itself has been instead analyzed in some papers. Eaton, Kortum and Kramarz (2004) for example find that high French market share in a destination reflects 88% more firm selling there and that given the market share of a country, larger sales to a larger market typically reflects 62% more firms selling there. Thus the extensive margin explains more variation than the intensive margin if we consider the trade structure of a country in a period.

The first question is more complicated to be answered. From one hand, in order to have predictions on the intensive and the extensive margin of trade, we need to have a model in which the unit of analysis is the firm. From the other hand since the finding refers to an asymmetric reaction of different sectors, we need to consider a model in which Ricardian or Hecksher-Olhin (HO) comparative advantage have a role.

Even without recurring to a complete model with all the characteristics, we can still give a look to what models at hand would predict after the reduction of tariffs in Turkey. Let's consider Textile and Drugs as the sectors in which France has respectively the lowest and the highest comparative advantage w.r.t. Turkey.

Neoclassical HO would predict that when tariffs are reduced to zero France will export Drugs to Turkey and Turkey would export Textiles to France. In the basic framework there is no mention to tariffs change and no mechanism through which there is intra-industry trade.

The extended Romalis version of the HO, using Krugman monopolistic competition and continuous variable trade costs will obtain intra-industry trade and will predict the following: for Turkey the share of France imported Drugs over total imported Drugs is greater than the share of France imported Textiles over the total imported Textile. This prediction, which Romalis shows to fit very well US data, does not help us in understanding the reaction to tariffs

change, since according to her model it should be true for all level of tariffs. Moreover it does not help us to understand why and how the probability to export for firm should change, since there is no firm level heterogeneity.

The only model that manage to give some predictions is the recent Bernard, Redding, Schott (2006) that incorporated firm level heterogeneity a la' Melitz in a 2 countries, 2 sectors, 2 factor neoclassical HO model. A clear prediction of this model is that a French firm in Drugs sector has more probability to export in Turkey than a French firm in Textile sector for each level of tariffs[8]. However when we turn to ask what happens when tariffs do change, the model does not present a close form solution, since it's a very rich but also a very complicated model.

In paragraph 3 I will present a model which can be directly compared with [BRS]one. In fact the basic framework is similar but I am considering a continuous of sectors to obtain predictions in a continuous space and I am considering a partial equilibrium environment which from one hand allows me to obtain closed form solution of the variables I am interested in and from the other hand makes the model closer to the empirical case under analysis. In particular

- Turkey is the Foreigner country less skilled endowed with respect to Home country which is France ;
- The CU settled between Turkey and EU was mentioned to reduce Turkey's import tariffs, but did not have effects on EU import tariffs from Turkey which were already low. Thus the model abstracts from the effect on tariff reduction on French import market, since there was a unilateral reduction of tariff which had main effects on French exporting and Turkey importing structure;
- Wages are taken as given and I do not allow for change in tariffs to change skill premium in the two countries because I am looking at the SR empirics of this liberalization. Moreover even if there would be effect on Skill Premium rate this would still be different from one since the tariffs are not 0 even after the CU;
- I abstract from entry and exit of firms in domestic market

[8] which is basically what Graph 2 shows in France-Turkey case

3. Model

I consider a partial equilibrium environment in which I combine the heterogeneity of firms, the heterogeneity of sectors with respect to their factor intensity and the heterogeneity of countries with respect to their endowment.

In developing the model I assume that home country is small enough not to affect the Price Index of foreigner country; I abstract from entry and exit of firms because I consider the reduction in tariff in one trade partner an event too small to influence the exit of firms in the home country and because I am looking at the very short run. For the same reasons I also abstract from the effect of tariff reduction on both countries' factor prices[9].

Demand

There are two countries which I indicate with H (home) and F (foreign). Home has a higher fraction of skilled (S) over unskilled (L) workers with respect to the other country: $\left(\frac{S}{L}\right)_H > \left(\frac{S}{L}\right)_F$. These two production factors are supplied inelastically and are mobile inside each country (they are not sector specific) but not between countries, thus respective wages are equalized in each country.

In each country there is a continuum of sectors *i* with $i \in (0,1)$.The index *i* ranks industries by relative factor intensity (S/L). Industries with higher *i* are more skill intensive.

In each industry firms are heterogeneous with respect to their exogenous productivity φ.

All consumers in the two countries are assumed to have identical Cobb Douglas preferences with the fraction of income spent on industry *i* equal to *b(i)* (Equation 1), where the consumption C_i in each industry is a CES function over the continuum varieties of goods ω (Equation 2) and ρ is a function of the elasticity of substitution:

$$U = \int_0^1 b_i \ln C_i d_i \qquad \text{(Equation 1)}$$

$$C_i = \left[\int_0^1 q_i(\omega)^\rho d\omega\right]^{\frac{1}{\rho}} \qquad \text{with } 0<\rho<1 \qquad \text{(Equation 2)}$$

[9] I am working to relax some hypothesis

Demand for a particular variety of each sector is:

$$q^D(i,\omega) = \left(\frac{p(i,\omega)}{P(i)} \right)^{-\sigma} \frac{E(i)}{P(i)} \qquad \text{(Equation 3)}$$

where $E(i)=b(i)Y$ is the fraction of income consumer spends in goods of industry *i* and $\sigma = 1/(1-\rho)$ is the constant elasticity of substitution greater than 1, *P(i)* is the Price Index for sector *i* and $p(i,\omega)$ is the price of good ω in sector *i*.

Price Index is given by

$$P_i = \left[\int_0^{N_i} p(i,\omega)^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}} \qquad \text{(Equation 4)}$$

where *N* is the exogenous number of firms operating in a given sector.

Production

Firms compete in a monopolistic competition environment. The output of each industry consists of a number of varieties that are imperfect substitutes for one another. Each variety is produced by a firm with a productivity level denoted by φ (so from now on I can substitute index ω with index φ in the equations). In each sector and in each country the distribution of firms' productivity is the same. The total cost function for producing in domestic market or in domestic and foreigner country is given by the following

$$TC(i,\varphi) = f_{i,d} + f_{i,x} + \frac{\hat{q}(i,\varphi)}{\varphi} w_S^{\beta_i} w_L^{1-\beta_i} \qquad \text{(Equation 5)}$$

where $\hat{q}(i,\varphi)$ is the supplied quantity, $f_{i,d}$ is the fixed cost the firm pays to sell in the domestic market, $f_{i,x}$ is the fixed cost the firm pays to sell in foreign market, β_i is the skill-factor intensity in the sector and w_S and w_L are skilled and unskilled wage respectively.

Notice that β_i is higher for sectors which use more intensively skill workers, that is for sectors that are ranked with a higher *i*. Thus in country H, where ratio of skilled over unskilled workers is higher than in country F, sectors with higher β_i are sectors which use more intensively the factor in which country H is more endowed. In other words sector at H with higher β_i have a comparative advantage with respect to country F. Thus in the analysis that will follow β_i will be my theoretical measure of comparative advantage.

Finally in this economy there is also variable iceberg cost to export which I will indicate by τ.

From now on we will only consider the export market (the market we are interested in), being the domestic market completely standard. Moreover I will introduce sub-indexes H and F to distinguish between the two countries since we are now in open economy.

Profits in Export Market

Price set by every firm in sector *i* is

$$p(i,\varphi) = \frac{\tau_{i,F} w_{S,H}^{\beta_i} w_{L,H}^{1-\beta_i}}{\rho\varphi} \qquad \text{(Equation 6)}$$

where $\tau_{i,F}$ is tariff that country F imposes on goods in sector *i* coming from country H and is between 1 and 2.

Foreign demand faced by each domestic exporter is given by:

$$q_F(i,\varphi) = \frac{E_{i,F}}{P_{i,F}} \left(\frac{\tau_{i,F} w_{S,H}^{\beta_i} w_{L,H}^{1-\beta_i}}{\rho\varphi P_{i,F}} \right)^{-\sigma} \qquad \text{(Equation 7)}$$

Thus total export-profits[10] are:

$$\pi_x(i,\varphi) = \tau_{i,F}^{1-\sigma} \frac{\left(w_{S,H}^{\beta_i} w_{L,H}^{1-\beta_i} \right)^{1-\sigma}}{\sigma} \frac{E_{i,F}}{(\rho P_{i,F})^{1-\sigma}} \varphi^{\sigma-1} - f_{i,x} \qquad \text{(Equation 8)}$$

[10] Notice that as in standard heterogeneous firm model if a firm export it is also active in the domestic market and its domestic profits are given by Equation 7 with no variable costs and domestic fixed costs. Exporting costs are sunk but we can introduce them each period like a share of the total sunk fixed cost.

Price Index in country F can be written (substituting Equation 6 into Equation 4 for country F and considering the open economy version) as:

$$P_{i,F} = \left[\int_0^{N_{i,F}} \left(\frac{w_{S,F}^{\beta_i} w_{L,F}^{1-\beta_i}}{\rho \varphi_F} \right)^{1-\sigma} d\varphi \right]^{\frac{1}{1-\sigma}} + \left[\int_0^{N_{i,RW}} \left(\frac{w_{S,RW}^{\beta_i} w_{L,RW}^{1-\beta_i}}{\rho \varphi_{RW}} \right)^{1-\sigma} d\varphi \right]^{\frac{1}{1-\sigma}} =$$

$$= w_{S,F}^{\beta_i} w_{L,F}^{1-\beta_i} \left[\int_0^{N_{i,F}} \left(\frac{1}{\rho \varphi_F} \right)^{1-\sigma} d\varphi \right]^{\frac{1}{1-\sigma}} + w_{S,RW}^{\beta_i} w_{L,RW}^{1-\beta_i} \left[\int_0^{N_{i,F}} \left(\frac{1}{\rho \varphi_{RW}} \right)^{1-\sigma} d\varphi \right]^{\frac{1}{1-\sigma}} \quad \text{(Equation 9)}$$

$$= w_{S,F}^{\beta_i} w_{L,F}^{1-\beta_i} Z_{i,F} + w_{S,RW}^{\beta_i} w_{L,RW}^{1-\beta_i} Z_{i,RW}$$

where $Z_{i,F}$ is a positive constant term given by a function of productivity distribution in each sector of country F and $Z_{i,RW}$ is the correspondent for the rest of the world. In open economy the Price Index of country F will depend not only on the goods produced domestically but also on the imported goods. Since country F is facing the trade liberalization I make the hypothesis that the second addend of the Price Index in Equation 9 is negligible, that is I assume that country F Price Index is mainly given from a function of domestically produced goods: $P_{i,F} \cong w_{S,F}^{\beta_i} w_{L,F}^{1-\beta_i} Z_{i,F}$. The only hypothesis we need to carry on our analysis is that the skill-premium incorporated in goods sold in country F (both domestically produced and imported) is higher than the skill-premium incorporated in goods produced in country H. This is the case if domestic firms in country F have much more market share than foreigner importers, which is plausible since tariffs in country F were high before their reduction. The Appendix A3 shows another version of the model in which ricardian comparative advantage is introduced instead of an HO kind. As I will show all the results and intuitions do hold for a Ricardian model, but I prefer to analyze an HO one here since take a Ricardian model to the empirics requires more stringent hypothesis. In particular it is not obvious how to measure a ricardian comparative advantage. In an HO world this task is much easier since comparative advantage follows from factor proportions and industries' factor intensity which instead are measurable. Moreover HO comparative advantage measure could be exogenous with respect to the actual productivity of each sector in each country if we assume that there is an optimal level of factor intensity in each sector as I will discuss in section 4.

Using the new formulation of F Price Index we get the following equation for exporting profits for firms in country H:

$$\pi_x(i,\varphi) = \tau_{i,F}^{1-\sigma}\left[\left(\frac{SP_H}{SP_F}\right)^{1-\sigma}\right]^{\beta_i}\left(\frac{w_{L,H}}{w_{L,F}}\right)^{1-\sigma}\frac{E_{i,F}}{(\rho Z_{i,F})^{1-\sigma}}\varphi^{\sigma-1} - f_{i,x} \qquad \text{(Equation 8.bis)}$$

and

$$r_x(i,\varphi) = \tau_{i,F}^{1-\sigma}\left[\left(\frac{SP_H}{SP_F}\right)^{1-\sigma}\right]^{\beta_i}\left(\frac{w_{L,H}}{w_{L,F}}\right)^{1-\sigma}\frac{E_{i,F}}{(\rho Z_{i,F})^{1-\sigma}}\varphi^{\sigma-1} \qquad \text{(Equation 10)}$$

where SP is the skill premium in each country (that is the skilled wage over the unskilled one) and Equation 10 indicates the revenues of a firm in country H gets from its exporting activity .
A firm will export if and only if its productivity is higher enough to cover fixed and variable exporting costs having profit higher or equal to zero. Simply solving for the productivity Equation 8.bis equal to zero we obtain the exporting threshold:

$$\varphi_{i,x} = \tau_{i,F}\left(\frac{SP_H}{SP_F}\right)^{\beta_i}\left(\frac{w_{L,H}}{w_{L,F}}\right)\frac{1}{\rho Z_{i,F}}\left[\frac{\sigma}{E_{i,F}}f_{i,x}\right]^{\frac{1}{\sigma-1}} \qquad \text{(Equation 11)}$$

so all firms with productivity higher than $\varphi_{i,x}$ will export.

Equation 11 shows how the exporting-threshold varies according to tariffs, comparative advantage and fixed costs to export, given foreign expenditure and productivity distribution in sectors in country F. We can express this result in terms of probability to export. To do this we need to specify a distribution function and express the result in Equation 11 in terms of the mass of firms which, according to the specified distribution, lie to the right of the threshold. Using the standard Pareto distribution function (Equation 12.a) we can write the probability to export for a firm with generic productivity φ as in Equation 12.b

$$\Pr(\varphi) = 1 - \left[\frac{K_{i,H}}{\varphi}\right]^{a_{i,H}} \quad \text{with} \quad \varphi \in \left[k_{i,H}, \infty\right) \qquad \text{(Equation 12.a)}$$

$$\Pr(\varphi > \varphi_{i,x}) = 1 - \left\{1 - \left[\frac{K_{i,H}}{\varphi_{i,x}}\right]^{a_{i,H}}\right\} = \left[\frac{K_{i,H}}{\varphi_{i,x}}\right]^{a_{i,H}} =$$

$$= \tau_{i,F}^{\ -a_{i,H}}\left[\left(\frac{SP_F}{SP_H}\right)^{a_{i,H}}\right]^{\beta_i}\left[\frac{w_{L,F}}{w_{H,F}}\right]^{a_{i,H}}\left[\frac{\sigma f_{i,x}}{E_{i,F}}\right]^{\frac{a_{i,H}}{1-\sigma}}\left[\rho K_{i,H} Z_{i,F}\right]^{a_{i,H}} \qquad \text{(Equation 12.b)}$$

where $K_{i,H}$ and $a_{i,H}$ are parameters of the Pareto distribution function.

Testable Predictions

Equations 10, 11 and 12b express the probability to export and the exported revenues by each firm when it exports. From these equations we can derive predictions to test empirically. Let's analyze first the extensive margin.

Extensive Margin

From Equations 11 and 12.b we know how the extensive margin reacts to changes in tariffs and comparative advantage. With respect to tariffs we find usual results[11]:

$$\frac{\partial \varphi_{i,x}}{\partial \tau_{i,F}} > 0$$
$$\frac{\partial \Pr(\varphi)}{\partial \tau_{i,F}} < 0 \qquad \text{(Equation 13)}$$
$$\varepsilon(\varphi_{i,x}, \tau_{i,F}) = 1$$
$$\varepsilon(\Pr(\varphi), \tau_{i,F}) = -a_{i,H}$$

so when tariffs decrease a firm has more probability to export given its productivity and the comparative advantage of the sector it belongs.

