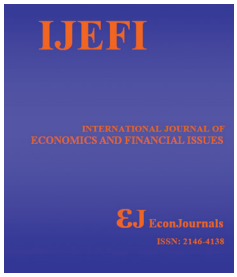

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Trade Agreements, Uncertainty and Capital Structure of Exporters

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ABSTRACT

This paper examines the role of export market uncertainty in the financing decisions of firms. To evaluate the effect of uncertainty reduction, I use the free trade agreement between Colombia and the USA that came into force in May 2012. Using firm-level data, and a diff-in-diff methodology, I find empirical evidence that Colombian firms that exported agricultural products to the USA experienced a decline in their leverage after the agreement's implementation. I further disaggregate the composition of liabilities to find that the source of decline was borrowing from financial institutions. I develop an oligopoly competition model with product market uncertainty where the source of uncertainty is embedded in a firm's profit function. The model predicts that the reduction in uncertainty leads to the decline in borrowing. The results of this paper suggest that trade agreements can benefit exporters in developing countries with imperfect capital markets where borrowing is costly.

Keywords: Capital Structure, Uncertainty, Trade Agreements, Trade Cost
JEL Classifications: D22, F10, F14, G32

1. INTRODUCTION

Capital structure is defined as the sources a firm uses to finance its operations. These sources are primarily divided between debt and equity. There is an extensive literature on the determinants of capital structure decisions, including firm-specific characteristics such as profitability, tangible assets (Rajan and Zingales, 1995; Frank and Goyal, 2009); management (Zwiebel, 1996; Berger et al., 1997); product market characteristics and uncertainty (Brander and Lewis 1986; Kovenock and Phillips 1997). However, there is very little evidence on the role of trade shocks, such as free trade agreements, on firm finances. I use firm- level data to test the impact of the free trade agreement between the USA and Colombia on the leverage of Colombian exporters.

This paper contributes to several branches of academic literature, connecting fields of international trade and corporate finance. First, it provides new evidence on the relationship between firm-level financial performance and uncertainty reduction in the form of trade liberalization. Baggs and Brander (2006) looks into the Canada-US free trade agreement, and how the sectoral changes in tariffs changed leverage and profits of firms in export-intensive versus import-intensive manufacturing industries. It shows that bilateral tariff changes during tariff phase-outs in the late 1980s-early 1990s led to the decline in leverage of export-oriented firms primarily due to the higher profitability of export. The results are consistent with the pecking order theory, showing that firms substitute debt financing with the cash flows generated from the export market. On the other hand, Rakhmayil and Yuce (2012) shows that the capital structure of firms may change in the opposite direction, depending on the trading partner and domestic institutions. For instance, according to the presented statistical results, while NAFTA decreased leverage of Canadian exporters, it has also increased the leverage of Mexican firms, though leaving the effect for the US firms ambiguous.

I extend the above evidence on the relationship between trade policy and leverage by providing a firm-level rather than sector-level

analysis of the trade liberalization event and use uncertainty reduction as the main channel of change in borrowing. I develop a theoretical model that connects product market uncertainty (regarding trade costs and demand fluctuations) and debt financing of exporters. In the model, firms borrow for strategic purposes only, in other words, to enhance their position in the output market in the presence of uncertainty, like in Brander and Lewis (1986) and Wanzenried (2003). The model predicts that uncertainty reduction leads to a decline in borrowing, higher output, and higher profits due to the limited liability effect of borrowing. Those predictions are consistent with the empirical observations. This is also the first paper to endogenize the borrowing decisions of firms. In the existing literature borrowing is either determined exogenously on the sectoral level (Manova, 2013; Manova et al., 2015) or by the institutional factors in the choice of trade finance (Schmidt-Eisenlohr, 2013; Hoefele, et al., 2016).

I contribute to the uncertainty literature by providing evidence on the importance of uncertainty reduction in the form of non-tariff trade barriers. Handley (2014) discusses the impact of uncertainty on exports, based on the Australian market. The paper provides both empirical and theoretical evidence that trade uncertainty leads to lower export volumes and product entry to the market. The World Trade Organization (WTO) reduces uncertainty leading to a higher number of exporters and higher trade volume. The topic is further discussed by Handley and Limao (2015). Similarly, based on the example of Portugal joining European Community (EC) in the late 1980s, the paper provides further statistical evidence that the number of exporters (firms) and products significantly increased after Portugal's accession to the EC. Handley and Lima˜o (2017) extends Handley and Limao (2015) by looking into US prices and consumer income, showing that tariff changes/reductions positively impact the well-being of US consumers by raising their income and reducing prices. Using two uncertainty proxies from existing literature, weighted average tariff overhang and number of shipments, I show that the decline in leverage was stronger if a firm faced a higher level of uncertainty.

