Credit Constraints and Spillover Effects of Financial Market Liberalization: Case of Colombia

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Abstract

Using updated measures of sectoral external finance dependence adapted to fit the Colombian economy, we show that financial liberalization as a result of the US-Colombia Trade Promotion Agreement in 2012 increased exports by firms in financially vulnerable sectors more than firms in less financially dependent sectors, with a one unit increase in financial vulnerability associated with an 18% increase in firm exports. Intuition would dictate that exports to the US should increase following lower tariffs; in fact, we see relatively higher exports in vulnerable sectors for Colombian exports to other countries, not exports to the United States, indicating that we should not credit lower tariffs for this effect. Rather, the financial development encouraged by the agreement had spillover effects. Reduction in the capital controls, financial market liberalization, and growth in the FDI increased export opportunities elsewhere.

1 Introduction

Critics of recent deep trade agreements point to sectors that remain protected (Rodrik, 2018; Stiglitz, 2019) as other sectors are liberalized to explain their dissatisfaction. We offer evidence to trade negotiators that relaxing those protections can in fact generate positive externalities for the rest of the economy, and therefore less protections should be afforded to those sectors.[1] We study Colombia's protected financial sector, reformed in 2012-2013 to comply with the US-Colombia Trade Promotion Agreement. The agreement *inter alia*, allows foreign financial services greater access to the Colombian market, generating spillovers to manufacturing firms, wholesale firms, and other firms who now have greater access to credit. Firms that rely relatively more on borrowing and external financing experience an economically and statistically significant increase in exports to third-party countries, especially those countries that are less financially developed than Colombia, following the US-Colombia Trade Promotion Agreement. Overall, a one standard deviation increase in the external finance dependence of a sector is associated with 18% higher levels of exports following the trade agreement. Given that the effect is even stronger when we consider Colombian exports to countries with lower levels of financial development, and the effect disappears when we consider exports to countries with higher levels of financial development, we attribute it to the financial reforms.

We argue that the agreement, whose negotiations concluded in 2006, pushed domestic reform in Colombia's financial services sector. The two relevant provisions of the trade agreement for our purpose include: (i) a reformed right of establishment, and (ii) permitting the purchase of insurance from foreign companies.[2] Previously, market access restrictions kept many foreign financial institutions out of Colombia. By law, they needed to form autonomous subsidiaries to operate in Colombia. Under the agreement, foreign banks and insurance companies could establish branches

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[1]Critics like Rodrik (2018) and Stiglitz (2019) correctly point out that some of these sectors require more regulations, especially the financial sector which we study in this paper. We agree that some protections should remain in place that can shelter economies from risky practices large multinational financial firms may engage in. However, this paper focuses on the benefits of allowing access to new sources of financial services with lower barriers to entry.

[2]The agreement also permanently reduced most tariffs to zero. However, prior to the agreement, Colombia already faced low tariffs when exporting to the US under the Generalized System of Preferences. Thus, the more interesting trade effects come from other provisions.

in Colombia or offer services without a local presence starting in 2013. Other reforms at the time included simplifying access to investment products by private investors and mutual funds, and offering preferential tax incentives for foreign investors (OECD, 2016). The resulting capital flows would be expected to reduce credit constraints for Colombian firms (Harrison et al., 2004; Héricourt and Poncet, 2009; Manova et al., 2015).

The lag between negotiations, which occurred when Colombia was experiencing a general shift in policy towards liberalization, and the agreement entering into force helps disentangle potential endogeneity concerns of the signing of the agreement. The period leading up to the end of negotiations saw large gains in financial market liberalizations: 1988 to 1994, Colombia's Laeven index of financial liberalization increased from 0 (lowest value) to 6.0 (the highest value) (Arbeláez and Echavarría, 2002), and from 2003 to 2004, foreign investment increased by 66% (Leech, 2005). These statistics indicate that Colombia became more open to trade before the period we study, and 2012 represents the relaxation of a major barrier to access foreign financial services.

Prior to the financial services market liberalization, manufacturing firms reported higher levels of difficulty obtaining external financing: in 2007-2008, nearly 25% of 7,683 manufacturing firms responded to a survey that the access to external financing was a "high" obstacle to innovation. In 2011-2012, just before the reforms were officially enacted, 274 firms (11% of firms that were interested in innovating) reported they were unable to innovate. Two-thirds of those firms reported access to external financing was a "high" or "medium" obstacle. From 2013-2014, the proportion of firms in this category fell to 55%, indicating more firms are finding external financing less of a burden to technological improvements.

Previous literature on credit constraints and financial development support our main result that firms in financially vulnerable sectors benefit more than less vulnerable firms from the trade agreement and subsequent financial market reforms. Manova (2008) shows a similar result following equity market liberalizations. After financial market reforms, financially vulnerable sectors in 91 countries increased exports to the rest of the world more than sectors that relied less on external financing. Previous cross-sectional studies found financially developed countries have the compar-

ative advantage in exporting in sectors with higher external finance dependence. Manova's use of time, country, and sector fixed effects go further to establish the causal effect of equity market liberalization. Here, we generally follow Manova's identification strategy, using a shock to Colombian financial markets, along with time and sector fixed effects. Instead of considering the exports of 27 three-digit ISIC manufacturing sectors across multiple countries as Manova does, we disaggregate the data into 226 four-digit ISIC sectors (both manufacturing and non-manufacturing, including agriculture and wholesale), compute Colombia-specific external finance dependence measures, and consider variations across total firm exports. With narrowly defined four-digit sectoral fixed effects, we are comparing how firms deviate from the average exports within their sector before and after the trade agreement.