The derivatives of the exporting threshold and of the probability to export with respect to our measure of comparative advantage β_i are:

$$\frac{\partial \varphi_{i,x}}{\partial \beta_i} < 0$$
$$\frac{\partial \Pr(\varphi)}{\partial \beta_i} > 0 \qquad \text{(Equation 14)}$$

where the signs depend on the comparison of skill premium in the two countries. This result means that firms located in country H and in sector which use more intensively skilled workers will export to country F with higher probability given the tariff level for their sector and given their productivity. This result is a kind-of HO result since when we have open economies and barrier to trade every country will export more of its abundant factor.

Finally to know more about the reactivity of sectors with different comparative advantage degree to tariffs change we analyze the cross derivatives and we find that:

[11] see Appendix A1 for calculations of this section.

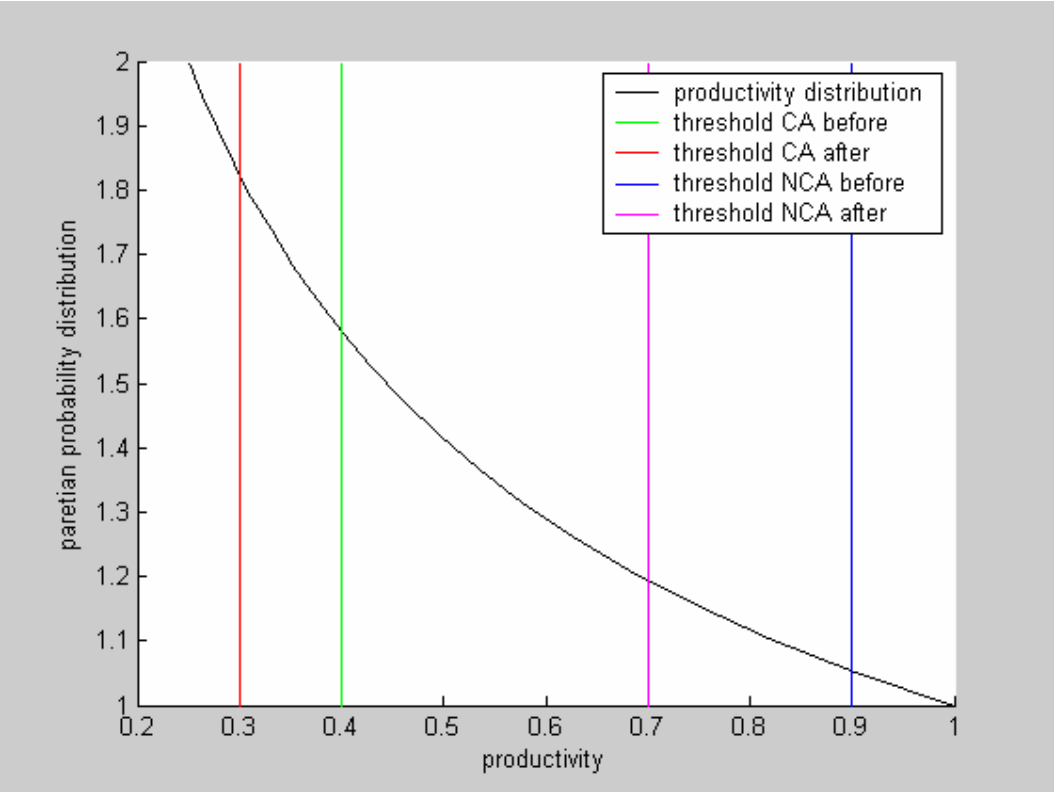
$$\frac{\left|\partial \varphi_{i,x} / \partial \tau_{i,F}\right|}{\partial \beta_i} < 0$$

$$\frac{\left|\partial \Pr(\varphi) / \partial \tau_{i,F}\right|}{\partial \beta_i} > 0$$

(Equation 15)

The two cross derivative tell us to different things: as tariffs decrease the exporting-threshold (first derivative) will move more for firms in comparative disadvantage sector (NCA) (the effect of tariffs on the threshold is higher for lower values of β_i) , but the total probability to export (second derivative), under a Pareto distribution, will be higher for firms in comparative advantage sectors (CA) (the effect of tariffs on the probability to export is higher for higher values of β_i).

Following graph clarifies why it is the case that we have two opposite results in threshold and probability:



The black line is a generic Pareto distribution and the coloured lines indicate the exporting thresholds for CA and NCA sectors, thus the probability to export is the area under the black line that lies on the right of each threshold. A firm in CA sector exports when its productivity is higher than 0.4 when tariffs are high and when its productivity is higher than 0.3 when there is a

drop of tariffs. The same drop of tariffs moves the export threshold from 0.9 to 0.7 for a firm in comparative disadvantage industry. Thus the threshold level changes more for firms in NCA sectors, however, since according to the distribution there is a smaller mass of firms in proximity of high productivity (which generally holds in data) then the increase in mass of exporters between the two level of tariffs is higher for CA sectors.

The result on the probability to export is of course sensitive to the distribution function we choose. If we use a uniform distribution function we get the same result we obtain from the threshold. This analysis clearly indicates that there are two effects at work here: the *threshold effect* which unambiguously indicates that firms in NCA are more reactive when tariffs do change and the *distribution effect* which may be neutral or go in the opposite direction (thus overturning the finding).

This finding is puzzling and completely new in literature. This not only suggests that firm characteristics are important to analyze the consequences of trade liberalization but also that the interaction between firms and sectors characteristics may lead to unexpected results about liberalization gains and losses[12].

The intuition beyond the *threshold effect* result is that for each level of tariffs firms which are in comparative advantage sectors have higher probability to export since foreigner demand for every good in the sector is higher, given the cost advantage in producing the goods Home has. Thus when tariffs decrease, more firms in each sector enters the foreigner market, but this number is higher for comparative disadvantage firms which where very penalized by the presence of high tariffs. The elasticity of the threshold with respect to the tariffs is 1, thus when tariffs decrease by 1% the threshold should decrease by 1%, but since it was already low for CA sector and high for NCA ones, the total effect ends up by being higher for the last ones. Thus starting point is important in determine the magnitude of the reaction of different firms in different sectors to trade liberalization. Models in trade do often proceed by considering a closed economy that suddenly undertakes trade liberalization, thus the effect of trade liberalization is studying by making tariffs go from a prohibitive infinite value (model without tariffs and with closed economy) to a finite value (model with iceberg tariffs between 1 and 2 and open economy). However there are very few cases in real world in which a complete closed economy becomes open in one spot, since in general what happens is that tariffs do decrease gradually. So what we are interested in should rather be the effect on exporting structure when

[12] The model presented in this paper does not allow us to conduct a proper welfare analysis, thus this conclusion should be considered as an indication of the fact that once we allow for sector and firm heterogeneity standard results from literature may be not preserved.

an economy goes from an openness degree to a more openness one, that is what happens with a marginal change in tariffs given that tariffs are already small enough to have an open economy.
A last important observation should be done considering results above. Theoretically threshold and distribution effect under Pareto distribution are opposite, thus which one of the two prevails remain an empirical question. Since threshold effect according to the model is unambiguously negative and distribution effect is most probably positive we have a clear way to interpret empirical results: if the total effect of tariffs on probability to export is higher for comparative disadvantage firms then we can conclude that the threshold effect is negative and that the distribution effect, even if positive, does not overturn the first effect. If the total effect is instead higher for comparative advantage firms then we are not able to know if the threshold effect is empirically negative and the distribution effect is higher in magnitude or if both threshold and distribution effect are positive.

A more formal way to disentangle among the threshold and the distribution effect is the following.
The total number of exporters is given by the area lying below the productivity distribution on the right of the threshold , that is:

$$N = \int_{\varphi_x(\tau)}^{h} \mu(\varphi) d\varphi$$

where $\mu(\varphi)$ is a generic distribution function and the threshold $\varphi_x(\tau)$ is indicated as a function of tariffs and h change according to the distribution function we choose. The underlined hypothesis of the formula above is that the productivity distribution of firms is fixed and does not change with tariffs (which is a good hypothesis looking at our data). Pareto distribution function is given by the following formula and it's defined between $[k, \infty)$

$$Pareto(pdf) = \mu^P(\varphi) = \frac{ak^a}{\varphi^{a+1}}$$

thus h for Pareto is infinity. Thus in this case we could better express N in the following way (where P stays for Pareto):

$$N = \int_k^{\infty} \mu^P(\varphi) d\varphi - \int_k^{\varphi_x(\tau)} \mu^P(\varphi) d\varphi = 1 - \int_k^{\varphi_x(\tau)} \mu^P(\varphi) d\varphi$$

where the first integral sum up to 1 since $\mu(\varphi)$ is a density function.
Using Leibnitz's rule for derivation[13] and we can write:

[13] Which I recall in the Appendix

$$\frac{\partial N}{\partial \tau} = -\left(\mu(\varphi_x)\frac{\partial \varphi_x(\tau)}{\partial \tau} - \varphi_x(\tau)\frac{\partial \mu(\varphi)}{\partial \tau}\Big|_k^{\varphi_x(\tau)} \right) =$$

$$= -\mu(\varphi_x)\frac{\partial \varphi_x(\tau)}{\partial \tau}$$

where the last equality derives from the fact that the productivity distribution is not a function of tariffs and the first term is the generic distribution function evaluated at $\varphi_x(\tau)$. Last formula exactly separates the distribution effect from the threshold one. Let's consider for example a uniform distribution compared with a Pareto one. With the uniform distribution we have that[14]

$$\frac{\partial N}{\partial \tau} = -\frac{1}{b-a}\frac{\partial \varphi_x(\tau)}{\partial \tau}$$

$$\frac{\partial N}{\partial \tau} = -\frac{ak^a}{(\varphi_x)^{a+1}}\frac{\partial \varphi_x(\tau)}{\partial \tau}$$

From equation 13 we know that the threshold effect with respect to tariffs is always positive (if tariffs decreases the threshold decreases also), but now it's clear that the distribution effect has a role when we consider also CA. In fact if we derive last expressions also w.r.t. CA we find:

$$\frac{\left|\partial N/\partial \tau\right|}{\partial CA} = \frac{1}{b-a}\frac{\left|\partial \varphi_x(\tau)/\partial \tau\right|}{\partial CA}$$

(-) (-)

PROB. CONSTANT DISTRIBUTION EFFECT — THRESHOLD EFFECT

$$\frac{\left|\partial N/\partial \tau\right|}{\partial CA} = ak^a\left(\frac{\partial\left[(\varphi_x)^{-(a+1)}\right]}{\partial CA}\frac{\partial \varphi_x(\tau)}{\partial \tau} + \frac{ak^a}{(\varphi_x)^{a+1}}\frac{\left|\partial \varphi_x(\tau)/\partial \tau\right|}{\partial CA} \right)$$

(+) (+) (+) (-)

PROBABILITY — DISTRIBUTION EFFECT — THRESHOLD EFFECT

So even if the combined threshold effect is always negative, when we consider the distribution effect results may be overturned as it is shown for Pareto distribution.

Intensive Margin

[14] Notice that with uniform distribution h=b because the function is defined between a and b, but calculus are the same since the integral over the total support is 1 being a probability function.

Equation 10 shows revenues that an H exporter gets. I will analyze predictions on revenues because this is the value I will use in the dataset to obtain insight on the intensive margin. There are two different concepts of revenues in this economy: revenues given that a firm was already an exporter before CU and total economy revenues considering also the fact that new firms are exporting. We want to find predictions for revenues at firm level and on aggregate economy for different CA sectors when tariffs decrease. Considering Equation 10 we get the following predictions for an already exporting firm:

$$\frac{\partial r_x(i,\varphi)}{\partial \tau_{i,F}} < 0$$
$$\frac{\partial r_x(i,\varphi)}{\partial \beta_i} > 0 \qquad \text{(Equation 16)}$$
$$\frac{\left|\partial r_x(i,\varphi)/\partial \tau_{i,F}\right|}{\partial \beta_i} > 0$$
$$\varepsilon(r_x(i,\varphi),\tau_{i,F}) = 1-\sigma < 0$$

As in Melitz I find that revenues increase with a decrease in tariffs and as a sort of HO result they are higher in comparative advantage sectors given firm productivity level and tariffs. Finally the effect of trade liberalization is higher for CA sector as the elasticity and cross derivative shows. The intuition of this result comes from the Krugman part of the model, that is from the monopolistic competition hypothesis. Demand for goods depends more than proportional from prices (through σ) and price is inversely proportional to productivity and directly proportional to tariffs, thus when price decreases (through a reduction in tariffs) demand increases more than proportional thus inflating revenues. Again since revenues in CA sector were already high their level will increase by more than the respective level of revenues in NCA firms.

Also the model helps as in understanding what happens to total exported revenues for different sectors before and after liberalization. In particular to total revenues exported by country H to country F are the following ones[15] :

[15] Equation 17 indicates both the total exports and the total exports for each sector since sectors are distributed according to a uniform form 0 to 1:

$$R = \int_a^b \int_{\varphi_x(\tau,\beta_i)}^{\infty} r(\varphi,\tau,\beta_i)\mu(\varphi)\frac{1}{b-a}d\varphi di = \int_0^1 \int_{\varphi_x(\tau,\beta_i)}^{\infty} r(\varphi,\tau,\beta_i)\mu(\varphi)\frac{1}{1-0}d\varphi di = \left[i\int_{\varphi_x(\tau,\beta_i)}^{\infty} r(\varphi,\tau,\beta_i)\mu(\varphi)d\varphi \right]_0^1 =$$
$$= \int_{\varphi_x(\tau,\beta_i)}^{\infty} r(\varphi,\tau,\beta_i)\mu(\varphi)d\varphi$$

$$R = \int_{\varphi_x(\tau,\beta_i)}^{\infty} r(\varphi,\tau,\beta_i)\mu(\varphi)d\varphi = \int_{k}^{\infty} r(\varphi,\tau,\beta_i)\mu(\varphi)d\varphi - \int_{k}^{\varphi_x(\tau,\beta_i)} r(\varphi,\tau,\beta_i)\mu(\varphi)d\varphi$$

(Equation 17)

where threshold is a function of tariffs and comparative advantage, the revenues a function of productivity, tariffs and comparative advantage and the distribution function is a function of the productivity. The integral goes from the exporting threshold to infinity because I already specified the Pareto function.

The effect of a change of tariffs on total exports, given comparative advantage is[16]:

$$\frac{\partial R}{\partial \tau} = -r(\varphi_x)\mu(\varphi_x)\left[\frac{\partial \varphi_x}{\partial \tau} - \frac{(\sigma-1)}{\tau}\right] \qquad \text{(Equation 18)}$$

(+) (+)

this derivative exists under a Pareto distribution with $a > (\sigma - 2)$ and is negative whenever the term in brackets is positive which holds if $\varphi_x > (\sigma - 1)$ since $\frac{\partial \varphi_x}{\partial \tau}\tau = \varphi_x$.

Equation 18 can also be expressed in another convenient way:

$$\frac{\partial R}{\partial \tau} = -r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \tau} - \frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi)\Big|_{\varphi_x} \qquad \text{(Equation 18.bis)}$$

(+) (-)

where the first term can be interpreted as the change in total revenues given by the change in threshold of export (how much all the firms above the threshold do export given their revenues where not depending on tariffs) and the second term can be interpreted as the increase in exported revenues induced by the change in tariffs (how much each exporter is increasing its revenues since tariffs decreased). There is a minus between the two terms because there is a sort of over-counting, in fact the first term we consider that all the firm export the same as the marginal firms and only the threshold change while in the second the threshold is fixed and we consider how the revenues of the limit firm will change because of tariffs.