Both theoretical and empirical findings make it possible to conclude that trade agreements benefit exporters in the countries with imperfect capital markets where borrowing is costly. The lending interest rate in Colombia was 9% at its lowest over the considered time period, which is more than twice the rate in the US during the same time frame. Moreover, very few Colombian firms are publicly traded, leaving debt as the least costly option for external financing. Furthermore, bank borrowing is more difficult for non-publicly traded and small firms (Jo˜eveer, 2013a, b; Berger and Udell, 1995).

In the next section I start with a discussion of the firm-level data and empirical methodology. I then develop a theoretical model and document how the model predictions are consistent with the observed empirical facts outlined in the previous section.

2. DATA AND METHODOLOGY

I use HS10 export transaction-level data of Colombian firms from 2007 to 2014, obtained from the Colombian Statistics Department (DANE) via *DataMyne.com*. I aggregate the data to calculate total export volumes of firms and their export to the USA (if any). I keep only continuous exporters over the considered time frame that were constantly exporting from 2007 to 2014. This reduces the volatility in debt levels that could result from the inclusion of new exporters that are characterized by higher leverage (Berman and He´ricourt, 2010; Greenaway et al., 2007). I clean the data from the non-firm entities (such as entrepreneurs and partnerships) based on the provided tax identification number (Tax ID), using the information from Colombian Internal Revenue Services on the type of Tax ID since no financial data is available for such entities. This procedure drops <5% of all observations. Finally, using the transaction level data, I obtain a number of shipments for each firm. I use this variable to control for the uncertainty: higher number of shipments is associated with lower uncertainty (Heise et al. 2015).

Firms' financial data is sourced from the Colombian Superintendency of Corporations - SIREM, and spans from 2006 to 2014. This data set includes information on firms' balance sheets, profit and loss accounts, and cash flow statements. It does not include information on the financially distressed firms, firms that have filed for bankruptcy or are currently undergoing restructuring. According to the description provided by SIREM, financial data provides a representative sample of medium-sized firms.

In addition to transaction-level data, I obtain the tariff schedule for traded goods (US HTS8-level), available from the Colombian trade agency *Proexport*, where products can be classified as immediately affected by the trade agreement (binding tariffs turn zero immediately after the Agreement came into force, category A), products that already have zero binding tariff due to the Andean Trade Preference Act (ATPA) (the Agreement just guarantees that those products are going to remain zero, category F), products that have quota restrictions (no tariff is applied up until certain cutoff, imposed on first come, first served basis; after quota is reached, products get taxed based on some tariff line, specified in the Agreement) and products that will remain with positive tariff for at least 5 years, being steadily phased out every year (categories C, T, R etc). I calculate weighted-average tariff overhang change for each firm, weighted by the corresponding aggregated HS6 product volume. The overhang measure serves as an additional proxy for the source of the uncertainty (similar to Handley, 2014; Handley and Limao, 2015).

Firms in the sample fall into three different categories: exporters to the USA, exporters to other countries and domestic firms. SIREM requires firms to identify their primary area of operations, based on modified ISIC Rev 3.1 classification. It slightly differs from the standardized classification on the 3- and (for some industries) 4-digit levels. Therefore, I aggregate firms' industry classification to a 2-digit level. Unfortunately, some firms change their reported primary industry in the data. I pick the most frequently identified industry by each firm and limit my sample to firms in agricultural and wholesale/retail industries (ISIC Rev 3.1 Industries A, B, and G) as some agricultural exporters identify Industry G as their primary category.

Figure 1: Leverage measures, medians: debt-to-asset ratio, total financial obligations to asset ratio and total debt to asset ratio, by firm type