Manova (2008) uses measures of external financial dependence created by Rajan and Zingales (1998); these are also the preferred measures of most research on credit constraints, measuring for each sector the average amount of capital investment not financed by firm cash flows. Sectors with low external finance dependence rely more on internal sources of funding. The measures, based on US publicly traded firm balance sheets from *Compustat* during the 1980's, have persisted in large part because of their plausible exogeneity. The US is considered to be financially developed; firms that desire external financing should be able to obtain it. In countries with lower financial development, this may not be the case. Thus, using US measures eliminates friction and potential endogeneity issues. On the other hand, the Rajan and Zingales' measures are restricted to manufacturing sectors decades ago. Much has changed in production processes since then, and constraints across countries may vary based on available technology and resource endowments. Recreating similar measures specifically for the Colombian economy accounts for these differences. We argue that the potential endogeneity issues (specifically, that firms who seek external financing but cannot find it) are not significant based on survey findings. We also find that our baseline results are qualitatively unchanged by using the original Rajan and Zingales (1998) measures.

An additional factor to consider is where financing for exports occurs. Schmidt-Eisenlohr (2013) proposes a model of trade financing where financial market conditions in the source and im-

porting countries dictate the contract selected by trading partners: transactions should be financed in whichever country has lower financing costs and weaker contract enforcement. Financing in the country with lower costs translates to minimizing the interest rate; financing in the country with weaker contract enforcement reduces the risk of default by the partner who did not pre-finance. Using transactional data from US poultry exporters, Antras and Foley (2015) confirm that cash in advance (importer financed) and letter of credit (bank financed) transactions are more likely than open account (exporter financed) when the importing country has weaker contract enforcement. However, Ahn et al. (2011) found that approximately 90% of Colombian imports are open account while 5% of imports are financed by letters of credit. Ahn proposes an alternative model where open account financing is relatively cheaper because lenders are less likely to experience a default. In Ahn's model, the exporter borrows from a bank. Upon sale of the final goods, the importer pays the bank, which automatically deducts the loan to the exporter. If the importer defaults, then the exporter still has an opportunity to repay the loan, creating less risk for the bank. This is surprising in Colombia because theory would predict that many more transactions should have been financed in other countries with lower financing costs. When Colombia gains greater access to US financial services, we expect Colombian firms gain access to more financing options. Since they are the primary borrowers, access to financing may mean less chance of defaulting on export loans to most of their destinations. This should be more meaningful for firms in financially vulnerable sectors, especially in their exports to countries with lower financial development.

The rest of the paper proceeds as follows: Section 2 introduces trends around the data; Section 3 discusses the method of constructing sectoral financial dependence measures; Section 4 refreshes the standard credit constraints with heterogeneous firms theoretical model; Section 5 introduces the empirical model; Section 6 discusses the results and robustness checks; and Section 7 concludes.

2 Stylized Facts

Before moving into the data, model, and results, we first present stylized facts about the trends surrounding FDI and trade in Colombia.

2.1 Foreign Direct Investment Flows

Figure 1: Colombian FDI, financial services, and manufacturing. Source: Colombian Central Bank
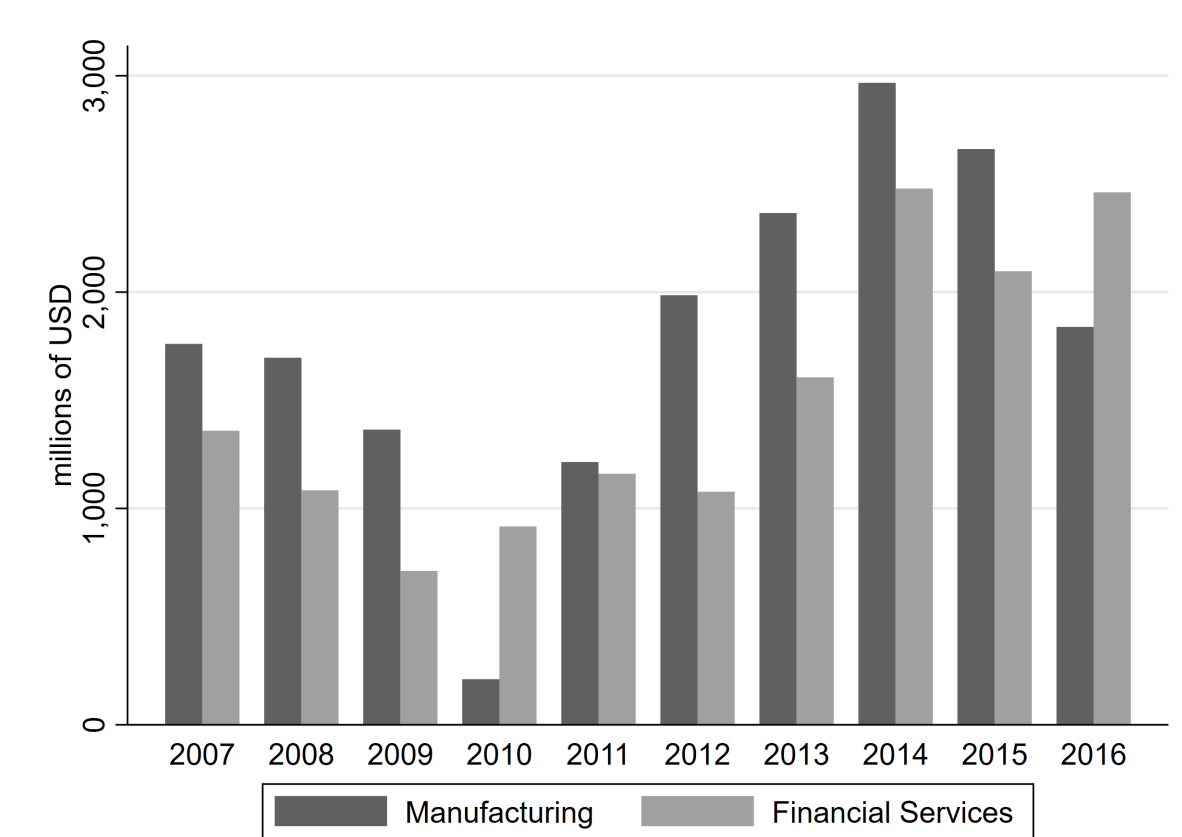
Figures 1- 3 present several stylized facts about capital (FDI) flows to Colombia. First, Colombian FDI increases from 2012 onward. Two major industries that received financial flows are manufacturing and financial services. While investment in manufacturing started growing from 2012, financial services attracted more capital from abroad starting from 2013. This fact could be explained by the series of financial reforms reducing capital controls to comply with the trade