Let's now analyze how total export do depends on comparative advantage index. The derivative of total revenues w.r.t comparative advantage index is[17]:

[16] see the appendix for following calculations
[17] see appendix A1 for calculation of equation 19 and for the condition for which it is greater than 0.

$$\frac{\partial R}{\partial \beta_i} = -r(\varphi_x)\mu(\varphi_x)\left[\frac{\partial \varphi_x}{\partial \beta_i} - (\sigma - 1)n\left(\frac{SP_H}{SP_F}\right)\right] \qquad \text{(Equation 19)}$$

(-) (+) (-)

which exists under a Pareto distribution with $a > (\sigma - 2)$ and is positive whenever $\varphi_x > (\sigma - 1)$. As before Equation 19 can be expressed in another convenient way which is as follows:

$$\frac{\partial R}{\partial \beta_i} = -r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \beta_i} - \mu(\varphi_x)\frac{\partial r(\varphi)}{\partial \beta_i}\bigg|_{\varphi_x}$$

(-) (+)

which can be interpreted as before: the first part is the change in total revenues calculated as the revenues of the marginal firms times the impact of CA on the threshold and the second part is the change derived by the change in the revenues of the marginal firms given the threshold.

4. Data and variables construction.

Data used in this analysis have different sources: data on French firms are taken from INSEE (Institute Nationale de la Statistique et des Etudes Economiques) BRN and DOUANE, data on tariffs come from TRAINS-WTO dataset, finally data from NBER Manufacturing Dataset and Caselli (2003) dataset have been used to build comparative advantage measures.

The first dataset , BRN(Benefice Reels Normaux), contains all accounting variable and total employment information of French firms whose turnover is higher than 3,5 millions of francs (about 530.000 euros) (they are required to compile every year the corresponding declaration), accounting for the 60% of all French firms.

In what follows I describe the variables taken from the BRN dataset.

Employment (L)

It is a full time-equivalent measure that accounts for part-time workers and it refers to the end of the year.

Value added (Y)

It is defined as the difference between production and materials, added to production subsidies minus value added tax and other accrued taxes or credits for production. It is divided by the industry value added price index at the two-digit level of the French industrial classification taken by the national accounts.

Labour cost (w)

It is equal to the total labour compensation costs.

Real capital stock (K)

This is measured as the gross book value of fixed assets including construction and other fixed assets. It is adjusted for inflation assuming all the stock was bought in one time at a date computed as the difference between the considered year and the age of the stock of capital. The age itself is defined as the product of an assumed life time of 16 years and the ration of the net to gross book value ratio.

Total sales (CA) and total sales to export (CAEX)

These are measured as total sales at home and in any other destination reported in the balance sheet of each firm.

The dataset DOUANE provides information about sales and countries to which every firm exports. Firms that in a single year are in BRN but not in DOUANE are considered non-exporters of that year.

I consider all manufacturing firms that appear in both datasets and that have positive value added, number of workers and capital. Moreover I eliminate firms for which the two datasets report different information about their exporting status.

The final dataset I will use contains information for 64.000 to 69.000 firms between 1994 and 1999. The number of firms differs from year to year since some of them exit from the domestic market. Accounting for firms exiting will be important in productivity measures. I will use two measures of exits. The first one is the "accounting measure" according to which I will consider as exited those firms that disappear from the BRN record under the working hypothesis that real entry and exit are well measured by the ones in the dataset. However this measure could over-count the number of exited-firms since firms could have changed their SIREN code following some kind of organization restructuring (mergers, acquisitions and so on). To mitigate it I consider a second measure of firm-exiting merging BRN dataset with the information about illiquidity problems at firm level given in the "Defaillance" dataset. This dataset contains the SIREN code of firms that in a specific year underwent a court process aimed to judge if their illiquidity situation is structural (solvability problems) or not (just illiquidity). Firms with illiquidity situation that disappear after one or two years from the BRN dataset are considered out of the market. Contrary to the previous measure, this one leads to an under-counting of the

real number of firms who exited the market. Some of them in fact could have exited without passing through a judgment about their accounting illiquidity.
Table 5 reports numbers of observations in the dataset, showing the number of operating firms per year, measured number of exited-firms, and the number of firms which are exporting in Turkey in each year.

In the empirical analysis I will use different measures of firm productivity.
First I consider the distance between labour productivity at firm level and average labour productivity at NES3 sector level which consists of 60 sectors. This allows me to check for structural difference in labour productivity among sectors. I turn then to construct more sophisticated and reliable measures of Total Factor Productivity using Olley-Pakes as well as Levinshon-Petrin techniques. Both these measures allow me to obtain TFP's measure as the residual of a regression on labour, capital and other factors controlling for simultaneity and selectivity bias. Simultaneity bias may arise because firms may adjust one production factor (capital) knowing a part of their productivity. Thus Olley-Pakes suggest to use an investment function that links capital stocks to capital flows and to estimate the coefficient of capital with a non-parametric technique. Levinshon-Petrin technique is very similar to the previous one but it consists in using a function for the demand of intermediate factors (material) instead of an investment function, since in firm level datasets many records for investment are zero. Selectivity bias may arise because in this dataset some firms exit and presumably they are the less productive ones. In order to check for this potential bias I will follow Olley and Pakes and I will incorporate an estimate of the survival function in the non parametric second stage. As explained before I will use two different measures of firm-exiting when dealing with the selectivity bias. Table 6 shows some descriptive statistics on constructed variables[18].
The second relevant variable is the comparative advantage index which I will measure considering skill and capital intensity. The skill-comparative-advantage has been calculated considering the following formulation $SCA_{ijk} = S_{i,US}\left(S_j - S_k\right)$ where i are NES60 or NES15 sectors, j refers to France and k refers to Turkey, S refers to skilled workers in different US sectors and to total endowment of skilled workers in the two relevant countries. An analogue measure has been constructed using capital endowment and capital industry intensity instead of skilled workers[19]. These measures of comparative advantage are indeed very close to their HO theoretical definitions. The first part of the formula is, respectively, the skilled and the capital

[18] Correlation among different measures is very high
[19] Measures in the same fashion have been recently used in Cuñat-Melitz (2005), Nunn (2004), Romalis (2004).

intensity at sector level, where US sectors are considered as an optimal benchmark toward which sectors in all countries should converge. The second part is simply the difference in endowment among the countries. Sectors that are more skilled intensive in their productive structure and are located in the country with more endowment of skilled workers will have more comparative advantage. As in Cuñat-Melitz (2005) the measures of US skilled and capital sector intensity have been building using NBER Manufacturing Dataset. Skilled sector intensity is the ratio of non-production over total wages, while capital intensity is given by the logarithm of capital per worker. Measures of total endowments are taken from Caselli (2003): capital abundance is the log of physical capital stock per worker while human skill abundance is calculated as the log average years of schooling in a country with Mincerian non-linear returns to education. However since I am looking only at the relation among two countries the weighting term (the difference among capital and skill endowment in the two countries) does only change the scale of the two CA indexes.

Table 7 shows the measures of the capital and human capital (skills) comparative advantage for 2-digit sector level. French sector with higher level of comparative advantage with respect to Turkish ones are "Drugs, Soap and Cleaners", "Chemicals Products", "Transportation", "Mechanical Equipment" and "Electric and Electronic Components". As expected Turkey has higher comparative advantage in traditional sectors like "Apparel, Textile and Leather Products" and "Textile Mills".

5. The empirical results.

Testable Predictions and results on the extensive margin.

The model provides three testing hypothesis on the extensive margin. The first two predictions, that are robust to firms' productivity distribution, tells that the probability to export increases as tariffs decrease and that it is higher for firms in comparative advantage sectors. The third prediction, the one we are interested in, is on the reactivity of firms to tariffs reduction according to sector they belong to. According to the threshold effect firms in comparative disadvantage sector should be more reactive to a reduction of tariff given their productivity. However this result is sensitive to the distribution of productivity as it was shown. In fact using a Pareto distribution function I found that probability to export is higher for firms in comparative advantage sectors. Theoretically we cannot disentangle between these two effects, while empirically this is possible. Kernel distribution function of firm level productivity shows

that if we cut out very unproductive firms, then Pareto distribution is a good approximation of reality. In particular exporters and firms that could become exporters (with high productivity but not high enough to export) are in the decreasing part of the distribution function. This means that the distributional effect as tariffs decrease is positive for firms in comparative advantage sectors (how already showed). Empirically we will estimate the total effect of CA on tariff reduction, anyway there are a finite number of ways to generate results:

- Threshold effect is positive and distributional effect positive thus total effect is positive
- Threshold effect is negative and distributional effect is positive and bigger in magnitude thus total effect is positive
- Threshold effect is negative and distributional effect is positive and smaller in magnitude thus total effect is negative.

In the first two cases we could not disentangle if theoretical results are correct or not, while in the third goes in the direction theory predicts.

These three predictions will be tested using a probit model and a linear regression one. The basic probit regression I run has the following structure:

$$\Pr\left[\exp\_TURKEY_{i,j,t}\right] = \Phi(\beta_1\varphi_{i,j,t-1} + \beta_2 T_{t,j} + \beta_3 T_{t,j} * CA_j + \beta_5 Z_{i,j,t-1} + \delta_j + \delta_t + \varepsilon_{ijt})$$

(Regression1)

where the dependent variable is a dummy that takes value 1 if a firm is exporting to Turkey in a given year and 0 otherwise, the sub-index i stays for plant, j for industry and t for year. Firm productivity is indicated by φ, T indicates tariffs, CA is the time invariant measure of comparative advantage. Z represents a set of firm level variables which I introduce to perform robustness checks: firm size measured with log of workers, firm capital intensity measured with logarithm of capital stock per year , logarithm of the wages paid by firms and a dummy that indicates if a firm is exporting to other destinations (except Turkey). All firm level variables are introduced with a lag in order to avoid any sort of endogeneity. Finally I introduce sector fixed effects and time fixed effects[20] to control for effects which may be different from CA and from tariffs. In particular using sector level fixed effect allows me to take care of the case in which initial level of Turkey tariffs to French imports were correlated with French sector CA (for example Turkey did impose higher import tariffs to protect some of its sectors) .

[20] I call them fixed effects even if there is the incidental parameter problem.

In all regressions I consider robust confidence intervals and I cluster the observations at sector digit-3 level. Notice that I can't introduce a direct measure of comparative advantage at 3-digit level since regressions display sector fixed effect at the same level of aggregation, so I can't test the magnitude of the effect of my measure of comparative advantage but I can be sure that there is nothing at sector level which has been omitted from the regressions[21]. Table 8 shows results for this first specification using capital comparative advantage measure and considering different measures of productivity[22] as well as all firm-level control variables[23]. All measures of productivity are positive and significant as I was expecting, in fact more productive firms have more probability to export; tariffs instead have a negative impact on this probability, since they increase the cost to sell abroad. The interacted term among tariffs and comparative advantage is positive and lower in magnitude with respect to the coefficient of the tariffs. This means that when CA is high the total effect of tariffs on the probability to export is lower in absolute term, while when CA is low this effect is higher in absolute term. Thus controlling for firm productivity and other firm characteristics we found that firms in comparative disadvantage sectors are more reactive to a tariffs' change, as the model was suggesting. Notice that exporting to other destinations in the previous period is always significant and very high in magnitude, meaning that firms which were already exporting somewhere else find easier to enter in a new market when tariffs' condition allow for it. Finally control variables capital and total cost of labour (wages) are positive and significant suggesting that firms more capital intensive or using more "high wage" workers have more probability to export to Turkey.

Regressions with the pooled probit model confirm the theoretical results, however when we run a probit and we estimate along with the parameters also dummies to account for unobserved effects we may incur in the so-called "incidental parameters problem" which generate bias and inconsistent estimations. This is the case of regressions presented in table 8 since I am controlling for unobserved sector effect (through the sector dummies) and unobserved time effect (through the time dummies). To overcome this problem I run the same regressions using a linear probability model (LPM) with result presented in Table 9. The baseline regressions I am running with the linear probability model is the following

[21] Anyway I have run the same regressions considering the CA measure and omitting the fixed effect. I obtain the same results for the interacted term and I obtain a positive and significant coefficient for the CA measure as was expected.

[22] Labour productivity is the distance of labour productivity at firm level from the average of its NES60 sector of belonging; TFP has been calculated with Olley and Pakes and with Levinshon and Petrin methods. To check for selection bias some measures of TFP have been calculated accounting for exiting firms. Firm has exited from the market according to two different measures which I am referring to with the names "defaillance" and "account".

[23] All regressions without control variables give the same results.

$$\exp\_Turkey_{i,j,t} = \beta_0 + \beta_1 \varphi_{i,j,t-1} + \beta_2 T_{t,j} + \beta_3 T_{t,j} * CA_j + \beta_5 Z_{i,j,t-1} + \delta_j + \delta_t + \varepsilon_{ijt}$$

(Regression 2)

where the variable are the same that in previous specification but the regression model is a linear instead that a probabilistic one.

With LPM the fixed effects can be estimated along with the coefficients without creating any bias or inconsistency. The only caveat of this methodology is that results can be higher than one or smaller than zero even if we are estimating a probability, thus unless explanatory variables are restricted LPM cannot be a good description of the population response probability. Therefore the LPM should be seen as a convenient approximation of the underlying response probability which can be estimated with fixed effect. Table 9 suggests that results with this methodology have the same direction that the ones with pooled probit.

Finally in Table 10 results of linear probability model with firm fixed effects are reported. Introducing firm fixed effects instead of sector ones allows me to control for firm unobserved effects different from firm productivity, capital, size and cost of labour which may correlate with initial level of tariffs. Results do confirm previous findings.

Same set of regressions have been run using skilled (human capital) comparative advantage measure analyzed in section 3. In Table 11 I only report some of the regressions estimated, more precisely the ones using Olley-Pakes TFP measure with both pooled panel model and linear probability model with firm fixed effect. Results are in line with previous findings.

To better assess the magnitude results of the regressions let's consider the estimated probability to enter Turkey market in Table 12. In the first column I report the 25th, 50th and 75th percentile of capital and human capital comparative advantage measure and in the second column I report the relative estimated increase in the probability to export to Turkey[24]. Estimations tell us that after controlling for firm level characteristics and sector and time fixed effects the probability to export to Turkey after the CU[25] increases by 2% for a firm in the first 25th percentile of capital comparative advantage, by 1.30% for a firm with a median capital comparative advantage and by 0.70% for a firm with higher capital comparative advantage. Similar results hold for human comparative advantage where the change in probability to export before and after CU goes from 26% to 21% as we consider firms in the first or in the last 25th human comparative advantage

[24] More precisely I am using estimations from LPM with sector fixed effect, Olley-Pakes TFP and capital comparative advantage and from LPM with firm fixed effect and human capital comparative advantage with measure 2.

[25] More precisely I am considering a reduction of tariffs from 10.42 (before CU average) to its half 5.21.

percentile. The effect in level is very small, but I was expecting it in the sense that I am looking at the change in probability for the marginal firm inside each sector.

Robustness analysis on extensive margin results.

Table 13 and 14 presents some control experiments that I have performed to test the robustness of the results. In particular I have run the same regression for different countries and using the same France-Turkey tariffs. If the effect I am capturing in previous regressions do not really depend on the tariff measure or if tariffs are measuring wrong think, then leaving the LHS of the regressions as before and considering the probability yto export in another country different from Turkey may give us the same results. Table 13 shows results for Morocco while table 14 indicates for different models and different RHS (probability to export to different country or set of countries) if the tariff and interacted tariff are statistically significant (with a V) or not (with a X). Both these tables show that in almost all these control experiments we don't find the same effect we find for Turkey, thus assessing the robustness of previous results.

Results on the intensive margin.