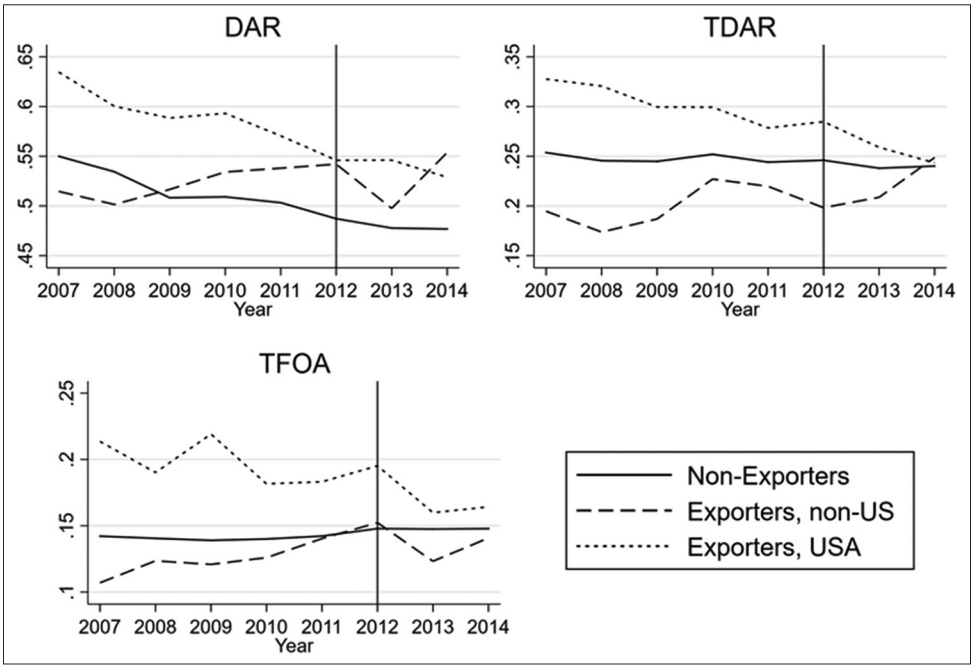
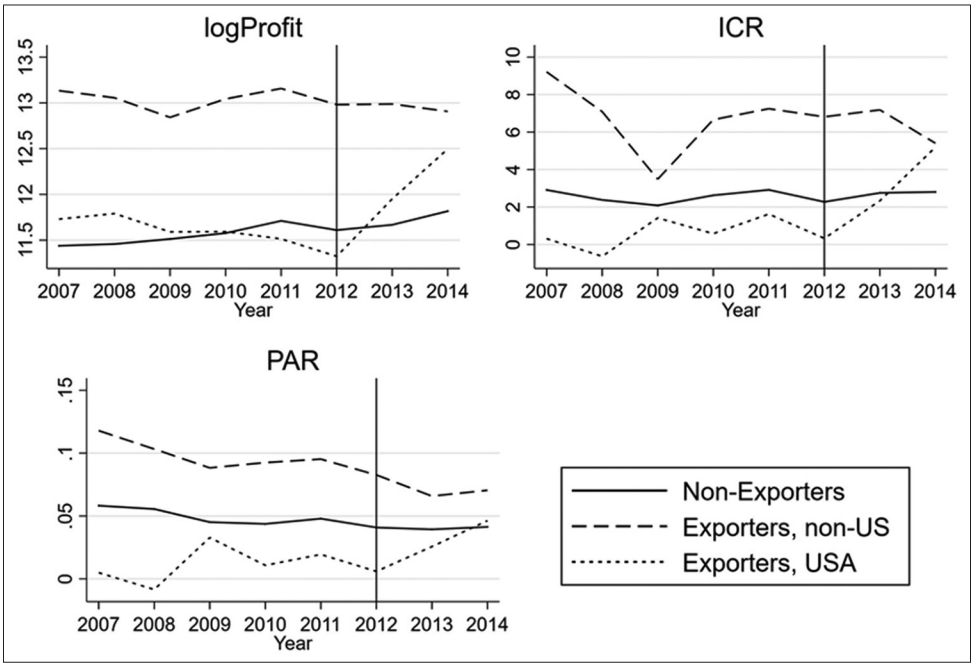


Figure 2: Profitability measures, medians: log of profits, interest coverage ratio and profit-to-asset ratio, by firm type



I measure leverage as the debt to asset ratio, which is the ratio of total liabilities to total assets. In addition to the above measure, I also construct a pure financial debt to asset ratio called total financial obligations to asset (TFOA) ratio that accounts for external financing of Colombian exporters, sourced from financial intermediaries. According to the definition provided by the Superintendence (SIREM), this variable represents: "the value of the obligations contracted by the economic entity by obtaining resources from credit institutions or other financial institutions or other entities other than the above, from the country or abroad, also includes commitments to repurchase investments and portfolio negotiated." In other words, this ratio includes only financial obligations, net of any operating expenses outstanding. Finally, I construct total debt to asset ratio (TDAR), that additionally includes total accounts payable, the value of issued bonds and other financial liabilities.

As firm-level controls, I include profitability, calculated either as ratio of total earnings before interest and tax to total sales, operational profit margin, profit to total assets ratio or log of net profits; and tangibility, measured as the ratio of total tangible assets, such as property, plants and equipment, to total assets. Those variables have proved to be important determinants of leverage in the previous work on capital structure (Frank and Goyal 2009; Rajan and Zingales, 1995; Joliet and Muller, 2013).

2.1. Data Trends

2.1.1. Leverage

From the above three graphs (Figure 1), one can notice a downward trend of leverage measures for Colombian firms, exporting to the USA. DAR starts declining in 2011, the year when the Agreement is signed. Other measures respond after the implementation of the FTA in 2012. Note that TFOA is the most disaggregated measure, showing only financial obligations of a firm from financial intermediaries. Leverage changes roughly by 5%, therefore, allowing to claim that the change happens through the decline in borrowing from financial institutions, specifically.