Figure 2: FDI in financial services, total vs the USA. Source: Colombian Central Bank
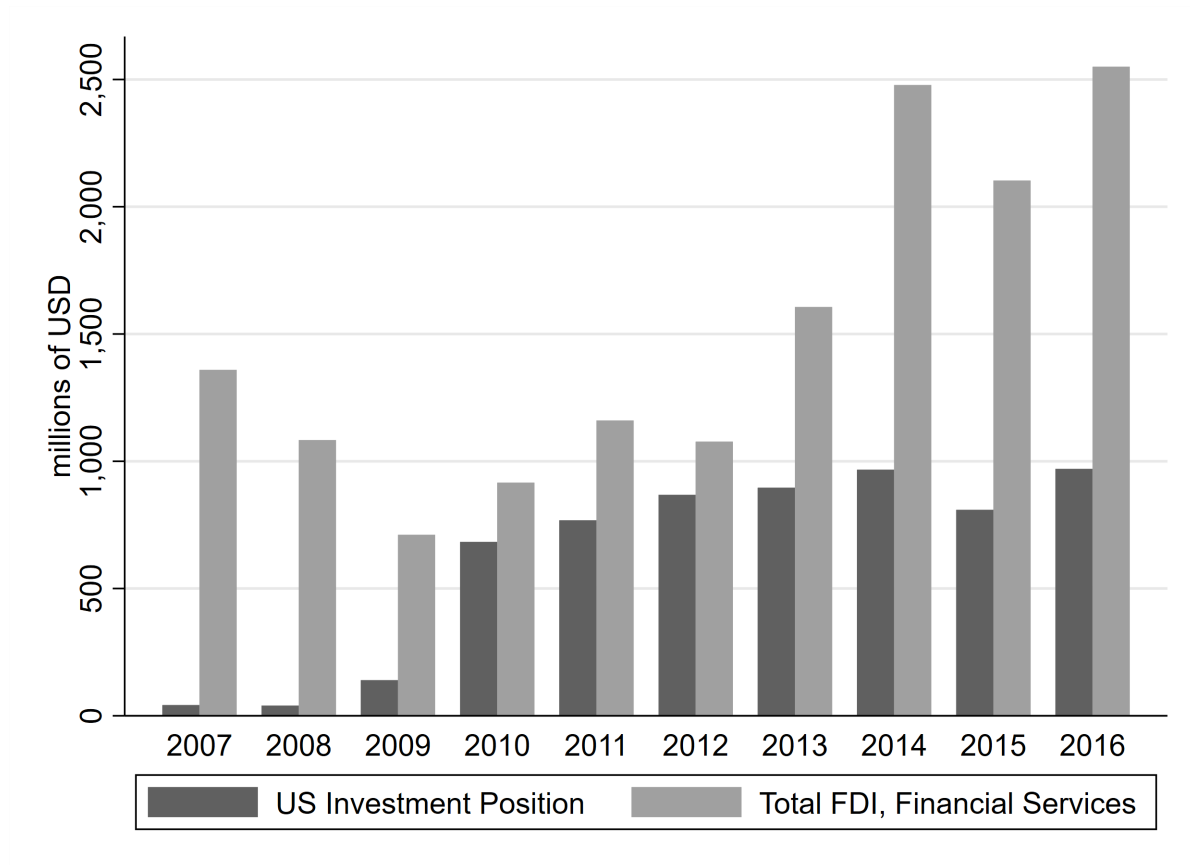

agreement. FDI flows into the financial services market from the US did not increase after the trade agreement took place, but FDI from other countries like Panama and the Bermudas did rise. This supports our conjecture that the financial reforms opened new channels for investment from more than just US financial institutions: capital flows overall in Colombia increased.