Predictions on the intensive margin of the model are of two types: we have prediction for variation in exported sales for firms that were already exporters before the reduction of tariffs and prediction about sales from firms that enter after the trade liberalization. Firms which were already exporters should have increased their sales and this effect should have been higher for firms in CA sector according to the model.
To explore this issue in the data I run the following regression in difference

$$\Delta Q_{i,j,t} = \beta_0 + \beta_1 \Delta T_{j,t} + \beta_2 \Delta T_{j,t} CA_j + \beta_3 \Delta Z_{i,j,t} + \Delta \varepsilon_{i,j,t} \qquad \text{(Regression 3)}$$

where i is the firm index, j is the sector NES 3 index and t is time, Z contains other level variables of interest like in the previous regressions. Being a regression in difference it does control for sector fixed effect by eliminating them.
Results are in Table 15. In all the three specifications tariffs are significant with the expected negative sign while the interacted term as a positive significant sign which tell that the increase in sales after reduction of tariffs as been higher for firms in NCA sectors. This result is not as we were expecting given the model. It's interesting to notice that sales to all other destinations is positive, significant and very big in magnitude (the R^2 after I introduce this variable jumps from 0.004 to 0.012), so firms that exported by more in other destinations during this period did

also export by more in Turkey. Also productivity measure has a big effect in the expected direction and it looses significance in the second regressions because of the presence of sales to other destinations, since more productive firms are more probable to be exporters.

Finally we can explore empirically how the sales of newly entered firms are related to tariffs and CA. In this case since a firm that begin to export change its sales from 0 to a positive numbers we can't use data at firm level. What I will do is to aggregate total sales in different years and NES 3 sectors for three groups of firms using three different dependent variables. In the first case the dependent variable is the sector-year difference in sales to Turkey for all firms; in the second case I will consider only firms that have been continuously exporting to Turkey and aggregate their sales at sector-year level; finally I will consider those firms which did exported only for some periods, that is firms which either did enter the market or did exit it.
Regressions in Table 16 are the following:

$$\begin{aligned}
\Delta AQ_{j,t}^{TOTAL} &= \beta_0 + \beta_1 \Delta T_{j,t} + \beta_2 \Delta T_{j,t} CA_j + \beta_3 \Delta Z_{j,t} + \Delta \varepsilon_{j,t} \\
\Delta AQ_{j,t}^{STAY} &= \beta_0 + \beta_1 \Delta T_{j,t} + \beta_2 \Delta T_{j,t} CA_j + \beta_3 \Delta Z_{j,t} + \Delta \varepsilon_{j,t} \qquad \text{(Regression 4)} \\
\Delta AQ_{j,t}^{NET_ENTRY} &= \beta_0 + \beta_1 \Delta T_{j,t} + \beta_2 \Delta T_{j,t} CA_j + \beta_3 \Delta Z_{j,t} + \Delta \varepsilon_{j,t}
\end{aligned}$$

where all variables at firm level are now aggregated at sector level. In particular the third regression does refer to the quantities coming from the net entry[26]. Predictions from theory on the net entry are mixed: a greater number of firms should enter in the NCA sectors after the liberalization but each of them should export less than newly entered firms in CA sectors. In this case we have a sort of intensive vs. extensive margin prediction regarding firms which do not export continuously. Finally each of this regression is controlled for average sector level of productivity, capital, size and paid wages to be sure that our tariff variable does not capture other variables that vary at sector and time level. As usual the direct measure of CA is not introduced because it is time invariant and difference regressions do control for all kind of sector specific time invariant characteristics (including CA).
Table 16 show the results for this set of regressions. In panel A total change in sales is explained by tariffs in the expected direction and by the interaction term which indicate that the change was higher for NCA sectors. Notably average sector TFP indicates that sales did increase in less

[26] Notice that the concept of net entry can't be defined at firm level because a firm either enters or exits (or nor entries nor exits), only aggregating all the firms by sector we can consider the sector level net entry.

productive sectors. When we turn to explore the aggregate sales for the group of firms which continuously exported we find that tariffs have the expected signs but they are no more significantly different from zero except for the specification with other sector characteristics. The total effect in panel A seems to be related to results in panel C where I am considering only the net entry by sector and time. Here again the result is that even if tariffs effect negatively the net entry, the effect is stronger for NCA sectors.

6. Conclusions.

In this paper I analyze both theoretically and empirically how the extensive margin (i.e. the probability to export) and the intensive margin (the exported quantities by firm) are affected by a reduction of tariffs for heterogeneous firms in sectors with different endowment-based comparative advantage.

According to the model more productive firms have higher probability to export, firms with the same productivity will have higher probability to export if tariffs are lower and/or if they belong to a sector with higher comparative advantage with respect to the foreign country. These first findings are respectively in line with standard firms' heterogeneous models and with standard Heckscher-Ohlin comparative advantage model. A new result suggests that there is a non-linear effect of tariffs reduction on different sectors. In particular exporting threshold moves more for firms in comparative disadvantage sectors. When we turn to analyze the probability to export, however, we need to consider firms' productivity distribution and depending on the selected distribution the last result can be overturned. The question is mainly empiric. Prediction on intensive margin at firm level suggests that CA firms should increase by more their export after tariff reduction.

In the empirical part I looked at French firms' probability to export to Turkey after Turkey entrance in European Customs Union.

As regards the extensive margin different regression models suggest that after the setting of the CU the probability to export has been higher for firms in comparative disadvantage sectors even controlling for firms characteristics, sector and time fixed effects. This means that empirically the threshold effect is stronger for NCA sector. Predictions on the intensive margin are not found in data, since again the exported sales do increase by more for firms in comparative disadvantage sectors.

Results of this paper suggest first that heterogeneity in sectors, associated to heterogeneity in firms characteristics (mainly productivity) are both important in assessing the consequences of tariffs reduction. Secondly theoretical and empirical results challenge the standard view on the

way comparative advantage sectors react to falling in trade costs since less comparative advantage sector do react more to change in tariffs.

This paper could be improved and extended in many directions. First, a broader experiment using change in import tariffs from many countries may be helpful to generalize this new finding. Second, from a theoretical point of view the analysis suggests that interacting heterogeneity in firms and heterogeneity in sectors, not only with respect to Hecksher-Ohlin comparative advantage status, is a fruitful area for future research.

References

Arnold, J.M. (2005). "Productivity Estimation at the Plant Level: A Practical Guide", *working paper mimeo*.

Baldwin, R. (2005). "Heterogeneous Firms and Trade: Testable and Untestable Properties of the Melitz Model", *NBER Working Paper* 11471.

Bernard, A.B., Jensen, J.B. and P.K. Schott (2003). "Falling Trade Costs, Heterogeneous Firms and Industry Dynamics", *NBER Working Paper* 9639.

Bernard, A.B., Redding, S. and P.K. Schott (2004). "Comparative Advantage and Heterogeneous Firms", *NBER Working Paper* W 10668.

Bustos, P. (2005). "Impact of Trade on Technology and Skill Upgrading: Evidence from Argentina", *working paper mimeo*.

Caselli, F. (2003). "Accounting for Cross-Country Income Differences", *Handbook of Economic Growth,* forthcoming.

Dornbush, R., Fischer, S. and P.A. Samuelson (1980). "Heckscher-Ohlin Trade Theory with Continuum of Goods", *Quarterly Journal of Economics*, 1980(2), 203-224.

Epifani, P. (2003). "Trade Liberalization, Firm Performance and Labor Market Outcomes in the Developing World: What Can We Learn from Micro-Level Data?", *World Bank Paper series.*

Erdogdu Erkan (2002) "Turkey and Europe: Undivided but Not United", *Middle East Review of International Affairs*, Vol. 6, N. 2.

Felbermayr and Kohler (2006), *Review of World Economics*, Vol. 142 (4).

Helpman, E., Melitz, M.J. and S.R. Yeaple (2004). "Export Versus FDI with Heterogeneous Firms", *American Economic Review*, 94(1), 300-316.

Helpman, E. and P.R. Krugman (1985). "*Market Structure and Foreign Trade*", MIT Press. Cambridge MA.

Levinsohn J. and A. Petrin (2003). " Estimating Production Functions Using Inputs to Control for Unobservables", *Review of Economic Studies* 70, 317-342

Melitz, M.J. (2003). "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica*, Vol. 71, November 2003, pp. 1695-1725.

Melitz, M.J. and A. Cuñat (2005). "Labour Market Flexibility and Comparative Advantage", *working paper, mimeo.*

Olley S. and A. Pakes (1996). "The Dynamics of Productivity in the Telecommunications Equipment Industry", *Econometrica* 64, 1263-1297

Pavcnik, N. (2002). "Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants", *Review of Economic Studies* 69, 245-276.

Romalis,J. (2004). "Factor Proportions and the Structure of Commodity Trade", *American Economic Review*, 94(1), 67-97.

Schor, A. (2004). "Heterogeneous Productivity Response to Tariff Reduction: Evidence from Brazilian Manufacturing Firms", *NBER Working Paper* W 10544.

Togan, S. (1995). "Trade Policy Review of the Republic of Turkey", in S. Arndt and C. Milner (eds), *The World Economy Global Trade Policy*, Blackwell, Oxford.

Togan,S. (1997). "Opening up the Turkish Economy in the Context of the Customs Union with the EU", *Journal of Economic Integration*, 12, 157-159.

Trefler, D. (2001). "The Long and Short of the Canada-US Free Trade Agreement", *NBER Working Paper* W 8293.

Tybout, J.R.(2001). "Plant and Firm-Level Evidence on 'New' Trade Theories", *NBER Working Paper* W 8418.

Ulgen, S. and Y. Zahariadis (2004), "The Future of Turkish-EU Trade Relations: Deepening vs Widening", *EU-Turkey Working Papers, No5, Centre for European Policy Studies*.

APPENDIX A: formulas

Appendix A0

Decomposition 1 aggregate

$$\ln\left(\frac{\sum_i Q_{it}}{\sum_i Q_{it-1}}\right) = \ln\left(\frac{\frac{\sum_i Q_{it}}{\sum_i N_{it}} * \sum_i N_{it}}{\frac{\sum_i Q_{it-1}}{\sum_i N_{it-1}} * \sum_i N_{it-1}}\right) = \ln\left(\frac{\overline{Q}_t * N_t}{\overline{Q}_{t-1} * N_{t-1}}\right) = \ln\left(\frac{\overline{Q_t}}{\overline{Q_{t-1}}}\right) + \ln\left(\frac{N_t}{N_{t-1}}\right)$$

Decomposition 1 at sector level

$$\ln\left(\frac{\sum_{i\in s} Q_{it}}{\sum_{i\in s} Q_{it-1}}\right) = \ln\left(\frac{\frac{\sum_{i\in s} Q_{it}}{\sum_{i\in s} N_{it}} * \sum_{i\in s} N_{it}}{\frac{\sum_{i\in s} Q_{it-1}}{\sum_{i\in s} N_{it-1}} * \sum_{i\in s} N_{it-1}}\right) = \ln\left(\frac{\overline{Q}_{st} * N_{st}}{\overline{Q}_{st-1} * N_{st-1}}\right) = \ln\left(\frac{\overline{Q_{st}}}{\overline{Q_{st-1}}}\right) + \ln\left(\frac{N_{st}}{N_{st-1}}\right)$$

Decomposition 2

$$Q_{t-1}^{TOTAL} = \sum_{i\in STAY} Q_{t-1,i} + \sum_{i\in EXIT} Q_{t-1,i}$$

$$Q_t^{TOTAL} = \sum_{i\in STAY} Q_{t,i} + \sum_{i\in ENTRY} Q_{t,i}$$

$$Q_t^{TOTAL} - Q_{t-1}^{TOTAL} = \sum_{i\in STAY} Q_{t,i} + \sum_{i\in ENTRY} Q_{t,i} - \sum_{i\in STAY} Q_{t-1,i} - \sum_{i\in EXIT} Q_{t-1,i}$$

$$\Delta Q_t^{TOTAL} = N_{t,STAY}\overline{Q}_{t,STAY} + N_{t,ENTRY}\overline{Q}_{t,ENTRY} - N_{t-1,STAY}\overline{Q}_{t-1,STAY} - N_{t,EXIT}\overline{Q}_{t,EXIT} \qquad \text{(A0)}$$

$$= N_{STAY}\,(\overline{Q}_{t,STAY} - \overline{Q}_{t-1,STAY}) + N_{t,ENTRY}\,\overline{Q}_{t,ENTRY} - N_{t,EXIT}\,\overline{Q}_{t,EXIT}$$

$$= \Delta Q_{t,STAY} + \Delta Q_{t,NET\_ENTRY}$$

Decomposition 3

To distinguish among net entry number of firms and net entry quantities we can write (A0) in a more convenient way:

$$N_{t,TOTAL}\overline{\Delta Q}_{t,TOTAL} = N_{STAY}(\overline{Q}_{t,STAY} - \overline{Q}_{t-1,STAY}) + N_{t,NET\_ENTRY}\overline{Q}_{t,EXIT} + N_{t,ENTRY}\overline{Q}_{t,NET\_ENTRY}$$

where

$$N_{t,NET\_ENTRY}\overline{Q}_{t,EXIT} + N_{t,ENTRY}\overline{Q}_{t,NET\_ENTRY} = N_{t,ENTRY}\overline{Q}_{t,ENTRY} - N_{t,EXIT}\overline{Q}_{t,EXIT}$$

and then by dividing everything by LHS we obtain:

$$\frac{N_{STAY}}{N_{t,TOTAL}}\frac{\Delta\overline{Q}_{t,STAY}}{\overline{\Delta Q}_{t,TOTAL}} + \frac{N_{t,NET\_ENTRY}}{N_{t,TOTAL}}\frac{\overline{Q}_{t,EXIT}}{\overline{\Delta Q}_{t,TOTAL}} + \frac{N_{t,ENTRY}}{N_{t,TOTAL}}\frac{\overline{Q}_{t,NET\_ENTRY}}{\overline{\Delta Q}_{t,TOTAL}} = 1$$

where

$$\overline{\Delta Q}_{t,TOTAL} = \frac{\Delta Q_{t,TOTAL}}{N_{t,TOTAL}}$$

represents the change in average quantities evaluated at the number of firms in period t.

Appendix A1: model

Equations from 13 to 15: threshold and probability

$$\frac{\partial\varphi_{i,x}}{\partial\tau_{i,F}} = \left(\frac{SP_H}{SP_F}\right)^{\beta_i}\frac{w_{LH}}{w_{LF}}\frac{1}{\rho Z_{i,F}}\left[\frac{\sigma f_{i,x}}{E_{i,F}}\right]^{\frac{1}{\sigma-1}} = \frac{\varphi_{i,x}}{\tau_{i,F}} > 0$$

$$\frac{\partial \varphi_{i,x}}{\partial \beta_i} = \tau_{i,F} \frac{w_{LH}}{w_{LF}} \frac{1}{\rho Z_{i,F}} \left[\frac{\sigma f_{i,x}}{E_{i,F}} \right]^{\frac{1}{\sigma-1}} \frac{\partial \left(\frac{SP_H}{SP_F} \right)^{\beta_i}}{\partial \beta_i} =$$

$$= \tau_{i,F} \frac{w_{LH}}{w_{LF}} \frac{1}{\rho Z_{i,F}} \left[\frac{\sigma f_{i,x}}{E_{i,F}} \right]^{\frac{1}{\sigma-1}} \left(\frac{SP_H}{SP_F} \right)^{\beta_i} \ln\left(\frac{SP_H}{SP_F} \right) = \varphi_{i,x} \ln\left(\frac{SP_H}{SP_F} \right) < 0$$

(I used the derivation rule $\frac{\partial b^x}{\partial x} = b^x \ln b$)

which holds given that Skill Premium is lower in country H, then the log of a number between 0 and 1 which is negative. Country H, in fact, has more skilled workers and country F has more unskilled workers. Since there is full employment and since we empirically observe that the two countries produce in all sectors, it must be that country H uses skill labour more intensively than unskilled labour in all sectors. Differentiating total costs with respect to factor prices we have that in order for H to use a higher ratio of skilled over unskilled workers in all sectors it must be that relative skilled over unskilled factor prices is lower in H than in F. In other words, given the hypothesis we have in this economy we can state that since $\left(\frac{S}{L} \right)_H > \left(\frac{S}{L} \right)_F$ then $\frac{w_{S,H}}{w_{L,H}} < \frac{w_{S,F}}{w_{L,F}}$. Thus $\frac{\partial \varphi_{i,x}}{\partial \beta_i}$ is negative.