2.1.2. Profitability

Profitability of exporters to the USA increases once the Agreement is implemented (Figure 2). Both profitability ratio and log of profits change their trends compared to the other two reference groups after 2012, similar to Baggs and Brander (2006). Interest coverage ratio (ICR) is calculated as the ratio of profits to interest expenses. Increasing ICR tells us that firms get financially healthier and more efficient. Note that interest expenses have remained relatively the same over the considered time frame. This data is available upon request.

2.1.3. Export Trends

The histogram at Figure 3 displays the distribution of overhang faced by the Colombian exporters to the US. The vast majority of the firms face positive overhang. Also, note that the number of transaction drops in 2011, and then increases after the Agreement is implemented. Finally, the export volume of the Colombian exporters to the US increases after 2012, compared to other exporting firms.

2.2. Trade Promotion Agreement: Background

Before the agreement implementation in May 2012, some Colombian products have already been receiving preferential treatment from the US based on the ATPA. Other goods faced positive binding tariffs that were instantly reduced to zero for the vast majority of them as it is discussed earlier. In 2011, roughly 90% of the Colombian products were imported to the USA without any import fees, and roughly 60% of the export volume qualified under the Andean Pact. The FTA guarantees free access to the US market in 99.9% of exported goods. According to the Agreement, over 65% of the exported goods have a positive binding tariff. Based on the estimates of Colombian authorities, the FTA should benefit predominantly small- and medium-sized firms due to potentially lower production and trade costs and new opportunities for technological improvement.

In addition to the reduction of binding tariffs, Colombian exporters faced a reduction in other non-tariff barriers, which, in turn, reduced the trade-related uncertainty. Figure 4 depicts the decline in trade costs, faced by agricultural exporters, after 2012. Chapter 5, Article 5.2 of the Trade Promotion Agreement (available through the Office of the United States Trade Representative) specifies that exporters from both countries shall face simplified customs clearing procedures, permitting the quick release of goods and allowing importers to pass the customs before the duties and other fees are determined. This part is vital for agricultural goods that are more time sensitive than manufacturing goods. The reduction in customs clearing time involves lower trade cost since goods do not have to be stored or have to be stored for a very short period (no longer than 48 h, according to the Agreement) before going through the customs. Therefore, uncertainty in trade costs is reduced due to the lower processing time. Tombe (2015) claims that trade costs are high for developing countries, especially in agricultural products, and claims that customs clearing costs are more harmful than tariffs since this type of exports is time sensitive. Figure 5 shows that manufacturing firms did not change their leverage after the Agreement was implemented. From Figure 4, we can notice that trade costs of manufacturing firms did not significantly change after 2012, suggesting the potential relationship between trade cost uncertainty and leverage.

Figure 3: Export summary, medians: number of transactions, a log of total FOB export volume, weighted average tariff overhang, by exporter type