2.2 Trade Flows

Colombian exports grew from $10 billion USD to $15 billion USD between 1995 and 2003. After 2003, exports skyrocketed; in 2007, just four years later and when our analysis begins, exports totaled around $25 billion USD (see Figure 4 for US and worldwide exports). Roughly a third of Colombia's exports go to the United States, with half of those exports related to oil. Given

Figure 3: Colombian FDI from USA, Panama and Bermudas. Source: Colombian Central Bank
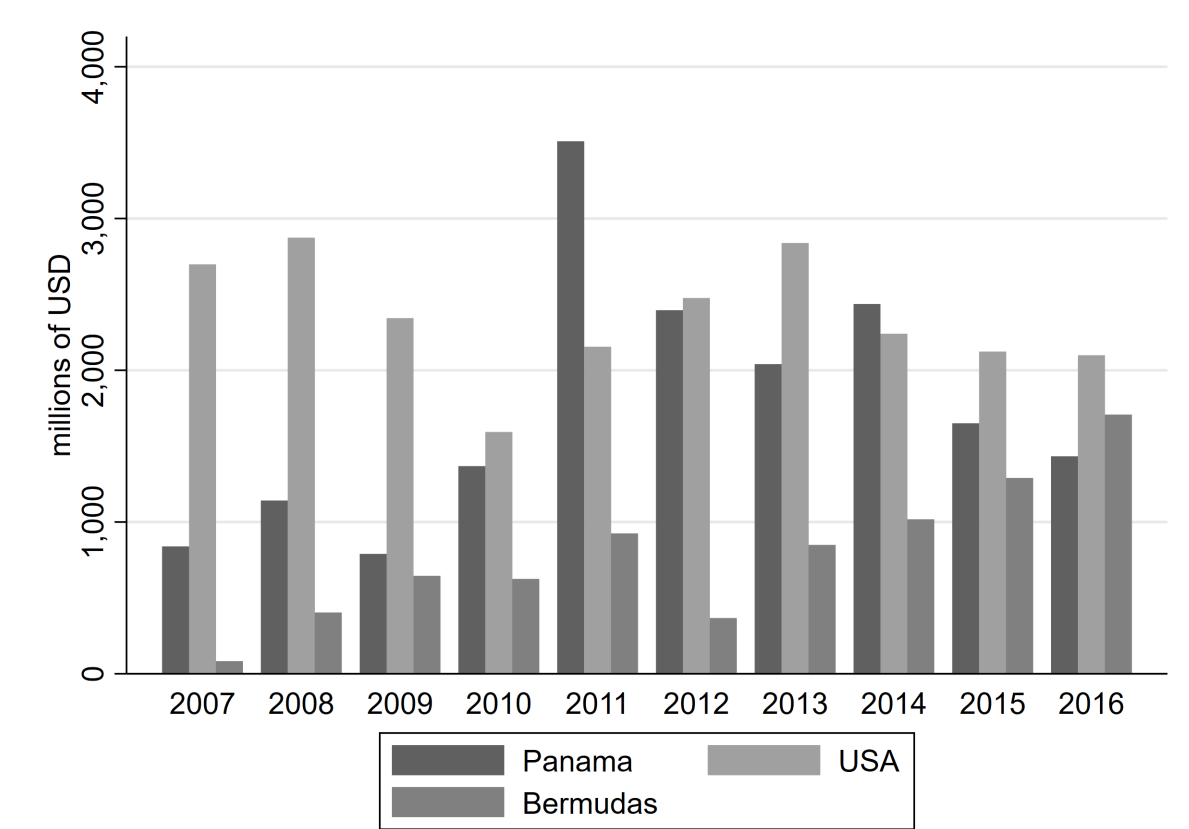
the globalization of Colombia, the importance of the US as a trading partner, and the convenient location of Colombia with ports in both the Atlantic and Pacific Oceans, it is no surprise that the two countries signed a trade agreement in 2012. What is more surprising is the sharp decline in Colombian exports worldwide and to the US following the agreement. Exports dropped from a peak in 2012 at around $60 billion USD to $30 billion USD in 2016. The fall in exports is due to declining oil prices (Figure 5 shows a smaller decline in non-oil exports to the US and worldwide), contraction in global demand, and rapid devaluation of the Colombian Peso (Figure 6) that reduced imports (WTO, 2018). Since Colombia is part of global supply chains, fewer imports translates to fewer exports. These changes in oil prices and exchange rates worked against the changes that may have been observed following the agreement entering into force, as they are decreasing Colombian exports. We will account for exchange rate fluctuations through time fixed effects in our empirical

Figure 4: Total Exports

model. We have also tested the model excluding oil exports; the results were very similar to our baseline model and are available upon request.