The cross derivative is simply:

$$\frac{\left| \partial \varphi_{i,x} / \partial \tau_{i,F} \right|}{\partial \beta_i} = \frac{w_{LH}}{w_{LF}} \frac{1}{\rho Z_{i,F}} \left[\frac{\sigma f_{i,x}}{E_{i,F}} \right]^{\frac{1}{\sigma-1}} \left(\frac{SP_H}{SP_F} \right)^{\beta_i} \ln\left(\frac{SP_H}{SP_F} \right) = \frac{\varphi_{i,x}}{\tau_{i,F}} \ln\left(\frac{SP_H}{SP_F} \right) < 0$$

Equation 16: firm level revenue

$$\frac{\partial r_x(i,\varphi)}{\partial \tau} = (1-\sigma)\tau_{i,F}^{-\sigma} \left[\left(\frac{SP_H}{SP_F} \right)^{1-\sigma} \right]^{\beta_i} \left(\frac{w_{L,H}}{w_{L,F}} \right)^{1-\sigma} \frac{E_{i,F}}{(\rho Z_{i,F})^{1-\sigma}} \varphi^{\sigma-1} = r_x(i,\varphi)(1-\sigma)\tau_{i,F}^{-1} < 0$$

$$\frac{\partial r_x(i,\varphi)}{\partial \beta_i} = \left[(1-\sigma)\ln\left(\frac{SP_H}{SP_F}\right)\right]\left[\left(\frac{SP_H}{SP_F}\right)^{1-\sigma}\right]^{\beta_i} \tau_{i,F}^{1-\sigma} \frac{E_{i,F}}{(\rho Z_{i,F})^{1-\sigma}} \varphi^{\sigma-1}\left(\frac{w_{L,H}}{w_{L,F}}\right)^{1-\sigma} = r_x(i,\varphi)(1-\sigma)\ln\left(\frac{SP_H}{SP_F}\right) > 0$$

since the ratio of skill premium is lower than 1.

$$\frac{\left|\partial r_x(i,\varphi)/\partial \tau_{i,F}\right|}{\partial \beta_i} = (\sigma-1)\tau_{i,F}^{-\sigma}\left[(1-\sigma)\ln\left(\frac{SP_H}{SP_F}\right)\right]\left[\left(\frac{SP_H}{SP_F}\right)^{1-\sigma}\right]^{\beta_i} \frac{E_{i,F}}{(\rho Z_{i,F})^{1-\sigma}} \varphi^{\sigma-1}\left(\frac{w_{L,H}}{w_{L,F}}\right)^{1-\sigma} =$$

$$= r_x(i,\varphi)\frac{(1-\sigma)(\sigma-1)}{\tau_{i,F}}\ln\left(\frac{SP_H}{SP_F}\right) > 0$$

Equations from 18 to 20: aggregate revenue

Following derivatives are obtained using the Leibnitz rule, which I recall here

LEIBNITZ'S RULE

$$\frac{d}{d\theta}\int_{a(\theta)}^{b(\theta)} f(x,\theta)dx = f(b(\theta),\theta)\frac{d}{d\theta}b(\theta) - f(a(\theta),\theta)\frac{d}{d\theta}a(\theta) + \int_{a(\theta)}^{b(\theta)}\frac{\partial}{\partial\theta}f(x,\theta)dx$$

where all the terms are differentiable with respect to theta and b and a are finite

In my application I will have

$a(\theta) = k$

$b(\theta) = \varphi_x(\tau,\beta_i)$

$f(x,\theta) = r(\varphi,\tau,\beta_i)\mu(\varphi)$

$x = \varphi$

$\theta = \tau; \theta = \beta_i$

Total Revenues in equation 17 are

$$R = \int_{\varphi_x(\tau,\beta_i)}^{\infty} r(\varphi,\tau,\beta_i)\mu(\varphi)d\varphi = \int_k^{\infty} r(\varphi,\tau,\beta_i)\mu(\varphi)d\varphi - \int_k^{\varphi_x(\tau,\beta_i)} r(\varphi,\tau,\beta_i)\mu(\varphi)d\varphi$$

Derivative with respect to tariffs

$$\frac{\partial R}{\partial \tau} \overset{1}{=} \left[\left(\frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi) + r(\varphi)\frac{\partial \mu(\varphi)}{\partial \tau}\right)\Big|_k^{\infty}\right] - \left\{r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \tau} + \left[\left(\frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi) + r(\varphi)\frac{\partial \mu(\varphi)}{\partial \tau}\right)\Big|_k^{\varphi_x}\right]\right\} =$$

$$= \left[\left(\frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi) + 0\right)\Big|_k^{\infty}\right] - \left\{r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \tau} + \left[\left(\frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi) + 0\right)\Big|_k^{\varphi_x}\right]\right\}$$

$$\overset{2}{=} \frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi)\Big|_{\infty} - \frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi)\Big|_k - r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \tau} - \left[\frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi)\Big|_{\varphi_x} - \frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi)\Big|_k\right] =$$

$$\overset{3}{=} \frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi)\Big|_{\infty} - r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \tau} - \frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi)\Big|_{\varphi_x} =$$

$$\overset{4}{=} 0 - r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \tau} - r(\varphi_x)(1-\sigma)\tau^{-1}\mu(\varphi_x) =$$

$$\overset{5}{=} -r(\varphi_x)\mu(\varphi_x)\left[\frac{\partial \varphi_x}{\partial \tau} - \frac{(\sigma-1)}{\tau}\right]$$

where equality number 2 derives from the hypothesis that the distribution is not a function of tariffs, equality number 3 derives from the fact that $\frac{\partial r(\varphi)}{\partial \tau}\mu(\varphi)\Big|_{\infty} = f(\varphi^{\sigma-a-2})\Big|_{\infty}$ and this is 0 as long as $a > \sigma - 2$.

The expression is negative when the term in brackets is positive. This is the case when

$$\frac{\partial \varphi_x}{\partial \tau} - \frac{\sigma-1}{\tau} > 0 \Rightarrow \frac{\partial \varphi_x}{\partial \tau}\tau > (\sigma-1) \Rightarrow \varphi_x > (\sigma-1)$$

Derivative with respect to CA index.

$$\frac{\partial R}{\partial \beta_i} \overset{1}{=} \left(\frac{\partial r(\varphi)}{\partial \beta_i} \mu(\varphi) + r(\varphi) \frac{\partial \mu(\varphi)}{\partial \beta_i} \right)\Bigg|_k^{\infty} - r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \beta_i} - \left[\left(\frac{\partial r(\varphi)}{\partial \beta_i} \mu(\varphi) + r(\varphi) \frac{\partial \mu(\varphi)}{\partial \beta_i} \right)\Bigg|_k^{\varphi_x} \right] =$$

$$\overset{2}{=} \left(\frac{\partial r(\varphi)}{\partial \beta_i} \mu(\varphi) \right)\Bigg|_{\infty} - \left(\frac{\partial r(\varphi)}{\partial \beta_i} \mu(\varphi) \right)\Bigg|_k - r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \beta_i} - \left[\frac{\partial r(\varphi)}{\partial \beta_i} \mu(\varphi)\Big|_{\varphi_x} - \frac{\partial r(\varphi)}{\partial \beta_i} \mu(\varphi)\Big|_k \right] =$$

$$\overset{3}{=} - r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \beta_i} - \left[\frac{\partial r(\varphi)}{\partial \beta_i} \mu(\varphi)\Big|_{\varphi_x} \right] =$$

$$\overset{4}{=} \frac{\partial R}{\partial \beta_i} = -r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \beta_i} - \mu(\varphi_x)\frac{\partial r(\varphi)}{\partial \beta_i}\Bigg|_{\varphi_x} =$$

$$\overset{5}{=} - r(\varphi_x)\mu(\varphi_x)\frac{\partial \varphi_x}{\partial \beta_i} + \mu(\varphi_x)r(\varphi_x)(\sigma - 1)\ln\left(\frac{SP_H}{SP_F}\right)$$

$$\frac{\partial R}{\partial \beta_i} = -r(\varphi_x)\mu(\varphi_x)\left[\frac{\partial \varphi_x}{\partial \beta_i} - (\sigma - 1)\ln\left(\frac{SP_H}{SP_F}\right) \right]$$

(-) (+) (-)

where equality number 2 derives from the hypothesis that the distribution is not a function of tariffs, equality number 3 derives from the fact that $\frac{\partial r(\varphi)}{\partial \beta_i} \mu(\varphi)\Big|_{\infty} = f(\varphi^{\sigma - a - 2})\Big|_{\infty}$ and this is 0 as long as $a > \sigma - 2$.

This derivative is positive whenever the terms in brackets is negative that is when

$$\frac{\partial \varphi_x}{\partial \beta_i} - (\sigma - 1)\ln\left(\frac{SP_H}{SP_F}\right) < 0 \Rightarrow \varphi_x \ln\left(\frac{SP_H}{SP_F}\right) - (\sigma - 1)\ln\left(\frac{SP_H}{SP_F}\right) < 0 \Rightarrow$$

$$\Rightarrow \ln\left(\frac{SP_H}{SP_F}\right)\left[\varphi_x - (\sigma - 1)\right] < 0 \Rightarrow \left[\varphi_x - (\sigma - 1)\right] > 0 \Rightarrow \varphi_x > \sigma - 1$$

Appendix A2: Ricardian-kind model

Consider the same economics structure as the basic model presented in the paper. The basic hypothesis are:

- Two symmetric countries H and L except for the productivity of their sectors;
- One immobile factor of production that all sectors use with a constant share and that is the same in the two countries ;
- Continuity of sectors whose differ for an exogenous productivity c_i where $c_i < c_j$ whenever sector *i* is more productive than sector *j*
- No firms' entry and exit;
- Foreign Price Index is given;
- Monopolistic competition;
- Love of variety demand structure;

Demand structure is as in the model presented before. However the structure of total costs for firms has now changed

$$TC(i,\varphi) = f_{i,d} + f_{i,x} + \frac{\hat{q}(i,\varphi)}{\varphi} c_{i,H} \qquad \text{(Equation A2.1)}$$

giving following prices

$$p(i,\varphi) = \frac{\tau_{i,F} c_{i,H}}{\rho\varphi} \qquad \text{(Equation A2.2)}$$

and the foreigner demand will be:

$$q_F(i,\varphi) = \frac{E_{i,F}}{P_{i,F}} \left(\frac{\tau_{i,F} c_{i,H}}{\rho\varphi P_{i,F}} \right)^{-\sigma} \qquad \text{(Equation A2.3)}$$

Thus exporting profits for firms will be as follows

$$\pi_x(i,\varphi) = \tau_{i,F}^{1-\sigma} \frac{\left(c_{i,H}\right)^{1-\sigma}}{\sigma} \frac{E_{i,F}}{(\rho P_{i,F})^{1-\sigma}} \varphi^{\sigma-1} - f_{i,x} \qquad \text{(Equation A2.4)}$$

and the productivity threshold to export is as usual obtained putting previous profits equal to zero:

$$\varphi_{x,i} = \left[\tau_{i,F}^{\sigma-1} \left(c_{i,H}\right)^{\sigma-1} (\rho P_{i,F})^{1-\sigma} \frac{\sigma}{E_{i,F}} f_{i,x} \right]^{\frac{1}{\sigma-1}} = \tau_{i,F} \frac{c_{i,H}}{\rho P_{i,F}} \left[\frac{\sigma}{E_{i,F}} f_{i,x} \right]^{\frac{1}{\sigma-1}} \quad \text{(Equation A2.5)}$$

The relative probability to export associated to a paretian productivity distribution is the following:

$$\Pr(\varphi > \varphi_{x,i}) = \left[\frac{K_{i,H}}{\varphi_{x,i}} \right]^{a_{i,H}} = (\tau_{i,F} c_{i,H})^{-a_{i,H}} \left[\frac{\sigma f_{i,x}}{E_{i,F}} \right]^{\frac{a_{i,H}}{1-\sigma}} \left[\rho K_{i,H} P_{i,F} \right]^{a_{i,H}} \quad \text{(Equation A2.6)}$$

The productivity exporting threshold increases with tariffs and decrease in the exogenous sector productivity, finally the effect of tariffs reduction is higher for sector with higher exogenous costs (as in the model in the paper this effect depends on the fact that the same percentage reduction is applied to starting different levels as the elasticity reveals)

$$\frac{\partial \varphi_{i,x}}{\partial \tau_{i,F}} = \frac{c_{i,H}}{\rho P_{i,F}} \left[\frac{\sigma}{E_{i,F}} f_{i,x} \right]^{\frac{1}{\sigma-1}} > 0$$

$$\frac{\partial \varphi_{i,x}}{\partial c_{i,H}} = \frac{\tau_{i,F}}{\rho P_{i,F}} \left[\frac{\sigma}{E_{i,F}} f_{i,x} \right]^{\frac{1}{\sigma-1}} > 0$$

$$\frac{\left| \partial \varphi_{i,x} / \partial \tau_{i,F} \right|}{\partial c_{i,H}} = \frac{1}{\rho P_{i,F}} \left[\frac{\sigma}{E_{i,F}} f_{i,x} \right]^{\frac{1}{\sigma-1}} > 0$$

and

$$\varepsilon_{\varphi_{i,x},\tau_{i,F}} = \varepsilon_{\varphi_{i,x},c_{i,H}} = 1$$

While considering the probability to export we find the following derivatives:

$$\frac{\partial \Pr ob(\varphi > \varphi_{i,x})}{\partial \tau_{i,F}} = -a_{i,H} (\tau_{i,F})^{-a_{i,H}-1} c_{i,H})^{-a_{i,H}} \left[\frac{\sigma f_{i,x}}{E_{i,F}} \right]^{\frac{a_{i,H}}{1-\sigma}} \left[\rho K_{i,H} P_{i,F} \right]^{a_{i,H}} < 0$$

$$\frac{\partial \Pr ob(\varphi > \varphi_{i,x})}{\partial c_{i,H}} = -a_{i,H} (c_{i,H})^{-a_{i,H}-1} (\tau_{i,F})^{-a_{i,H}} \left[\frac{\sigma f_{i,x}}{E_{i,F}} \right]^{\frac{a_{i,H}}{1-\sigma}} \left[\rho K_{i,H} P_{i,F} \right]^{a_{i,H}} < 0$$

$$\frac{\left| \partial \Pr ob(\varphi > \varphi_{i,x}) / \partial \tau_{i,F} \right|}{\partial c_{i,H}} = -a_{i,H}^2 (\tau_{i,F})^{-a_{i,H}-1} (c_{i,H})^{-a_{i,H}-1} \left[\frac{\sigma f_{i,x}}{E_{i,F}} \right]^{\frac{a_{i,H}}{1-\sigma}} \left[\rho K_{i,H} P_{i,F} \right]^{a_{i,H}} < 0$$

and the relative elasticities are now

$$\varepsilon_{prob(\varphi>\varphi_{i,x}),\tau_{i,F}} = \varepsilon_{\Pr ob(\varphi>\varphi_{i,x}),c_{i,H}} = -a_i .$$

Finally the exported revenues are given by the profit formulation before subtracting the export fixed costs and the relative derivatives are as following:

$$\frac{\partial r_x(i,\varphi)}{\partial \tau_{i,F}} = (1-\sigma)(\tau_{i,F})^{-\sigma} \frac{(c_{i,H})^{1.\sigma}}{\sigma} \frac{E_{i,F}}{(\rho P_{i,F})^{1-\sigma}} \varphi^{\sigma-1} < 0$$

$$\frac{\partial r_x(i,\varphi)}{\partial c_{i,H}} = (1-\sigma)(c_{i,H})^{-\sigma} \frac{(\tau_{i,F})^{1.\sigma}}{\sigma} \frac{E_{i,F}}{(\rho P_{i,F})^{1-\sigma}} \varphi^{\sigma-1} < 0$$

$$\frac{\left|\partial r_x(i,\varphi)/\partial \tau_{i,F}\right|}{\partial c_{i,H}} = (\sigma-1)(1-\sigma) \frac{(\tau_{i,F})^{.\sigma}(c_{i,H})^{-\sigma}}{\sigma} \frac{E_{i,F}}{(\rho P_{i,F})^{1-\sigma}} \varphi^{\sigma-1} < 0$$

$$\varepsilon(r_x(i,\varphi),\tau_{i,F}) = 1-\sigma < 0$$

Basically we obtain the same results there are in the model in the paper both for the extensive and the intensive margins.