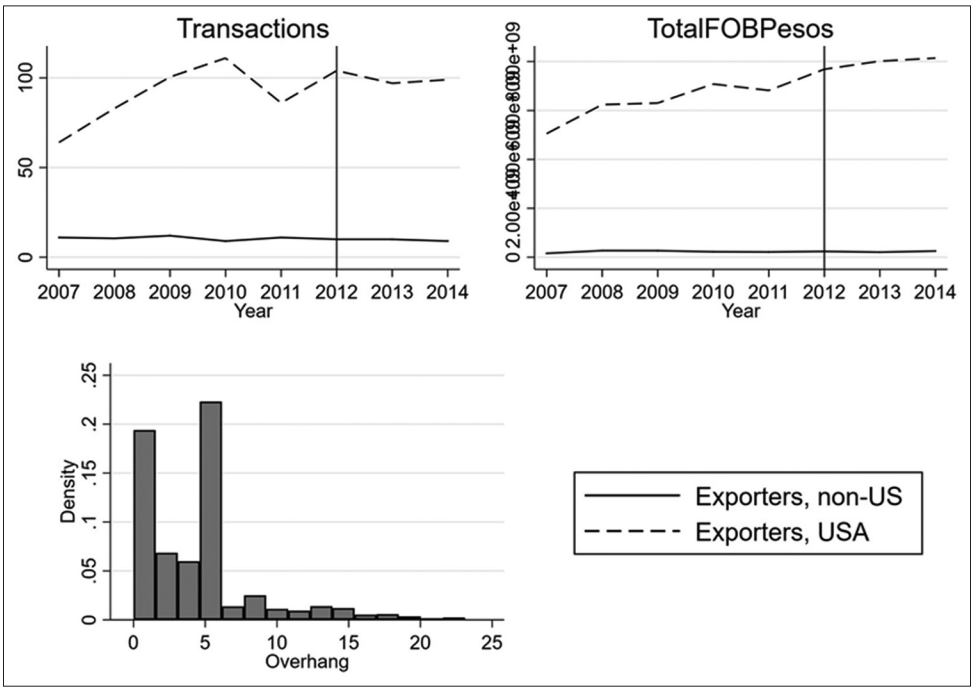
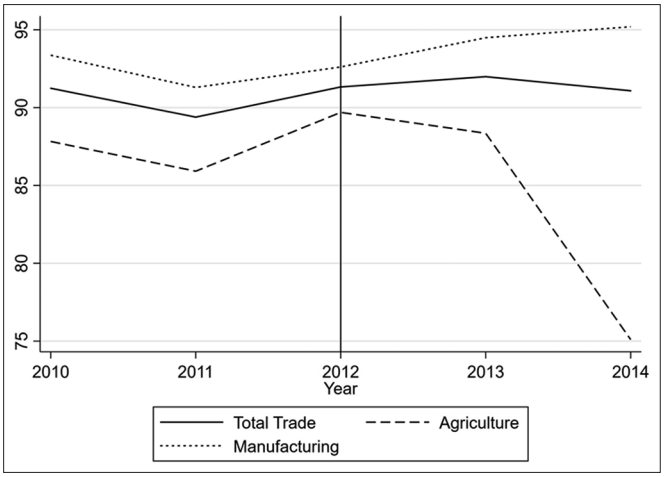
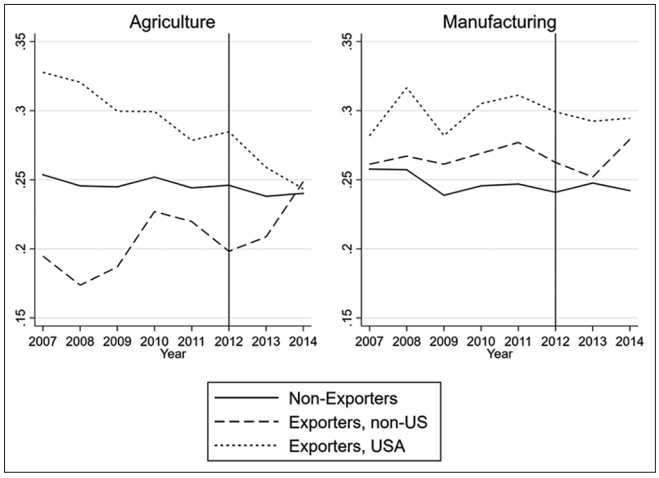


Figure 4: Trade costs between Colombia and the USA



Source: World Bank

Figure 5: Total debt to asset ratio, Agricultural vs. Manufacturing sectors



3. EMPIRICAL RESULTS

In this paper, I only focus on firms that are classified as agricultural producers according to ISIC Rev3.1, i.e. ISIC2 codes 1 and 5, and also wholesale and retail firms (ISIC codes 50 and 51) that export agricultural products. The sample includes firms that were continuous exporters to the USA from 2007 and 2014, continuous exporter to other countries, and non-exporting (domestic) firms from the above ISIC industries. The data satisfies the necessary requirements for using the difference-in-difference methodology: the divergence in trends (demonstrated earlier in the data section), distinct treatment and control groups, and the exogenous shock (2012 Trade Promotion Agreement). I estimate the following equations:

$$\text{Leverage}_{it} = \text{DID(Continuous US Exporter)}_{it} + \text{Pro f itability}_{it-1} + \text{Size}_{it-1} + \text{Tangibility}_{it-1} + \text{SectoralLeverage}_{it-1} + \{FE\} + \text{error}_{it} \quad (1)$$

I further interact the uncertainty measure with the diff-in-diff indicator to account for the differential uncertainty effects between firms:

$$\text{Leverage}_{it} = \text{DID(Continuous US Exporter)}_{it} \times \text{Uncertainty} + \text{Profitability}_{it-1} + \text{Size}_{it-1} + \text{Tangibility}_{it-1} + \text{SectoralLeverage}_{it-1} + \{FE\} + \text{error}_{it} \quad (2)$$

where:

- Leverage is measured using three variables: debt-to-asset ratio (DAR), Total debt to asset ratio (TDAR), and total financial obligations to asset ratio (TFOA)
- DID is a difference in difference indicator, that is equal to one for years greater or equal than 2012 (the date of the agreement) for the continuous exporters to the USA. Negative coefficient in front of this indicator is expected, meaning that the trade agreement is expected to lower the leverage of the Colombian exporters to the US.
- Profitability (log of profits, PAR or profit margins)
- Size - measured using log of total assets or sales
- Tangibility - tangible assets
- FE - firm and industry-time fixed effects.

Uncertainty - measure of uncertainty, proxied with tariff overhang, the number of shipments or CIF to FOB ratio I introduce several firm-level financial controls that have been found to be important determinants of leverage. According to Frank and Goyal (2009), these controls are profits, tangible assets, firm size and industry-specific characteristics of leverage. Estimation results show expected results with respect to the relationship signs. We can see that firms that have higher profits will tend to have lower leverage. This is consistent with the pecking order theory, which states that firms will prefer retained earning over expensive debt. Firms that have higher tangible assets can offer higher collateral and, thus, the relationship is also positive. Finally, larger firms are likely to have relatively higher leverage. The results are robust when other proxies of size are used, such as sales or export volumes.