3   Data

All non-financial firms above a certain size are required to submit balance sheets to the *Superintendencia de sociedades*, a branch of the Ministry of Commerce, Industry, and Tourism. Thus, data include both publicly and non-publicly traded firms. Data also extend beyond the manufacturing sector to include wholesale/retail, construction, and agriculture, among other sectors. The balance sheets range from 1995 to 2015. Each year, firms must report the four-digit ISIC sector they operate within. These classifications are fluid: while firms tend to have a sector they frequently report, the sector may change year to year. For example, Goodyear, the tire company, sometimes reports a manufacturing sector and sometimes reports a retail sector. We assign each firm a primary sector: the sector which they report most often to smooth out these fluctuations. In addition to balance
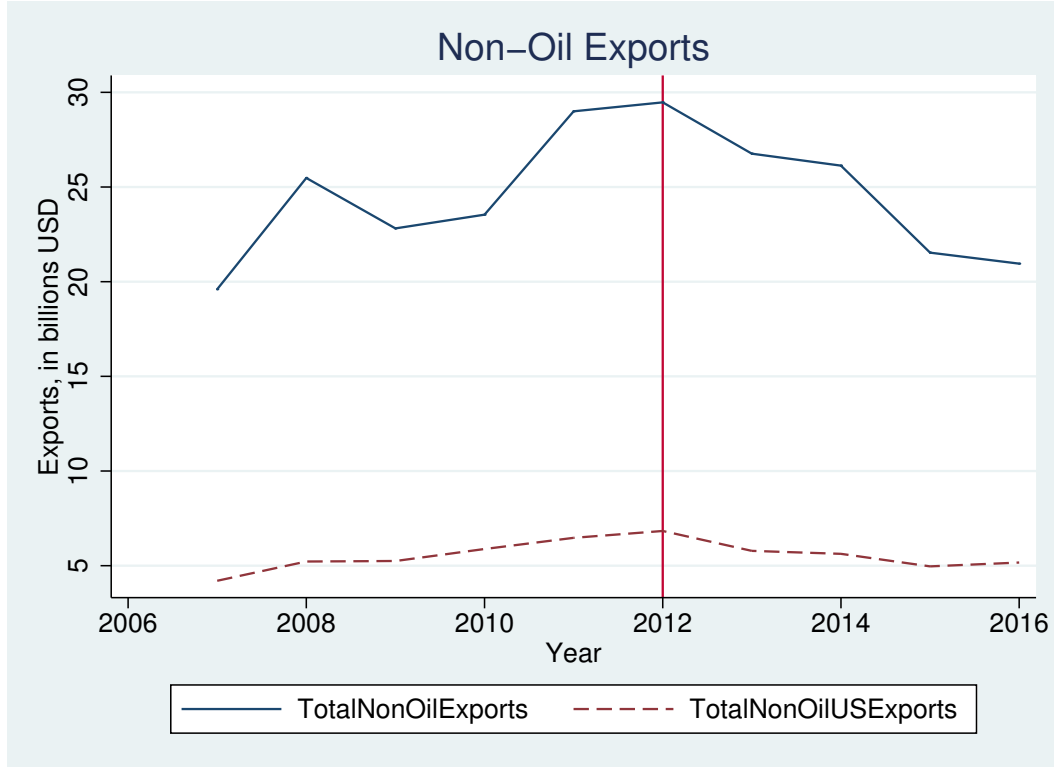
Figure 5: Total Non-Oil Exports

sheet data, we obtain firm-product-destination level data on exports from *DataMyne.com* for 2007 to 2016, providing data on four years before and four years after the signing of the US-Colombia trade agreement. Firms are matched between the datasets on their unique tax identification code, the NIT.

We use the balance sheet data to construct sectoral measures of external finance dependence as in Rajan and Zingales (1998). For each firm, we subtract the total cash flows from operations from the total cash flows from investment activities (eg, purchases and sales of capital) over all years. Then, we divide by the total cash flows from investment activities, yielding a percentage of investment activities not financed internally. Aggregating across years smoothes out timing of investment decisions made by firms. Once each firm has a percentage of investment not financed internally, we take the median firm by four-digit ISIC sector to eliminate the influence of outliers. Table 1 shows the summary statistics of sectoral external finance of sectors, grouped by broader industry. As noted, Rajan and Zingales (1998) only uses manufacturing firms. However, due to
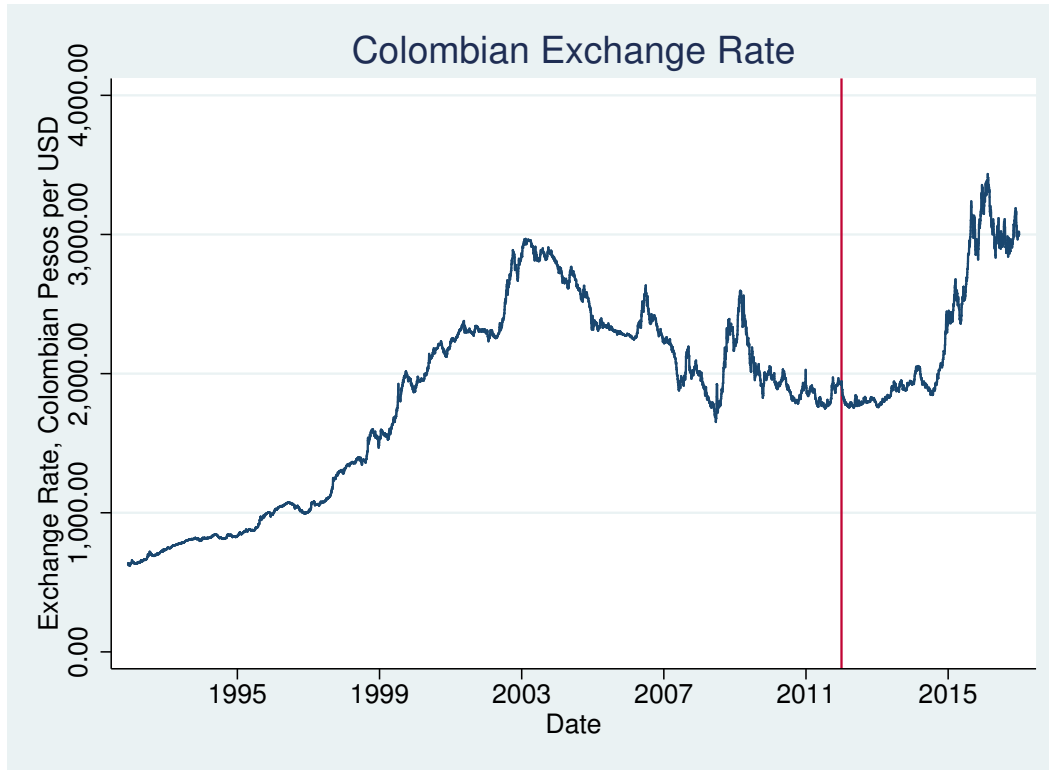
Figure 6: Daily Exchange Rate

firms fluid classification into ISIC sectors- the classification each year is based on which sector the firm contributed the most value to in that year (United Nations Statistical Commission, 2002)- we compute external finance dependence for all sectors. Table 2 shows the external finance dependence ranking of the most and least vulnerable sectors, excluding outliers. The average sectoral external finance dependence is 0.0609 with a standard deviation of 0.9812.