APPENDIX B: tables, figures and graphs

sector I-O name	NPR with EU in 1994	NPR with EU after CU
Coal mining	3.33	0.00
Crude petroleun	0.00	0.00
Iron and mining	0.00	0.00
Other metalic ore mining	0.13	0.00
Non-metallic mining	9.09	0.00
Stone quaryng	1.95	0.00
Non-alcoholic beverages	56.92	0.00
Processed tobacco	44.40	0.00
Ginning	0.00	0.00
Textiles	21.19	0.00
Clothing	14.75	0.00
Leather and fur production	7.85	0.00
Footwear	24.40	0.00
Wood products	15.25	0.00
Wood furniture	26.22	0.00
Paper and paper products	13.59	0.00
Printing and publishing	8.23	0.00
Fertilizers	8.22	0.00
Pharmaceutical production	3.33	0.00
Other chemical production	10.79	0.00
Petroleum refining	22.54	0.00
Petroleum and coal products	5.62	0.00
Rubber products	19.57	0.00
Plastic products	24.61	0.00
Glass and glass production	16.85	0.00
Cement	30.45	0.00
Non-metallic mineral	18.33	0.00
Iron and steel	8.00	0.00
Non-ferrous metals	4.52	0.00
Fabricated metal products	18.36	0.00
Non-electrical machinery	7.36	0.00
Agricultural machinery	6.98	0.00
Electrical machinery	9.69	0.00
Shipbuilding and repairing	6.13	0.00
Railroads equipment	0.00	0.00
Motor vehicles	27.33	0.00
Other transport equipment	0.01	0.00
Other manufacturing industries	2.92	0.00

Source: Togan (1997)

Table 0. *Nominal Protection Rate of Turkish sectors before and after the formation of CU.*

Growth rate of French exported quantities to Turkey, Rest of the World and Morocco (%)					
	94-95	95-96	96-97	97-98	98-99
TURKEY					
total	0.02	**0.40**	0.19	0.05	0.15
number of firms	0.13	**0.16**	0.08	0.03	-0.06
average quantity	-0.11	**0.24**	0.12	0.02	0.21
REST OF THE WORLD					
total	0.10	-0.01	0.13	0.06	-0.01
number of firms	0.012	-0.007	-0.007	-0.007	-0.022
average quantity	0.088	-0.003	0.133	0.062	0.014
MOROCCO					
total	0.12	-0.04	0.14	0.06	0.07
number of firms	0.0009	0.0004	0.003	-0.001	0.007
average quantity	0.12	-0.04	0.14	0.06	0.067

Table 1. *Decomposition 1 by years (log growth rate).*

log growth rate of total export, average export and number of exporting in 1995-1996			
	TOTAL	INTENSIVE	EXTENSIVE
Total	**0.40**	**0.24**	**0.16**
by sector			
Apparel, Textile and Leather Products	**0.81**	**0.40**	**0.41**
Furniture and Fixture	0.27	-0.05	**0.32**
Printing and Publishing	0.45	0.23	**0.22**
Paper and Allied Products, Lumber and Wood Products	0.02	-0.19	**0.22**
Transportation Equipment	**1.29**	**1.29**	0.00
Textile Mill Products	0.06	-0.13	0.19
Mechanic Equipment	0.55	**0.45**	0.11
Electric and Electronic Equipment	0.13	0.14	-0.02
Electric and Electronic Components	0.38	0.26	0.12
Food, Beverages and Tobacco	**1.12**	**1.06**	0.06
Mineral Products (Stone, Clay and Glass Products)	0.51	0.29	**0.23**
Chemicals and Allied Products	0.27	0.21	0.06
Fabricated Metal Products	**0.57**	**0.32**	**0.24**
Motor Vehicles and Equipment	0.02	-0.04	0.07
Drugs, Soaps and Cleaners	0.20	0.13	0.07

Table 2. *Decomposition 1 by inverse sector capital intensity (log growth rate).*

NET DECOMPOSITION OF CHANGE IN EXPORTED QUANTITIES						
year	ΔQ_t^{TOTAL}	$\frac{\Delta Q_t^{TOTAL}}{Q_{t-1}^{TOTAL}}$	$\frac{\Delta Q_t^{STAY}}{\Delta Q_t^{TOTAL}}$	$\frac{\Delta Q_t^{ENTRY}}{\Delta Q_t^{TOTAL}}$	$\frac{\Delta Q_t^{EXIT}}{\Delta Q_t^{TOTAL}}$	$\frac{\Delta Q_t^{ENTRY} + \Delta Q_t^{EXIT}}{\Delta Q_t^{TOTAL}}$
1994-1995	12.90	0.02	-0.79	3.43	-1.64	1.79
1995-1996	**421.80**	**0.49**	**0.9**	**0.17**	**-0.7**	**0.1**
1996-1997	276.00	0.22	0.92	0.19	-0.11	0.08
1997-1998	84.50	0.05	0.87	0.55	-0.41	0.13
1998-1999	267.20	0.16	1.07	0.17	-0.24	-0.07

Table 3. *Decomposition 2 by years (first column in millions of francs)*

NET DECOMPOSITION OF CHANGE IN EXPORTED QUANTITIES									
year	ΔQ_t^{TOTAL}	$N_{t,STAY}$	$\Delta\overline{Q}_{t,STAY}$	$\Delta\overline{Q}_{t,NET\_ENTRY}$	$N_{t,ENTRY}$	$\overline{Q}_{t,EXIT}$	N_{t,NET_ENTR}	$\Delta Q_{t,STAY}$	$\Delta Q_{t,NET\_ENTRY}$
1994-1995	12,900.00	1559	-6.543	14.291	809	40.34	286	-10,200.00	23,100.00
1995-1996	421,800.00	1829	207.217	22.340	941	54.17	402	379,000.00	42,800.00
1996-1997	276,000.00	2109	120.910	12.465	881	45.54	220	255,000.00	21,000.00
1997-1998	84,500.00	2275	32.220	7.322	821	48.95	106	73,300.00	11,200.00
1998-1999	267,200.00	2206	129.193	-6.796	707	71.01	-183	285,000.00	-17,800.00

Table 3 bis *Decomposition 3 in levels by years (in thousands of francs)*

NET DECOMPOSITION OF CHANGE IN EXPORTED QUANTITIES in 1995-1996								
	$\frac{N_{STAY}}{N_{t,TOTAL}}$	$\frac{\Delta\overline{Q}_{t,STAY}}{\overline{\Delta Q}_{t,TOTAL}}$	$\frac{\Delta Q_t^{STAY}}{\Delta Q_t^{TOTAL}}$	$\frac{\overline{Q}_{t,NET\_ENTRY}}{\overline{\Delta Q}_{t,TOTAL}}$	$\frac{N_{t,ENTRY}}{N_{t,TOTAL}}$	$\frac{\overline{Q}_{t,EXIT}}{\overline{\Delta Q}_{t,TOTAL}}$	$\frac{N_{t,NET\_ENTRY}}{N_{t,TOTAL}}$	$\frac{\Delta Q_t^{ENTRY}+\Delta Q_t^{EXIT}}{\Delta Q_t^{TOTAL}}$
Apparel, Textile and Leather Produ	0.60	1.16	*0.70*	0.16	0.57	0.52	**0.40**	*0.30*
Furniture and Fixture	0.68	1.21	*0.82*	-0.16	0.51	0.82	**0.32**	*0.18*
Printing and Publishing	0.71	0.74	*0.52*	0.26	0.77	0.95	**0.29**	*0.48*
Paper and Allied Products, Lumbe	0.74	4.52	*3.36*	-10.11	0.57	13.29	**0.26**	*-2.36*
Transportation Equipment	1.00	1.00	*1.00*	-0.01	0.36	0.0114	0.0000	*-0.0027*
Textile Mll Products	0.79	1.07	*0.85*	-1.25	0.44	3.39	**0.21**	*0.15*
Mechanic Equipment	0.86	0.95	*0.82*	0.36	0.45	0.14	0.14	*0.18*
Electric and Electronic Equipment	1.02	0.28	*0.28*	2.46	0.30	0.65	-0.02	*0.72*
Electric and Electronic Componen	0.85	1.03	*0.88*	0.18	0.46	0.24	0.15	*0.12*
Food, Beverages and Tobacco	0.92	1.13	*1.04*	-0.12	0.46	0.16	0.08	*-0.04*
Mneral Products (Stone, Clay and	0.77	1.24	*0.96*	-0.04	0.34	0.23	**0.23**	*0.04*
Chemicals and Allied Products	0.93	0.96	*0.90*	0.35	0.27	0.15	0.07	*0.10*
Fabricated Metal Products	0.74	1.08	*0.79*	0.20	0.48	0.41	**0.26**	*0.21*
Motor Vehicles and Equipment	0.92	0.73	*0.67*	1.37	0.23	0.22	0.08	*0.33*
Drugs, Soaps and Cleaners	0.92	1.07	*0.98*	-0.23	0.26	0.91	0.08	*0.02*

Table 4. *Decomposition 3 by inverse sector capital intensity for 1995-1996*

	Number of observations					
year	1994	1995	1996	1997	1998	1999
Operating firms	69563	64939	65950	68085	66972	67322
of which exporters	*24349*	*24652*	*24475*	*24305*	*24143*	*23608*
of which exporters to Turkey	*2082*	*2368*	*2770*	*2990*	*3096*	*2913*
as % of operating firms	***2.99***	***3.65***	***4.20***	***4.39***	***4.62***	***4.33***
as % of total exporters	***8.55***	***9.61***	***11.32***	***12.30***	***12.82***	***12.34***
Accounting exited-firms		4624	3613	1478	2591	2241
Exited-firms according to "defaillance" measure		1549	1618	1112	729	695

Table 5. *Number of Observations.*

variable	Obs	Mean	Std. Dev.	Min	Max
workers	470452	49.38	352	0	60062
value added in log	467024	7.94	1.57	0	17.8
capital in log	468390	7.58	1.85	0	17.87
materials in log	470188	7.99	1.9	0	18.98
investments in log	323856	5.16	2.14	0	16.43
wage in log	469614	7.65	1.53	0	16.61
labour productivity as a distance from sector average	466101	-0.13	0.51	-5.96	5.64
TFP (OP) (Olley Pakes calculation)	366059	4.55	0.55	0.025	10.11
TFP (OP) j (Olley Pakes calculation accounting for attrition bias)	366059	4.61	0.59	-0.14	10.48
TFP (OP) d (Olley Pakes calculation accounting for attrition bias)	366059	4.62	0.59	-0.07	10.48
TFP (LP) (Levhinson-Petrin)	464508	0.44	0.96	-6.83	7.84

Table 6. *Basic statistics*

sectors	number of observations in each sector (1994)	phisical capital CA index * K endowment	human capital CA index * S endowment	phisical capital CA index	human capital CA index	difference in tariff 95-97
Food, Beverages and Tobacco	11141	7.15	0.11	4.27	0.33	8.99
Apparel, Textile and Leather Products	3889	4.40	0.10	2.63	0.29	-6.88
Printing and Publishing	7550	6.12	0.19	3.65	0.56	-2.87
Drugs, Soaps and Cleaners	907	8.04	0.20	4.80	0.58	-2.87
Furniture and Fixture	4750	5.83	0.13	3.48	0.39	-3.94
Motor Vehicles and Equipment	1031	7.81	0.07	4.66	0.21	-2.10
Transportation Equipment	751	6.44	0.14	3.84	0.41	-1.06
Mechanic Equipment	9687	6.67	0.14	3.98	0.42	-2.38
Electric and Electronic Equipment	4177	6.73	0.21	4.02	0.62	-2.10
Mineral Products (Stone, Clay and Glass P	3706	7.31	0.11	4.36	0.31	-2.19
Textile Mill Products	2507	6.64	0.08	3.97	0.24	-2.08
Paper and Allied Products, Lumber and Wo	4106	6.25	0.09	3.73	0.28	-3.14
Chemicals and Allied Products	3942	7.32	0.13	4.37	0.38	-2.15
Fabricated Metal Products	9817	7.49	0.10	4.47	0.30	-5.14
Electric and Electronic Components	1602	6.98	0.15	4.17	0.45	-3.31

Table 7. *The Comparative Advantage Measures by 2-digit Sectors*

prob of exporting to Turkey	pooled probit model with sector FE					
	1	2	3	4	5	6
TFP (OP)	0.42***	0.23***				
TFP(OP) (defaillance)			0.22***			
TFP (OP) (account)				0.22***		
TFP (LP)					0.26***	
labour productivity						0.25***
tariff	**(-0.04)*** **	**(-0.038)*** **	**(-0.038)*** **	**(-0.038)*** **	**(-0.037)*** **	**(-0.033)*** **
Capital CA* tariff	**0.005*** **	**0.004*** **	**0.0049*** **	**0.0049*** **	**0.0048*** **	**0.004*** **
exporter in OD	1.68***	1.14***	1.14***	1.14***	1.14***	1.14***
size		(-0.07)	(-0.087)	(-0.088)	(-0.13)**	0.0008
capital		0.10***	0.097***	0.097***	0.27***	0.045**
wage		0.37***	0.38***	0.38	0.33***	0.36***
N· observations	180585	180580	180580	180580	180580	180580
pseudo R^2	0.29	0.4	0.4	0.4	0.4	0.4
pseudo LL	-23285	-19668	-19671	-19672	-19645	-19660
Cluster	NES 3	NES 3	NES 3	NES 3	NES 3	NES 3
Robust CI	YES	YES	YES	YES	YES	YES
year dummies	YES	YES	YES	YES	YES	YES
sector dummies	YES	YES	YES	YES	YES	YES

Notes: Plant-level probit regression. Robust standard errors are adjusted for clustering at the three-digit NES industry level classification. *** means significant at the 1% level; ** means significant at the 5% level; * means significant at the 10% level. Dependent variable is a dummy taking value of 1 if the plant export in Turkey and 0 otherwise. Coefficient for the regressions dummies and constant terms are not reported.