To avoid concerns related to the problem of endogeneity, I first estimate a very simple difference-in-differences equation where the only explanatory variable is a diff-in-diff indicator. Table 1 presents the estimation results for all three leverage measures. Notice that the coefficient in front of the indicator is roughly the same in magnitude when different measures of debt are used. This makes it possible to conclude that the main source of the decline in leverage is through lower borrowing from the financial institutions. After the Agreement took place in 2012, leverage ratios of exporters to the USA falls, on average, by 0.023 every year after the Agreement.

Table 2 includes the estimation results of the specification (1). Columns (1) to (5) test the original specification with the added financial controls discussed above. The magnitudes of coefficient

Table 1: Estimation results, effect of the trade agreement on the leverage of exporters, the difference-in-differences indicator only

Variables	(1) DAR	(2) TDAR	(3) TFOA
DID	−0.0234**	−0.0274***	−0.0214**
	−0.0114	−0.0105	−0.00897
Observations	30,941	30,941	30,941
R-squared	0.339	0.352	0.302

Robust standard errors in parentheses: ***P<0.01, **P<0.05, *P<0.1

remain relatively the same (as they were obtained in Table 1) among all variables used, being slightly higher for the DAR variable (due to the broader definition of the variable).

Finally, Tables 3 and 4 include robustness checks. Columns (1) - (2) of Table 3 test the original specification with the original treatment group against the new control group: exporting firms to the US in the manufacturing sector only. The results are the same, with only coefficients slightly changing in their value. Table 4 reports the estimates for the cohort of firms that have been exporters to the US from 2008, and the sample is shortened to cover years from 2008 to 2014. The following three specification test

Table 2: Estimation results, difference-in-differences specification (1)

Variables	(1) DAR	(2) DAR	(3) TDAR	(4) TFOA	(5) TFOA
DID	−0.0266***	−0.0265***	−0.0224**	−0.0220***	−0.0202**
	(0.00857)	(0.00853)	(0.00913)	(0.00749)	(0.00788)
$Tangibility_{t-1}$	0.110***	0.0990***	0.144***	0.0739***	0.0607***
	(0.0148)	(0.0139)	(0.0267)	(0.0113)	(0.0122)
$log(Profit)_{t-1}$	−0.00957***	−0.0109***		−0.00370***	
	(0.00116)	(0.00111)		(0.000828)	
$log(Assets)_{t-1}$	0.0146***				
	(0.00473)				
$log(Sales)_{t-1}$		0.0212***	−0.0103*	0.0139***	0.0118
		(0.00384)	(0.00565)	(0.00243)	(0.00745)
PAR_{t-1}					−0.315
					(0.271)
Observations	25,936	25,763	29,236	25,763	29,237
R-squared	0.843	0.847	0.358	0.784	0.313

Robust standard errors in parentheses: *** P<0.01, **P<0.05, * P<0.1

Table 3: Estimation results, the interaction of the difference-in-differences indicator with uncertainty proxy, log of transactions and the tariff overhang

Variables	(1) DAR	(2) TFOA	(3) DAR	(4) TDAR
	Log (Transactions)		Tariff Overhang	
DID×*Uncertainty*	−0.00491***	−0.00399**	−0.00510***	−0.00467***
	(0.00170)	(0.00156)	(0.00186)	(0.00157)
$Tangibility_{t-1}$	0.110***	0.0741***	0.109***	0.112***
	(0.0148)	(0.0113)	(0.0148)	(0.0138)
$log(Profit)_{t-1}$	−0.00958***	−0.00371***	−0.00960***	−0.00753***
	(0.00116)	(0.000829)	(0.00116)	(0.00109)
$log(Assets)_{t-1}$	0.0145***		0.0147***	
	(0.00474)		(0.00473)	
$log(Sales)_{t-1}$	0.0139***		0.00755**	
	(0.00243)		(0.00342)	
Observations	25,936	25,763	25,936	25,763
R-squared	0.843	0.784	0.843	0.777

Robust standard errors in parentheses: ***P<0.01, **P<0.05, *P<0.1

Table 4: Robustness checks, 2008 cohort. Control group consists of manufacturing exporters to the USA. Uncertainty is proxied using the tariff overhang