Using actual amounts invested by Colombian firms may be problematic, but we do not believe it enters into play here. First, the period under study follows major financial market liberalizations. Second, using a period of 20 years reduces the influence of business cycles and credit crunches. Finally, evidence in the manufacturing sector suggests access to external credit was generally not considered an obstacle to innovation.[3] Table 3 shows the results of a survey of firms that innovated or planned on innovating over the years 2007-2014 mentioned in Section 1. While nearly 25% of innovating manufacturing firms in 2007 and 2008 felt access to external finance was a significant

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[3]"Innovation" includes improving the production process, purchasing new capital, researching new products or markets, or applying for intellectual property licenses, for example.

barrier (timed around a credit crunch), this fraction declined to less than 20% in the following survey. Later surveys break down these values further: in 2011-2012, of the 389 manufacturing firms that indicated access to external financing was a high barrier to innovation, only 86 firms were actually unable to make an investment (3.5% of all firms intending to innovate during that period). By aggregating investments over 20 years, we minimize the effects of firms not having access to external financing in any particular year.

Table 4 compares our measures to the original Rajan and Zingales (1998) and augmented Kroszner et al. (2007) measures of external finance dependence. Many, though not all, of the rankings are similar across the three measures, indicating that US measures of external finance dependence may not be representative of Colombia's financial situation, while still exhibiting similarities. The estimated correlation between the Rajan and Zingales measures and our measures is 0.1958; the correlation between the Kroszner updated measures and our measures is 0.3873.

We match firms and their sectoral external finance dependence measures with firm-destination-year export data from 2007 until 2016 in our empirical model.

4 Theoretical Model

Conceptually, the theoretical model is based on Manova (2013), summarized below. Consumers love variety. Firms in Colombia in sector s face a sunk sector-specific entry cost, $c_s f_e$. They draw productivity $\frac{1}{a}$ from a CDF $G(a)$ with support $[a_L, a_H]$. The marginal cost of production is $c_s a$. There are no fixed costs or borrowing requirements for domestic production. However, firms that export to destination i pay fixed cost $c_s f_i$ each period along with iceberg trade costs $\tau_i > 1$. A fraction $d_s \in (0,1)$ of the fixed cost of exporting must be paid up-front and covered by outside capital, so firms must borrow $d_s c_s f_i$. They pledge collateral; a fraction $t_s \in (0,1)$ of the entry cost $c_s f_e$ can be used for this purpose. Firms in more financially vulnerable sectors must either bear more of the fixed cost up-front (higher d_s) or are less able to use tangible assets as collateral (lower t_s). Within Colombia, $1 - \lambda$, where $0 \leq \lambda \leq 1$, represents the probability that a firm defaults on

Table 1: Summary Statistics for External Finance

Industry	Number of Sectors	Average Firms per Sector	Mean	Standard Deviation	Min	Max
Agriculture	9	346	.182	.12	-.03	.322
Fishing	1	100	.421	.	.421	.421
Mining	12	116	.452	.357	-.035	1.24
Manufacturing	120	67	-.0426	1.3	-12.7	2.26
Electricity	4	33.5	.171	.336	-.241	.515
Construction	5	1415	.122	.0883	.00929	.238
Wholesale	24	584	-.0233	.422	-1.8	.556
Hotels and restaurants	2	482	.0237	.0213	.00864	.0387
Transport	17	135	.0175	.195	-.489	.246
Financial Intermediation	6	471	.687	.807	.092	2.23
Real estate	31	350	-.0542	.529	-1.35	2.11
Public administration	4	1.2	-163	331	-659	5.97
Education	4	31.5	.153	.229	-.0575	.473
Health	6	48.8	-.235	1.24	-2.54	1.24
Other service	19	49.3	-.0338	3.6	-12.5	8.53
Private households	1	13	.839	.	.839	.839
Extra-territorial organizations	1	5	-.000373	.	-.000373	-.000373

External finance dependence is defined in the text. These measures are based on all non-financial firms reporting balance sheets. Firms are classified based on their most-reported ISIC Revision 3.1 industry.

Sector	Rank	External Finance Dependence
3592	1	1.41
3591	2	1.38
5164	3	1.32
9111	4	1.29
8532	5	1.24
1030	6	1.24
7530	7	1.2
5149	8	1.04
3530	9	1.01
6711	10	.888
3512	257	-.771
6720	258	-.829
3312	259	-.928
1600	260	-1.07
3410	261	-1.16
3230	262	-1.23
2911	263	-1.24
7495	264	-1.35
2913	265	-1.49
3693	266	-1.58

Table 2: Ranks for External Finance Dependence of ISIC Rev. 3 sectors, excluding major outliers (top and bottom 1 percentiles).

