# Comment on "Trade Integration in Colombia: a Dynamic General Equilibrium Study with New Exporter Dynamics" by George Alessandria and Oscar Avila

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**Abstract**

This paper provides a series of comments aimed mainly at addressing the empirical relevance of the proposed interpretation of the mechanism and partly at considering the possible interaction between the trade and labor market reforms that took place in Colombia in the same period. In particular, it first highlights the stylized facts about Colombian exports and exporters that the model aims to theoretically reconcile and I briefly summarize the mechanism proposed in the microeconomic block of the theory. Next, it focuses on two crucial assumptions made in the model; it proposes a complementary way of presenting the mechanism and proposes ways to evaluate the empirical relevance on the competing interpretations. Finally, it focuses on the broader economic and institutional background characterizing Colombia in the early Nineties and highlights the possibility that other reforms taking place in the same years may have interacted with trade liberalization in shaping firms' distribution and export dynamics as well as welfare.

Key words: trade liberalization, structural reforms, heterogeneous firms, export dynamics.

## 1 Introduction

How did the trade liberalization reform of the early Nineties in Colombia affect welfare in the short and long run, once its effects on exporters' dynamics and technological improvement

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are taken into account? Alessandria and Avila (2019) address this question quantitatively by means of a general equilibrium, heterogeneous firms model that is able to match macro and micro facts about Colombian export and exporters between 1989 and 2007. The main insight of their theory is that trade liberalization induces more firms to make the costly and risky investment required to improve their transportation technology and become exporters. It also makes incumbent exporters keep investing to maintain or improve their transportation technology and export with a higher intensity. Overall, the additional effects of trade on exporter dynamics and transportation technology amplify the welfare gains relative to the most common quantifications in the literature, especially in the medium run.

The idea that trade induces firms to engage in more risky investment to improve their performance as exporters is interesting and sensible. However, confining such improvement to transportation technology may downplay the importance of the proposed mechanism. The following comments are aimed mainly at addressing the empirical relevance of the proposed interpretation of the mechanism and partly at considering the possible interaction between the trade and labor market reforms that took place in Colombia in the same period. In Section 2, I highlight the stylized facts about Colombian exports and exporters that the model aims to theoretically reconcile and I briefly summarize the mechanism proposed in the microeconomic block of the theory. Section 3 focuses on two crucial assumptions made in the model; it proposes a complementary way of presenting the mechanism and proposes ways to evaluate the empirical relevance on the competing interpretations. Section 4 focuses on the broader economic and institutional background characterizing Colombia in the early Nineties and highlights the possibility that other reforms taking place in the same years may have interacted with trade liberalization in shaping firms' distribution and export dynamics as well as welfare. Section 5 concludes.

## 2   Reconciling Macro and Micro Export Shares

The "micro" block of the model is aimed at matching a series of observations on the change in export shares between the early 90s and 2007, and on the dynamics of exporting firms. The first fact is the 95% increase in Colombian aggregate export share, accompanied by a 45% increase in the average export share per firm (intensive margin) and a doubling of the share of exporting firms (extensive margin). This observation is in line with recent evidence showing that both margins are important to explain trade flows (Bernard et al., 2018; Bonfiglioli et al., 2019; Hummels and Klenow, 2005), and it is hard to reconcile in the baseline Melitz and Redding (2014) model with a Pareto distribution of firms' productivity.

The second set of facts, highlighted also in Eaton et al. (2008) relative to the Colombian experience, is that many new exporters enter every year, but a small fraction of them con-

tinue to export after the first couple of years; new exporters are significantly smaller than average exporters both in size and in export share; conditional on surviving, exporter status is very persistent; it takes longer to the average new exporter to reach the export intensity of continuing exporters. A number of contributions in the literature on exporters' dynamics have pointed out that the existence of a large sunk cost for becoming an exporter is not enough to explain these facts (see among others Ruhl and Willis, 2017 and Timoshenko, 2015). Some authors argue that adding learning about foreign market conditions or about the export activity may be more effective for explaining these facts and the additional evidence that continuing exporters expand along the extensive margin by serving additional destination countries (e.g., Eaton et al, 2014 and Arkolakis, 2010).