Variables	(1) TDAR	(2) DAR	(3) TDAR	(4) TDAR
DID	−0.0224***	−0.0259***	−0.0266***	
	(0.00686)	(0.00780)	(0.00697)	
$Tangibility_{t-1}$	0.117***	0.00951	0.0509*	0.0512*
	(0.0153)	(0.0316)	(0.0264)	(0.0263)
$log(Profit)_{t-1}$	−0.00849***	−0.00857***	−0.00642***	−0.00657***
	(0.00123)	(0.00164)	(0.00170)	(0.00170)
$log(Assets)_{t-1}$	0.0317***	0.0112	0.0257***	0.0259***
	(0.00483)	(0.00898)	(0.00858)	(0.00865)
DID×*Uncertainty*				−0.00430***
				(0.00137)
Observations	23,328	7,272	7,272	7,272
R-squared	0.792	0.855	0.822	0.822

Robust standard errors in parentheses. *** P<0.01, **P<0.05, * P<0.1

the 2008 cohort against manufacturing firms, and the diff-in-diff coefficient remains significant and negative. The last two columns of Table 4 include firms that entered the US exporting market in 2010 or prior years. Column (4) includes manufacturing as the control group, and column (5) tests it against other exporters and local firms. Both the interaction coefficient and the diff-in-diff indicator remain significant.

In the next Section I propose a model that will account for the observed trends and estimation results, namely: increasing profits, declining leverage and increasing export volume (see the Data Trends subsection).

4. MODEL

In this section, I introduce a product market uncertainty model, where firms issue debt in the presence of uncertainty about their output market. I closely follow Brander and Lewis (1986) and Wanzenried (2003) in the setup of the model. Consider n firms that compete in the oligopolistic environment. Firm i faces a linear demand $p_i = A - q_i - \sum n\, q_j$, where i and j are indexes of the firms and A is market size, and we assume that goods are perfect substitutes. This assumption is necessary for the derivation of the n-firm case, since it does not require any further assumptions on $n\,(n-1)/2$ cross-pair product differentiation parameters between n firms.

Suppose that firms face the uniformly distributed shock u_i associated with their future profits, such that $u_i \in (u;\bar{u}), u > 0$. The shock includes both favorable and unfavorable states. For example, agricultural exporters could be facing potentially higher trade costs due to the uncertainty in customs clearing time. Similarly, firms may experience higher demand due to the lower competition from other exporters, or a faster customs clearing time. Additionally, I impose the restriction on the magnitude of the shock, similar to (Wanzenried, 2003), to ensure positive debt levels: $\bar{u} < (A - \tau c)(n-1)/(n^2+1)$.

This is a two stage model. First, each firm chooses a debt level D_i, and then managers make their respective production decisions. Let ρ_i be the interest rate specific to this debt contract. The marginal costs of each firm are constant, such that $MC = \tau c$, where c is constant production cost; τ is the iceberg trade cost $\tau > 1$. I further assume that shocks between firms are distributed independently. Each firm makes an offer to the investor with the amount of the chosen debt and the corresponding interest rate, that is determined endogenously. The firm goes bankrupt with probability $\psi = (\hat{u}_i + \bar{u})/2\bar{u}$, where $\hat{u}_i$ is the critical shock level, such that firm breaks even after the repayment of the debt D_i. Firm's break-even condition is then:

$$\left(A - q_i - \sum_{j\neq i}^{n} q_j - \tau c + \hat{u}_i\right) q_i - D_i(1+\rho_i) = 0 \tag{3}$$

If a firm defaults on its debt obligations, the investor receives operational profits of this firm. Assuming that the investor is risk-neutral, the following equation represents investor's participation constraint:

$$D_i = (1-\psi)(1+\rho_i) D_i + \psi E[R_i u_i < \hat{u}_i] \tag{4}$$

where $E[R_i \mid u_i < \hat{u}_i]$ is the expected operational profit in case of bankruptcy. In other words, investors should be breaking even in expectation, thus, their expected payoff is zero.

The problem is solved using backward induction. At the second stage of the game manager treats debt level D_i as given, and the only objective is to maximize the expected net profit, also called expected total value of a firm, represented by the following optimization problem:

$$\max_{qi} E[V_i(q_i, \sum_{j\neq i}^{n} q_j)] = \int_{\hat{u}_i}^{\bar{u}} \Omega f(u_i)\, du_i + \int_{-\bar{u}}^{\hat{u}_i} 0 du_i \tag{5}$$

where $\Omega = \left[\left(A - q_i - \sum_{j\neq i}^{n} q_j - \tau c + u_i\right) q_i\right]$. The first term in the objective function tells us that firm i is able to make profit if the shock level is higher than the critical level $\hat{u}_i$ The second term is zero, since if u_i is lower than the critical level, a firm cannot repay the loan, thus, it is forced to default on its debt obligations, leaving all operational profits to the investor.