Table 8. *Probability of entering Turkey market with pooled probit model and capital comparative advantage.*

prob of exporting to Turkey	linear probability model with sector FE					
	1	2	3	4	5	6
TFP (OP)	0.029***	0.0168***				
TFP(OP) (defaillance)			0.018***			
TFP (OP) (account)				0.017***		
TFP (LP)					0.019***	
labour productivity						0.234***
tariff	**(-0.0035)****	**(-0.0036)*****	**(-0.0037)*****	**(-0.0037)*****	**(-0.0036)****	**(-0.0033)*****
Capital CA* tariff	**0.000437****	**0.00463*****	**0.00047*****	**0.00047****	**0.00046****	**0.0004*****
exporter in OD	0.093***	0.033^^	0.038***	0.033**	0.033***	0.033***
size		0.008	0.009	0.0087	0.0034	0.019***
capital		0.016***	0.016***	0.016***	0.028***	0.012***
wage		0.015***	0.014*	0.015**	0.013***	0.009**
N· observations	180585	180580	180580	180580	180580	180580
R^2	0.1	0.16	0.16	0.16	0.16	0.16
Cluster	NES 3	NES 3	NES 3	NES 3	NES 3	NES 3
Robust CI	YES	YES	YES	YES	YES	YES
year dummies	YES	YES	YES	YES	YES	YES
sector dummies	YES	YES	YES	YES	YES	YES

Notes: Plant-level probit regression. Robust standard errors are adjusted for clustering at the three-digit NES industry level classification. *** means significant at the 1% level; ** means significant at the 5% level; * means significant at the 10% level. Dependent variable is a dummy taking value of 1 if the plant export in Turkey and 0 otherwise. Coefficient for the regressions dummies and constant terms are not reported.

Table 9. *Probability of entering Turkey market with linear probability model and capital comparative advantage.*

prob of exporting to Turkey	linear probability model with firm FE					
	1	2	3	4	5	6
TFP (OP)	0.005***	0.006***				
TFP(OP) (defaillance)			0.006***			
TFP (OP) (account)				0.006***		
TFP (LP)					0.007***	
labour productivity						0.0067***
tariff	**(-0.002)*** **	**(-0.002)*** **	**(-0.002)*** **	**(-0.002)*** **	**(-0.002)*** **	**(-0.002)*** **
Capital CA* tariff	**0.0003*** **	**0.0003** **	**0.0003** **	**0.0003** **	**0.0003** **	**0.003*** **
exporter in OD	0.002**	0.001	0.001	0.001	0.001	0.001
size		0.008**	0.008**	0.008**	0.006***	0.010***
capital		0.004***	0.004***	0.004***	0.008***	0.003***
wage		0.003**	0.003*	0.003*	0.003*	0.003***
N· observations	180585	180580	180580	180580	180580	180580
R^2 within	0.038	0.004	0.004	0.004	0.004	0.004
R^2 between	0.023	0.14	0.14	0.14	0.14	0.15
R^2 overall	0.014	0.11	0.11	0.11	0.12	0.12
Robust CI	YES	YES	YES	YES	YES	YES
year dummies	YES	YES	YES	YES	YES	YES
firm fixed effect	YES	YES	YES	YES	YES	YES

Notes: Plant-level probit regression. Robust standard errors are adjusted for clustering at the three-digit NES industry level classification. *** means significant at the 1% level; ** means significant at the 5% level; * means significant at the 10% level. Dependent variable is a dummy taking value of 1 if the plant export in Turkey and 0 otherwise. Coefficient for the regressions dummies and constant terms are not reported.

Table 10. *Probability of entering Turkey market with linear probability model, capital comparative advantage and firm level fixed effects.*

prob of exporting to Turkey	pooled probit model with sector FE		Linear Probability model with firm FE		pooled probit model with sector FE		Linear Probability model with firm FE	
	HCA				Skill Intensity by Sector			
	1	2	3	4	1	2	3	4
TFP (OP)	0.23***		0.006***		0.23***		0.006***	
	(0.04)		*(0.001)*		*(0.04)*		*(0.001)*	
TFP (LP)		0.26***		0.006***		0.26***		0.006***
		(0.04)		*(0.001)*		*(0.04)*		*(0.001)*
tariff	**(-0.02)****	**(-0.02)****	**(-0.001)*****	**(-0.001)*****	**(-0.02)****	**(-0.02)****	**(-0.001)*****	**(-0.001)*****
	(0.01)	*(0.01)*	*(0.003)*	*(0.003)*	*(0.01)*	*(0.01)*	*(0.003)*	*(0.003)*
human CA* tariff	**0.016****	**0.016****	**0.007*****	**0.007*****	**0.05****	**0.05****	**0.002*****	**0.002*****
	(0.07)	*(0.07)*	*(0.002)*	*(0.002)*	*(0.02)*	*(0.02)*	*(0.0008)*	*(0.0008)*
exporter in OD	1.14***	1.14***	0.001	0.001	1.14***	1.14***	0.001	0.001
	(0.05)	*(0.05)*	*(0.001)*	*(0.001)*	*(0.05)*	*(0.05)*	*(0.001)*	*(0.001)*
size	(-0.07)	(-0.13)**	0.008***	0.006***	(-0.07)	(-0.13)**	0.008***	0.006***
	(0.07)	*(0.06)*	*(0.002)*	*(0.001)*	*(0.07)*	*(0.06)*	*(0.002)*	*(0.002)*
capital	0.1***	0.27***	0.004***	0.008***	0.1***	0.27***	0.004***	0.008***
	(0.02)	*(0.04)*	*(0.001)*	*(0.001)*	*(0.02)*	*(0.04)*	*(0.001)*	*(0.002)*
wage	0.3***	0.3***	0.003	0.003	0.4***	0.3***	0.003	0.003
	(0.06)	*(0.05)*	*(0.002)*	*(0.002)*	*(0.06)*	*(0.05)*	*(0.002)*	*(0.002)*
N· observations	180580	180580	180580	180580	180580	180580	180580	180580
pseudo R^2	0.4	0.4			0.4	0.4		
pseudo LL	-19669	-19647			-19669	-19647		
R^2 within			0.16	0.16			0.0047	0.0047
R^2 between			0.12	0.12			0.15	0.15
R^2 overall			0.63	0.63			0.12	0.12
Cluster	NES 3	NES 3	NO	NO	NES 3	NES 3	NO	NO
Robust CI	YES	YES	YES	YES	YES	YES	YES	YES
year dummies	YES	YES	YES	YES	YES	YES	YES	YES
sector dummies	YES	YES	NO	NO	YES	YES	NO	NO

Notes: Plant-level probit regression. Robust standard errors are adjusted for clustering at the three-digit NES industry level classification. *** means significant at the 1% level; ** means significant at the 5% level; * means significant at the 10% level. Dependent variable is a dummy taking value of 1 if the plant export in Turkey and 0 otherwise. Coefficient for the regressions dummies and constant terms are not reported.

(a) results are similar with other TFP measures

Table 11. *Probability of entering Turkey market with different models and human capital comparative advantage measures*

	CA	increase in prob. to export to Turkey	difference prob. to export to Turkey	growth in prob. to export to Turkey
capital CA				
25 percentile	6.11	from 0.214 to 0.219	0.003	2%
50 percentile	7.0	from 0.217 to 0.22	0.003	1.30%
75 percentile	7.3	from 0.22 to 0.221	0.001	0.70%
human capital CA				
25 percentile	0.09	from 0.016 to 0.020	0.0042	26%
50 percentile	0.12	from 0.0165 to 0.020	0.0039	23%
75 percentile	0.15	from 0.017 to 0.0208	0.0036	21%

Table 12. *Estimated probability of entering Turkey market with different models and measures of comparative advantage.*

prob of exporting to MOROCCO	pooled probit model with sector FE		Linear Probability model with firm FE		pooled probit model with sector FE		Linear Probability model with firm FE	
	KCA				HCA			
	1	2	3	4	1	2	3	4
TFP (OP)	0.1***		0.007***		0.1***		0.007***	0.006***
	(0.02)		*(0.002)*		*(0.02)*		*(0.001)*	*(0.001)*
TFP(LP)		0.09***		0.006***		0.09***		
		(0.02)		*(0.001)*		*(0.02)*		
tariff	**(-0.001)**	**(-0.0009)**	**(-0.0004)**	**(-0.0004)**	**(-0.003)**	**(-0.001)**	**(-0.001)**	**(-0.001)**
	(0.004)	*(0.004)*	*(0.0006)*	*(0.0006)*	*(0.005)*	*(0.005)*	*(0.003)*	*(0.003)*
CA* tariff	**0.0002**	**1.0002**	**0.00006**	**0.00005**	**0.03**	**1.03**	**0.0005**	**0.0005**
	(0.0006)	*(0.0006)*	*(0.00009)*	*(0.00009)*	*(0.04)*	*(0.04)*	*(0.003)*	*(0.003)*
exporter in OD	1.21***	1.21***	0.008***	0.008***	1.21***	1.21***	0.008***	0.008***
	(0.04)	*(0.04)*	*(0.002)*	*(0.002)*	*(0.04)*	*(0.04)*	*(0.001)*	*(0.001)*
size	(-0.12)**	(-0.16)***	0.014***	0.012***	(-0.12)**	(-0.16)***	0.01***	0.01***
	(0.05)	*(0.04)*	*(0.002)*	*(0.002)*	*(0.04)*	*(0.04)*	*(0.002)*	*(0.002)*
capital	0.022	0.08***	0.004***	0.008***	0.02	0.08***	0.004***	0.004***
	(0.02)	*(0.02)*	*(0.001)*	*(0.002)*	*(0.02)*	*(0.02)*	*(0.001)*	*(0.002)*
wage	0.42***	0.42***	0.004	1.004	0.42***	0.42***	0.003	0.003
	(0.05)	*(0.05)*	*(0.002)*	*(0.002)*	*(0.05)*	*(0.05)*	*(0.002)*	*(0.001)*
N· observations	180580	180580	180585	180580	180585	180580	180585	180580
pseudo R^2	0.36	0.36			0.36	0.36		
pseudo LL	-28883	-28887			-28883	-28886		
R^2 within			0.002	0.002			0.002	0.002
R^2 between			0.17	0.17			0.17	0.17
R^2 overall			0.13	0.13			0.13	0.13
Cluster	NES 3	NES 3	NO	NO	NES 3	NES 3	NO	NO
Robust CI	YES	YES	YES	YES	YES	YES	YES	YES
year dummies	YES	YES	YES	YES	YES	YES	YES	YES
sector dummies	YES	YES	NO	NO	YES	YES	NO	NO

Table 13. *Control experiment using Morocco*

prob of exporting to	pooled probit model with sector FE		Linear Probability model with firm FE		pooled probit model with sector FE		Linear Probability model with firm FE	
	KCA				HCA			
	1	2	3	4	1	2	3	4
Turkey	*v*	v	*v*	v	*v*	v	*v*	*v*
Morocco	*x*	x	*x*	x	*x*	x	*x*	*x*
Romania	*v*	v	*v*	v	*x*	x	*x*	*x*
Hungary	*x*	x	*x*	x	*x*	x	*x*	*x*
Algeria	*v*	v	*x*	x	*x*	x	*x*	*x*
Italy	*v*	v	*x*	x	*x*	x	*x*	*x*
All the world	*x*	x	*x*	x	*x*	x	*x*	*x*
All the rest of the world	*x*	*x*	*x*	*x*	*x*	*x*	*x*	*x*
Cluster	NES 3	NES 3	NO	NO	NES 3	NES 3	NO	NO
Robust CI	YES	YES	YES	YES	YES	YES	YES	YES
year dummies	YES	YES	YES	YES	YES	YES	YES	YES
sector dummies	YES	YES	NO	NO	YES	YES	NO	NO

Table 14. *Other control experiments*

Δ sales to TK	GLS		
	1	2	3
Δ TFP (OP)	**0.16****	**0.09**	**0.17***
	(0.07)	*(0.077)*	*(0.10)*
Δ tariff	**(-0.055)*****	**(-0.048)*****	**(-0.049)*****
	(.016)	*(0.015)*	*(0.015)*
Capital CA* Δ tariff	**0.006****	**0.005****	**0.005****
	(0.002)	*(0.002)*	*(0.002)*
Δ sales to OD		**0.28*****	**0.23*****
		(0.06)	*(0.07)*
Δ size			**0.40****
			(0.18)
Δ capital			**-0.038**
			0.070
Δ wage			**-0.048**
			-0.15
N· observations	3687	3670	3670
R^2	0.012	0.004	0.015
Cluster	NES 3	NES 3	NES 3
Robust CI	YES	YES	YES

Notes: Firm-level GLS regression. Robust standard errors are adjusted for clustering at the three-digit NES industry level classification. *** means significant at the 1% level; ** means significant at the 5% level; * means significant at the 10% level. Dependent variable is the difference in log sales to Turkey for each firm that has been exporting in all the years of analysis.

(a) results are similar with other TFP measures

Table 15. *Firm level intensive margin*

Δ sales to TK (all firms)	GLS		
	1	2	3
Δ tariff	**(-29.9)****	**(-26.3)****	**(-26.84)****
	(9.43)	*(9.39)*	*(9.46)*
Capital CA* Δ tariff	**3.5****	**3.05****	**3.09****
	(1.23)	*(1.23)*	*(1.24)****
Δ average tfp		**(-414.12)*****	**(-341.25)***
		(167.6)	*(185.27)*
Δ average size			**47.3**
			(244.8)
Δ average capital			**118.8**
			(196.2)
Δ average wage			**-8.3**
			(14.4)
N· observations	168	168	168
R^2	0.07	0.11	0.12
F test	6.89	6.77	3.61

Table 16a

Δ sales to TK (already exporters)	GLS		
	1	2	3
Δ tariff	**-1.91**	**-1.44**	**(-1.47)***
	(1.23)	*(1.22)*	*(1.23)*
Capital CA* Δ tariff	**0.22**	**0.16**	**0.17**
	(0.16)	*(0.16)*	*(0.16)*
Δ average tfp		**(-55)****	**(-57)****
		(21.8)	*(24.36)*
Δ average size			**0.67**
			(31.85)
Δ average capital			**26.19**
			(25.53)
Δ average wage			**2.35**
			(1.87)
N· observations	168	168	168
R^2	0.02	0.05	0.07
F test	1.72	3.33	2.14

Table 16b

Δ sales to TK (net entry)	GLS		
	1	2	3
Δ tariff	**(-28)*** **	**(-24)*** **	**(-25.3)*** **
	(8.65)	*(8.64)*	*(8.70)*
Capital CA* Δ tariff	**3.28*** **	**2.89*** **	**2.92** **
	(1.13)	*(1.13)*	*(1.14)*
Δ average tfp		**(-358)^^**	**-284.2**
		154	*(172.2)*
Δ average size			**46.6**
			(225)
Δ average capital			**92.6**
			(180.4)
Δ average wage			**-10.6**
			13.27
N· observations	168	168	168
R^2	0.08	0.11	0.12
F test	7.14	6.69	3.71

Table 16c

Notes: Firm-level GLS regression.. *** means significant at the 1% level; ** means significant at the 5% level; * means significant at the 10% level. Dependent variable is the difference in aggregate log sales to Turkey for each sector.