This paper argues that the driving force behind exporters' dynamics is the fact that exporters need to make a sustained risky investment in transportation technology improvement. In particular, as in Alessandria, Choi and Ruhl (2014), a sunk cost element is loaded on the fixed investment required to drive the firm-specific component of the variable trade cost down from infinity to a finite amount, $\xi_H$, which is larger than the average cost faced by continuing exporters. However, this investment is also risky since the reduction in the iceberg trade cost occurs only with some probability, $\eta$. Once a firm starts exporting, it needs to keep investing a certain amount to keep the iceberg cost finite and, with some probability, reduce it to $\xi_L$. Crucially, the probability of drawing a different $\xi$ in the next period is lower than that of no change. This assumption makes it at the same time more likely that a new exporter with $\xi_H$ is soon forced out of the foreign market (it just takes a small negative productivity shock), and that a continuing exporter (with $\xi_L$) keeps serving the foreign market. In this context, a bilateral reduction in tariffs induces entry of new exporters, which are significantly smaller and more likely to quit after one year than the continuing ones due to their higher transport cost. Continuing exporters increase their export intensity by more than recent exporters owing to their (on average) better transport technology. Over time, the market becomes more competitive, thereby further reducing the chances of survival for new exporters and inducing less firm entry. On the other hand, those new exporters who draw $\xi_H$ earlier on experience a dramatic increase in their export share because they benefit at the same time from lower tariffs and iceberg cost.

This "micro" block is nested in an otherwise standard small open economy model of aggregate consumption and savings with a representative household. Next, the resulting model is calibrated, assuming a single sector and using some parameter estimated for the US, to match various moments of Colombian firms' distribution and export dynamics prior to trade liberalization, and then used to perform a series of exercises. While the calibrated model replicates quite well the increase in average firm-level export intensity (the intensive margin), it falls short of capturing the increase in the share of exporters. Interestingly,

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to match the latter, a substantial increase relative to 1989-91 is needed in the probability of successful entry into export (i.e., the reduction of $\xi$ from infinity to $\xi_H$), from 15% to 25%, which is interpreted as an improvement in the efficiency of the investment in transport technology. Focusing on the intensive margin, the calibrated model shows that 15 per cent of the increase in average firms' export intensity is explained by the reduction in the average iceberg cost induced by the fall in average tariffs (which explain the remaining 85 per cent). This fall in the average $\xi$ is due to the reallocation of market shares towards continuing exporters. At the macro level, the increase in aggregate export intensity following trade liberalization leads to a gradual expansion in consumption and capital accumulation, which are partially reverted in the long run due to the increased competition which discourages firm creation. All in all, the massive increase in consumption, capital and output (especially along the transition) leads to welfare gains of about 7 per cent at the steady state. Interestingly, almost a half of these gains are generated by the increase in the probability of successful entry into export that is needed to match the increase in the share of exporters.

## 3  Transportation Technology Only?

In this section, I focus on the interpretation and empirical relevance of two crucial assumptions: (i) Firms invest in transportation technology and (ii) The probability of successful entry in the export market depends on the efficiency in investment technology and may change with tariffs.

The parameter capturing firm-specific iceberg costs, $\xi$, enters the expression for revenues in the foreign market as any shifter driving prices up proportionally to productivity, $e^{-z}$, as follows:

$$p^* (z, \xi, f) \, y^* (z, \xi, f) = \left[ \frac{\theta}{\theta - 1} MC \, (1 + \tau) \, \xi e^{-z} \right]^{1-\theta} D,$$

where $\theta$ denotes the elasticity of substitution (held equal to 5 in the calibration), $D$ captures market conditions, $\tau$ is the tariff rate and $MC$ is the marginal cost component that depends on technology and factor prices. While all these variables may be considered as sector or sector-time specific, $\xi$ and $e^{-z}$ may vary over time at the firm level. The same expression applies to domestic revenues with $\tau = 0$ and $\xi = 1$ ($D$ is the same under the assumption of symmetric countries). While very clean and tractable, this equation is observationally equivalent to the one that can be derived under alternative set-ups.

For instance, one can assume preferences in country $k \in \{H, F\}$ to be CES over the varieties in a given sector $j$ as described by

$$C_{j,k} = \left[ \int_{\omega \in \Omega_{j,k}} \gamma_k (\omega) \, c_k (\omega)^{\frac{\theta-1}{\theta}} \, d\omega \right]^{\frac{\theta}{\theta-1}},$$