Table 3: Manufacturing Firms with Credit Constraints

Years	Number of Innovators (Actual and Potential)	Importance of Access to External Financing as Obstacle to Innovation		
		High	Medium	Low
2007-2008	7,683	1,895	1,417	4,371
2009-2010	3,406	584	1,087	1,735
2011-2012	2,410	389	694	1,327
2013-2014	2,047	292	670	1,085
Years	Number who were unable to innovate	Importance of Access to External Financing as Obstacle to Innovation		
		High	Medium	Low
2007-2008	-	-	-	-
2009-2010	-	-	-	-
2011-2012	274	86	97	91
2013-2014	203	51	62	90

Data from EDIT Survey

Table 4: Ranks Comparing to Rajan and Zingales (RZ) and Kroszner et al. (KLK)

ISIC Rev. 2	Ext Dep	Fin	RZ	KLK	Rank RZ	Rank KLK	Rank
311	.104		.137	-.15	18	24	9
313	.157		.0772	.03	20	12	8
314	-1.07		-.451	-1.14	27	36	35
321	.177		.401	.01	7	15	6
322	-1.08		.0286	-.21	23	26	36
323	-.053		-.14	-.95	25	35	22
324	-.0366		.	-.74	.	34	21
331	.174		.284	.05	10	10	7
332	.217		.236	-.38	12	31	4
341	.0835		.176	-.35	17	30	12
342	-.155		.204	-.42	16	33	30
352	-.0737		.219	-.3	14	29	26
353	.526		.042	-.02	22	16	1
354	.493		.334	.13	8	8	2
355	-.054		.227	-.02	13	16	23
356	-.0641		1.14	-.02	1	16	24
361	.486		-.146	-.41	26	32	3
362	-.117		.528	.03	4	12	28
369	.0664		.062	-.29	21	28	14
371	.0909		.0871	.05	19	10	11
372	-.0082		.0055	-.12	24	23	19
381	.00395		.237	-.25	11	27	17
382	-.0082		.445	-.04	6	19	19
383	-.105		.767	.24	3	7	27
384	-.0643		.307	-.08	9	22	25
385	.033		.961	.72	2	2	15
390	.000931		.47	.28	5	6	18

their loan and forfeits collateral $t_s c_s f_e$. Higher levels of financial development are marked by lower chances of default (higher λ). Firms choose export price and quantity in i to maximize profits.

$$\max_{p,q,F} \underbrace{p_{is}(a)q_{is}(a)}_{\text{Revenue}} - \underbrace{q_{is}(a)\tau_i c_s a}_{\text{Variable Costs}} - \underbrace{(1-d_s)c_s f_i}_{\text{FC- not borrowed}} - \underbrace{\lambda F(a) - (1-\lambda)t_s c_s f_e}_{\text{Exp. value of loan}} \tag{1}$$

$$\text{s.t. } q_{is}(a) = \frac{p_{is}(a)^{-\varepsilon}\theta_s Y_i}{P_{is}^{1-\varepsilon}} \tag{2}$$

$$p_{is}(a)q_{is}(a) - q_{is}(a)\tau_i c_s a - (1-d_s)c_s f_i \geq F(a) \tag{3}$$

$$-d_s c_s f_i + \lambda F(a) + (1-\lambda)t_s c_s f_e \geq 0 \tag{4}$$

The first constraint is demand in country i, the second is the firm's liquidity constraint (they should conceivably be able to repay the loan $F(a)$), and the third is the investor's participation constraint (their expected return should be non-negative).

Manova (2013) solves for the threshold condition that determines the cut-off productivity for firms to export to market i and performs comparative statics on the cut-off productivity as affected by the model parameters d_s and λ.

$$r_{is}(a_{is}) = \left(\frac{\tau_i c_s a_{is}}{\alpha P_{is}}\right)^{1-\varepsilon}\theta_s Y_i = \varepsilon\left\{\left(1 - d_s + \frac{d_s}{\lambda}\right)c_s f_i - \frac{1-\lambda}{\lambda}t_s c_s f_e\right\} \tag{5}$$

$$\frac{\partial\left(\frac{1}{a_{is}}\right)}{\partial d_s} > 0 \quad \frac{\partial\left(\frac{1}{a_{is}}\right)}{\partial \lambda} < 0 \quad \frac{\partial^2\left(\frac{1}{a_{is}}\right)}{\partial d_s \partial \lambda} < 0 \tag{6}$$

Using this model, an increase in a country's financial development has four relevant effects: (i) increases the probability of exporting relatively more in financially vulnerable sectors; (ii) increases the number of products exported relatively more in financially vulnerable sectors; (iii) increases the number of destinations relatively more in financially vulnerable sectors; and (iv) increases the level of firm exports relatively more in financially vulnerable sectors.

5 Empirical Model

The empirical model closely follows Manova et al. (2015):

$$\ln Exports_{it} = \beta_0 + \beta_1 Liberalization_{it} + \beta_2 Liberalization \times ExtFin_{it} + \beta_3 \ln Size_{it-1} + \alpha_j + \delta_t + u_{it}$$

(7)

where *Liberalization* is an indicator variable equal to one if the year is 2012 or later, $\ln Size$ measures the size of firms using their sales from the previous year, α_j captures sector fixed effects, including the effect of the financial vulnerability of a sector, and δ_t captures time fixed effects (such as annual exchange rate fluctuations). We cluster standard errors at the sector level. Identification of the model comes from the sectoral fixed effects. By controlling for each sector, we compare exports within the sector before and after liberalization (while also controlling for general time fixed effects).

We build off the baseline model by testing subsamples of the data. First, we only consider exports to the United States which are subject to somewhat lower barriers to trade following the 2012 agreement. Second, we only consider exports to countries other than the US. Next, we run separate regressions for exports to countries with a lower level of financial development than Colombia (as defined by the median ratio of private credit to GDP over this time period) and those with a higher level of financial development. Results follow.