Taking F.O.C. with respect to q_i, and setting it equal to 0, we obtain the following best response functions:

$$q_i\left(\hat{u}_i, \sum_{j\neq i}^{n} q_j\right) = \frac{A - \tau c}{2} - \frac{1}{2}\sum_{j\neq i}^{n} q_j + \frac{\hat{u}_i + \bar{u}}{4} \tag{6}$$

Substituting each q_j into the expression above and solving a system of equations, we get an expression for the best response function:

$$q_i\left(\hat{u}_i, \sum_{j\neq i}^{n} \hat{u}_j\right) = \frac{2(A - \tau c) + n\hat{u}_i - \sum_{j\neq i}^{n} \hat{u}_j + \bar{u}}{2(n+1)} \tag{7}$$

Since the best response functions now depend only on the critical shock levels of all firms, I substitute the above expressions for quantities, into the total expected profits expression and solve for the optimal critical shock level $\hat{u}^*$ that will maximize these profits:

$$\max_{\hat{u}_i} E[\pi(\hat{u}_1, \sum_{j\neq i}^{n} \hat{u}_j)] = \int_{-\bar{u}}^{\bar{u}} [H] f(u_i)\, du_i \tag{8}$$

Where $H = (A - q_i - \sum_{j\neq i}^{n} q_j - \tau c + u_i) \times q_i$, and each q_i and q_j are the functions of all n critical shocks from equation (7) Differentiating with respect to the critical shock level, we obtain the following expression for the critical shock:

$$\hat{u}_i^* = \frac{2(A - \tau c)(n-1)}{n^2 + 1} - \bar{u} \tag{9}$$

Using the above expression, we can plug it into the appropriate best response function to obtain optimal quantity:

$$q_i^* = \frac{n(A-\tau c)}{n^2+1} > q_i^{c*} = \frac{(A-\tau c)}{n+1} \quad (10)$$

where *qc∗* is the output in the standard Cournot model. The presence of uncertainty motivates firm to implement a more aggressive output strategy. Note that the quantity, optimal shock and profit levels will be identical between all firms due to the symmetry.

Using the expressions for quantity and critical shock, I solve for expected profits:

$$E\pi_i = \frac{n(A-\tau c)^2}{(n^2+1)^2} < E\pi_i^c = \frac{(A-\tau c)^2}{(n+1)^2} \quad (11)$$

and probability of default:

$$\Psi = \frac{\bar{u}+\hat{u}_i^*}{2\bar{u}} = \frac{(A-\tau c)(n-1)}{\bar{u}(n^2+1)} \quad (12)$$

Comparing new profit levels to the Cournot ones, one can notice that the new more aggressive output leads to a lower expected profits. Therefore, presence of uncertainty is also harmful for profitability.

We can solve for the optimal debt level, using the investor's participation constraint and firm's break-even condition. Plugging expressions for quantity and critical shock, together with the bankruptcy probabilities into the participation and break-even constraints, I obtain the optimal debt level:

$$D_i^* = \frac{n(A-\tau c)^2}{(n^2+1)^2} + \frac{n(A-\tau c)2(A-\tau c)(n-1)(n^2+1)\bar{u}}{\bar{u}(n^2+1)^3} + \frac{\overline{u^2}(n^2+1)^2 - (A-\tau c)^2(n-1)^2\bar{u}}{\bar{u}(n^2+1)^3} \quad (13)$$

4.1. Proposition: Reduction in Uncertainty Leads to the Decline in Leverage

$$\frac{\partial D_i}{\partial \bar{u}} = \frac{n(A-\tau c)}{n^2+1}\left(\frac{A^2(n-1)^2 - \overline{u^2}(n^2+1)^2}{\overline{u^2}(n^2+1)^2}\right) > 0 \quad (14)$$

Therefore, reduction in uncertainty leads to lower optimal debt levels. In other words, lower volatility in costs and demand incentivizes firms to act less aggressively.

5. CONCLUDING REMARKS

This paper explores the effects of trade cost uncertainty reduction on the borrowing decisions of exporters. I use the structural break caused by the free trade agreement between Colombia and the USA to show the differential effects on leverage between the Colombian exporters to the USA, other exporters, and local firms. I suggest a model that endogenizes borrowing decisions and product market characteristics in the form of cost uncertainty. The model predicts higher output, higher profits, and lower leverage after the reduction in uncertainty.

The paper also demonstrates that trade agreements can benefit firms through the financial channel in addition to lower trade barriers and trade costs. FTA's reduce uncertainty about trade cost, leading to a decline in a firm's leverage. Lower debt levels reduce the financial burden for the exporters in countries like Colombia that are characterized by imperfect capital markets.

Further research is required to strengthen the claims of this paper. So far the data does not allow to check whether the exported products did comply with the rules of origin. One way to do it would be to calculate the percentage of complied goods using the USITC import data. Moreover, a better proxy for uncertainty is required that would incorporate some firm-specific trade cost measures. Finally, this model accounts only for strategic use of debt and leaves it to further studies to account for operational usage of debt, its timing, and managerial motives.

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