(a) results are similar with other TFP measures

Table 16. *Sector level intensive margin (16a for all firms exporting to TK in at least one period; 16b for firms which where exporting to TK in all periods; 16c for firms who where entering or exiting)*

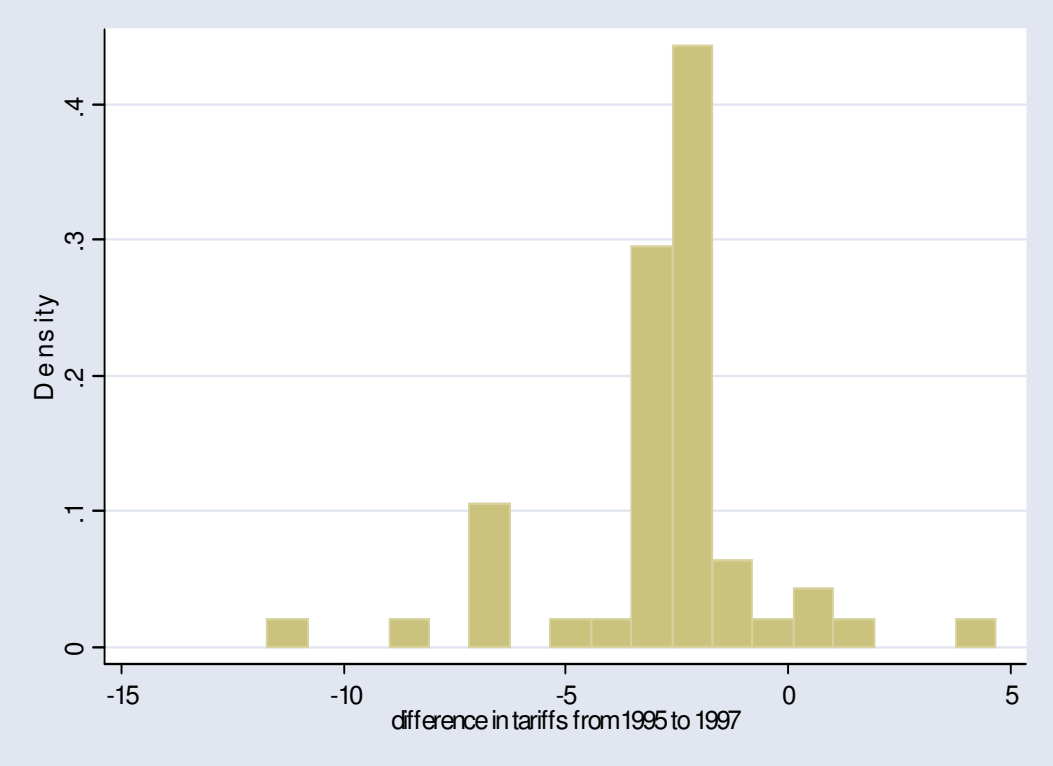


Figure 1. *Change in Turkish import tariffs after the entrance in European Customs Union.*

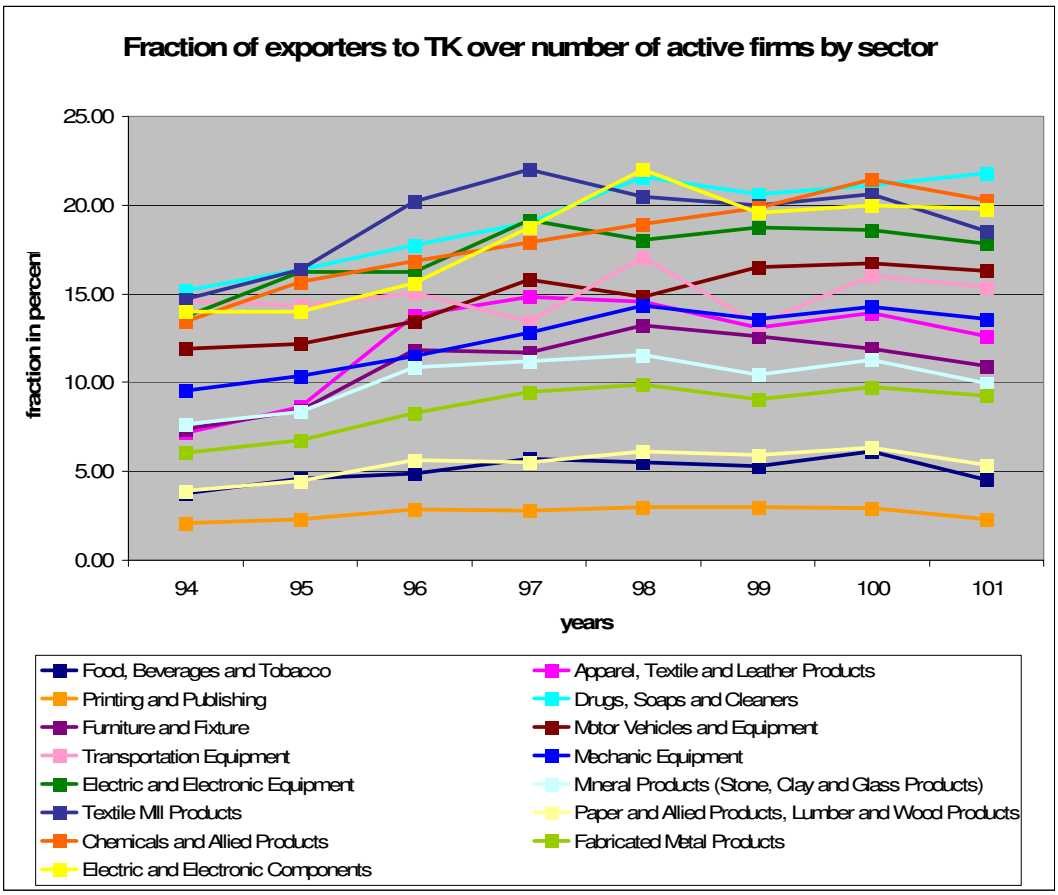
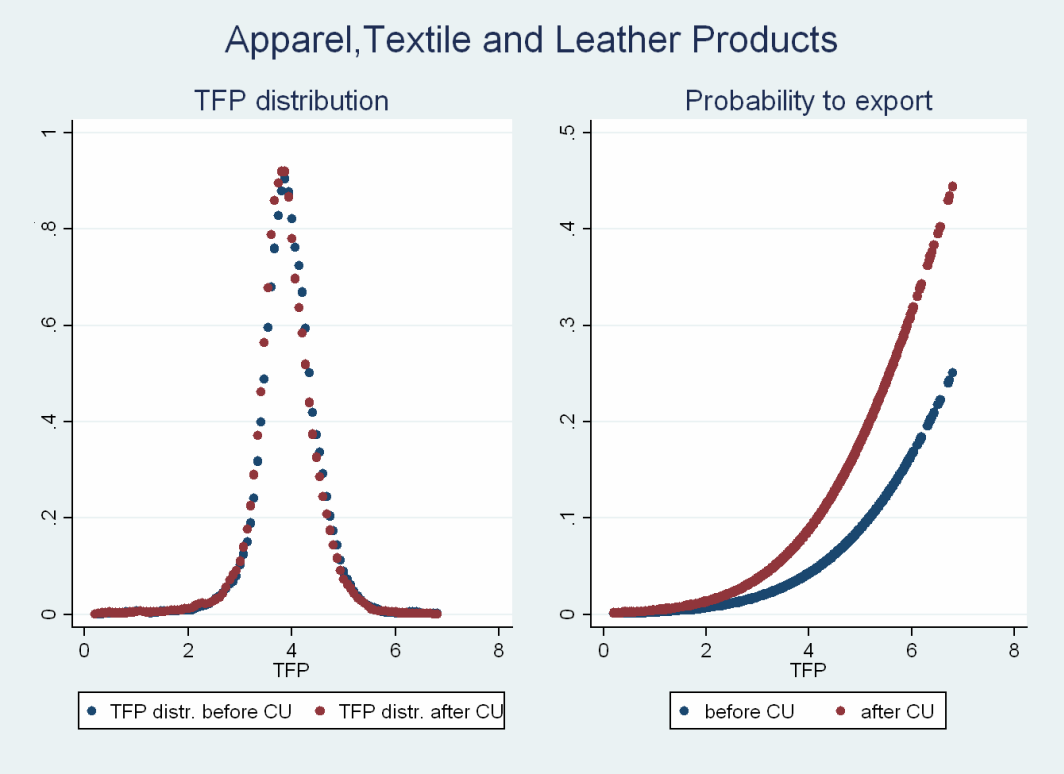


Figure 2. *Fraction of firms exporting to Turkey over active firms by year and sector.*



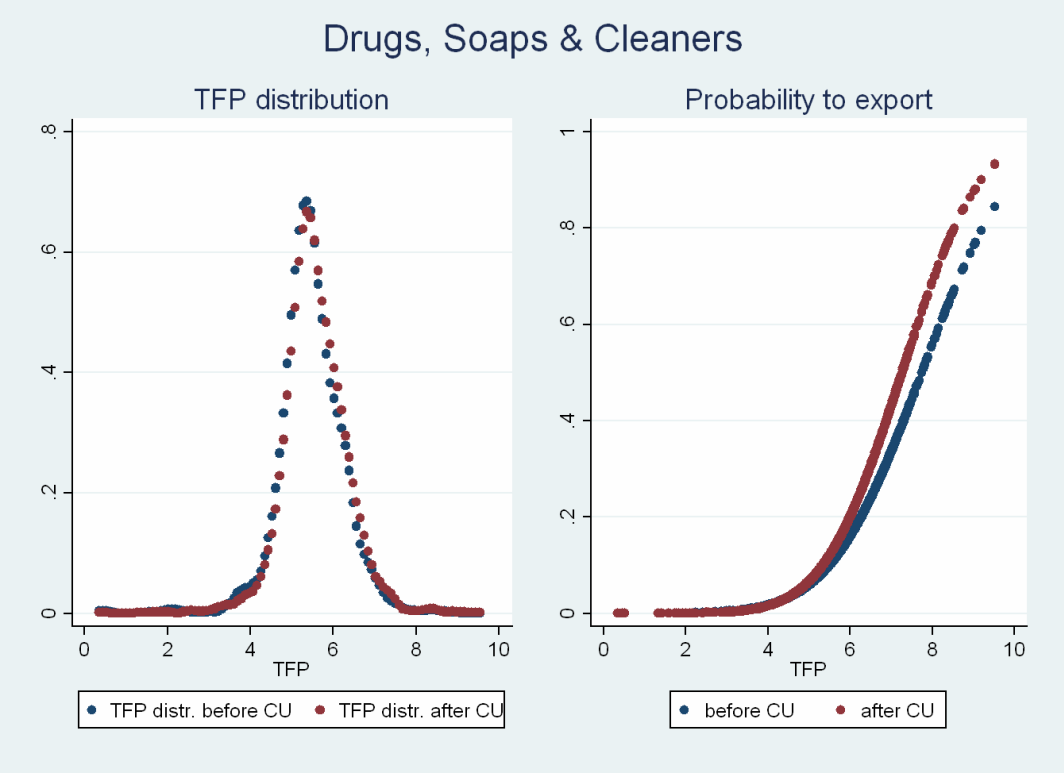
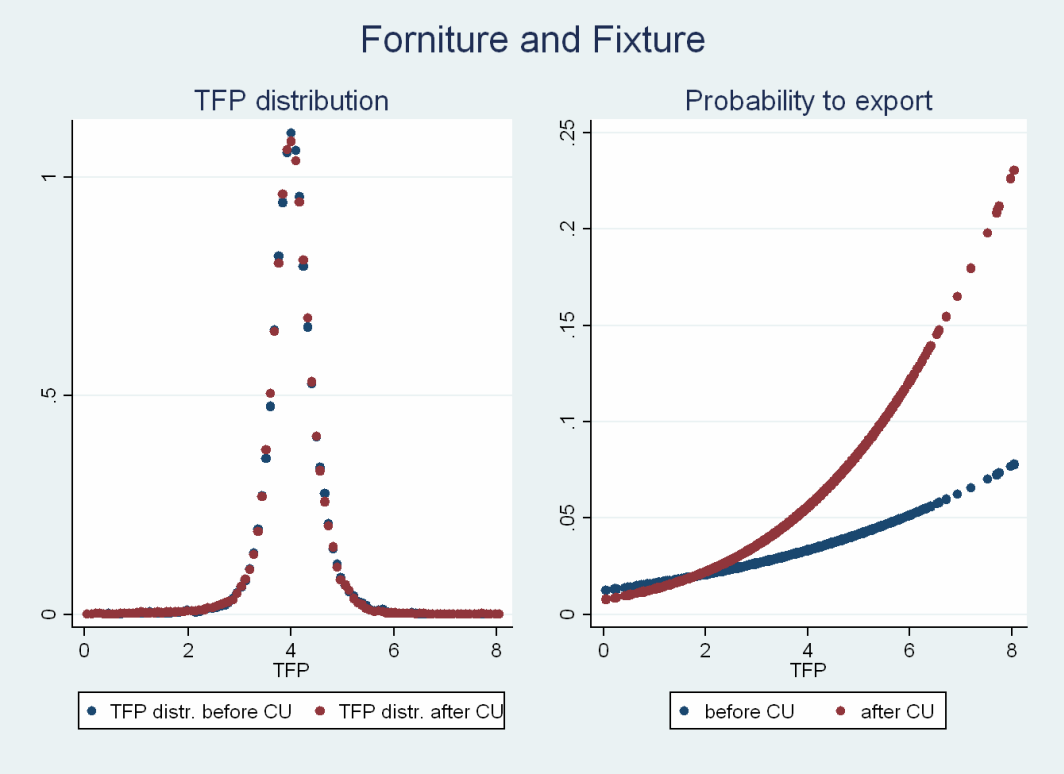


Figure 3 A, B. *TFP distribution and probability to export for some sectors*



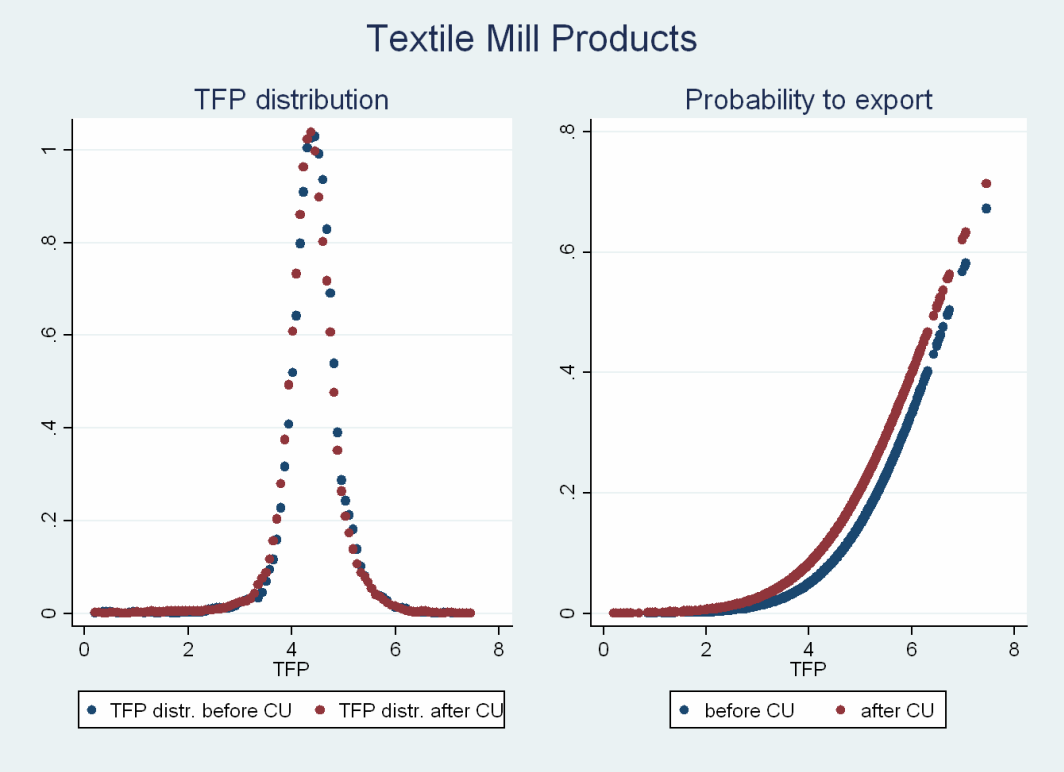


Figure 3 C,D. *TFP distribution and probability to export for some sectors*