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where $\Omega_{j,k}$ is the set of varieties ($\omega$) sold in sector $j$ and market $k$ from any origin country, and $\gamma_k(\omega)$ is a variety-specific demand shifter capturing consumers' taste for a firm's product in country $k$. It can be further assumed that firms in $H$ face, in addition to a tariff, a sector and destination specific iceberg cost, $\delta_{jk}$, related to characteristics like the bulkiness, weight and storability of the items, and the distance to destination market. In this case, the expression for sales of firms from country $H$ selling in $F$ becomes

$$p^*(z,\xi,f)\,y^*(z,\xi,f) = \left[\frac{\theta}{\theta-1}MC\,(1+\tau)\frac{\delta_F}{\gamma_F}e^{-z}\right]^{1-\theta}D,$$

where $\xi \approx \delta_F/\gamma_F$ and both (sets of) parameters possibly varying across firms and sectors over time. The interpretation of the model, however, would be different. Under the alternative set-up, potential new exporters would choose whether to make a risky investment in adapting their variety to the foreign taste ($\gamma_F$ switching from 0 to positive), and continuing exporters would need to keep investing to maintain and possibly improve the perceived quality of their varieties on the foreign market. While improvements in both transport technology and quality are easy to imagine, it seems more difficult that the technology of a continuing exporter deteriorates (from $\xi_L$ to $\xi_H$) than that foreign consumers lose interest its products. However, discriminating between both interpretations seems ultimately an empirical question.

Using firm-level data on domestic and foreign sales, and assuming CES demand, it is possible to identify $\xi$ out of the difference between domestic and foreign sales conditional on the tariff and a time fixed effect capturing the differences between market conditions ($D$ may differ across asymmetric countries). Under the alternative set-up, using information on oil price and sector-specific measures of bulkiness (as in Hummels, 2007) would also allow the researcher to partly discriminate between the common iceberg trade cost $\delta$ and the firm-specific average foreign taste $\gamma$. Using more disaggregated data for export by destination, it would also be possible to identify more precisely the taste shocks across countries (as in Aw, Lee and Vandenbussche, 2018). Comparing how much variation in export is accounted for by the variation in the estimated values for $\xi$, $\gamma$ and $\delta$ may give a better idea of which model parameters are more empirically relevant.

The probability of successful investment in export technology, $\eta$, is assumed to be exogenous and it is interpreted as the efficiency in investment.[1] While Section 3, describing the model, does not devote much attention to the role of this parameter, Section 4 emphasizes the fact that its increase, which is the only change allowing the model to match the data on the number of new exporters without worsening the fit in other respects, is responsible

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[1] Similarly, the Markov transition probabilities for the transportation technology of continuing exporters are exogeous, but they are not associated with efficiency.

for nearly half of the welfare gains from trade liberalization. This begs for clarification and possibly for a modification of the model to incorporate the notion that $\eta$ may endogenously change with tariffs. A possibility in this direction could be allowing firms to choose how much to invest in the export technology (or appeal in the foreign market), $f_H$, which affects their probability of success. Similarly to the mechanism in Bonfiglioli, Crinò and Gancia (2018), trade liberalization would disproportionately raise sales of exporters due to convexity, thereby inducing firms to invest more to increase the probability of successful entry in the foreign market. This would generate the negative correlation between tariffs and $\eta$ hinted at in Section 4.

## 4   Labor Market Reforms

Between 1989 and 1994, Colombia went through a series of major structural and institutional reforms. In the span of five years, the country liberalized trade, FDI, the exchange rate market and the domestic financial sector. It also privatized telecoms and utilities provision and deregulated the transportation sector and labor market (see Montenegro, 1995). Some of these reforms may have interacted with trade liberalization in shaping firm dynamics. In particular, the labor market reform reduced firing costs from 50 to 8 per cent of the average yearly wage, which may have reduced production costs, but also affected the sorting between firms and workers and raised unemployment (see Ruggieri, 2019). On the other hand, the deregulation of air transportation, shipping, ports and trains, by dismantling national monopolies may have led to a sharp fall in variable trade costs. Taking into account these reforms may at the same time improve the fit of the model and deliver an even more accurate quantification of the gains from trade liberalization.

## 5   Conclusions

Alessandria and Avila (2019) propose a general equilibrium model to quantify the welfare gains originated by Colombia's trade liberalization while taking into account the effects the reform had on firms' dynamics and export intensity at the macro and micro level. The microeconomic block of the theory, partly drawn from Alessandria, Choi and Ruhl (2014), is of particular interest because it is able to match a host of stylized facts while preserving transparency. These comments propose an alternative way to present the mechanism, based on a risky investment in improving the perceived quality of a firm's products on the foreign market, and some ideas for an empirical strategy to identify the crucial parameters of the model The proposed alternative is in line with the findings in Bonfiglioli, Crinó and Gancia (2019) that most of the variation in firm-level export across country-sector pairs is explained by variation in a general measure of appeal, which may incorporate both technology and

consumers' taste. Discriminating between transportation costs and perceived quality seems important to better understand the role of each component in shaping export dynamics. From a macroeconomic perspective, considering the possible interaction between trade liberalization and other reforms occurring simultaneously in Colombia may further improve accuracy in the quantification of the welfare effects.

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