6 Results

Table 5 shows the results of the main regression and subsamples. Column 1 uses all exports from Colombia to the rest of the world. Firms that are larger export more: a 1% increase in size is associated with a 0.82% increase in exports. As expected, the time after the free trade agreement represents a decline in exports across the board for all firms (the coefficient on *Liberalization*. However, firms that are in more financially vulnerable sectors decrease their exports by less following liberalization: a one unit increase in the sector's financial vulnerability (approximately a

one standard deviation increase) is associated with an 18% increase in firm exports. The latter effect disappears when we only consider exports to the US, but reappears when we consider non-US exports with a greater-than-doubled magnitude of 29.5% increase in exports, suggesting that liberalization aided firms in financially vulnerable sectors more in transactions with non-US countries. Transactions involving the US already had access to US financial markets, whereas transactions with non-US countries did not have the same access before the US-Colombia trade agreement as after. A similar result holds when comparing columns 4 and 5: exports to less financially developed countries increase by 18.7% with a one unit increase in sector financial vulnerability, and exports to more financially developed countries are not affected by financial dependence. Based on Schmidt-Eisenlohr (2013) and Ahn et al. (2011), exports to more financially developed countries are likely to be financed in those more developed countries, so the access granted to foreign banks in Colombia, for example, would not have a significant effect on exports.

6.1   Robustness Checks

To confirm our results are not driven by (i) using Colombia-specific measures of external finance dependence, and (ii) including non-manufacturing sectors, we now present a series of robustness checks that make our results comparable to existing literature. We test the original empirical specification using three standard measures of financial vulnerability from the literature: external finance dependence (calculated in the same way as our measure), asset tangibility (a measure of the tangible asset requirement per sector), and inventories ratio (a measure of inventories to sales on the sectoral level). These measures, originally computed by Rajan and Zingales (1998) and updated by Kroszner et al. (2007), naturally limit the sample to the 27 ISIC manufacturing sectors used in Manova (2013). Additionally, we disaggregate observations further. Rather than using a single firm-sector observation, we take into account that multiproduct firms may operate in multiple sectors which experience different levels of financial vulnerability. Our observations in this section are at the firm-sector level, aggregating firm exports to the ISIC manufacturing sectors.

Table 5: Regression Results

VARIABLES	(1) All Exports	(2) US Only	(3) Non-US	(4) Lower Dev	(5) Higher Dev
Liberalization	-0.651***	-0.291***	-0.591***	-0.746***	-0.257***
	(0.0854)	(0.118)	(0.104)	(0.0963)	(0.0798)
Liberalization × *ExtFin*	0.180*	0.0125	0.295**	0.187*	0.0401
	(0.0939)	(0.265)	(0.149)	(0.101)	(0.169)
ln(*LaggedSales*)	0.817***	0.650***	0.802***	0.759***	0.773***
	(0.0508)	(0.0672)	(0.0514)	(0.0530)	(0.0486)
Constant	-0.373	2.549**	-0.988	-1.150	-0.205
	(0.795)	(1.004)	(0.815)	(0.859)	(0.754)
Observations	30,225	10,383	28,023	21,223	22,805
R^2	0.403	0.393	0.363	0.371	0.393
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
Clustered SE	Sector	Sector	Sector	Sector	Sector
Number of Sectors	226	196	223	212	214

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Regression model corresponding to model specified in the text.

Columns (1) and (2) of Table 6 demonstrate the estimation of the above specification over the entire sample of all firms in all 27 industries. The difference between these two columns is in the proxy for size used in the regression. In the first column, we follow Manova et al. (2015) and use the total export volume of the firm. We find that the increase in the sector's external finance dependence by 1 standard deviation (0.375) leads to, on average, 7.3% export growth after the 2012 trade agreement. In the second column, we use the log of total assets from SIREM to address the potential endogeneity issue between total export volume and firm-product export volume. We also drop 2015 from financial reporting data as this is a year when Colombia changed their reporting standards. This reduces the sample size by more than twice due to the shorter time period (2007-2014 instead of 2007-2016 as in specification (1)) and availability of the financial reports for only roughly half of the firms. However, the matched firms cover over 70% of total exports in the available time frame. The results are consistent with the original measure, but the magnitudes of coefficients slightly change: the effect increases to 7.8%. Coefficients in front of both size proxies suggest that larger firms export more, which supports the existing evidence (Manova, 2013; Muûls, 2015).

Next, we split our sample into subgroups based on relative financial vulnerability. Column (3) includes estimation results for the top-9 most vulnerable sectors (top third of sectors that rely on external financing). Within this smaller group of the most vulnerable sectors, a one standard deviation increase in vulnerability results, on average, to a 9.8% increase in exports following liberalization. Thus, we see a marginally stronger effect for the most affected by relaxed credit constraints.

In Table 7, we test the spillover effects using other measures of financial vulnerability from Kroszner et al. (2007). For comparison purposes, we use a log of total sales (domestic and international) as a proxy for a firm's size.

Columns (1) and (2) include results for the baseline measure of financial vulnerability - external finance dependence. Notice that the coefficient is still significant and positive. Columns (3) and (4) use inventories ratio as a proxy for credit constraints. The coefficient is positive, meaning that

Table 6: Robustness Checks: 27 Manufacturing industries

VARIABLES	(1) $log(Export)_{ist}$	(2) $log(Export)_{ist}$	(3) $log(Export)_{ist}$
	Full sample	Full sample	High Vuln
Liberalization	0.0469	0.119*	0.117
	(0.0392)	(0.0590)	(0.118)
Liberalization $\times ExtFinDep_s$	0.191**	0.211***	0.263**
	(0.0694)	(0.0680)	(0.0993)
$log(Export)_{it}$	0.581***		
	(0.0186)		
$log(Assets)_{it}$		0.205***	0.202**
		(0.0436)	(0.0694)
Observations	134,186	59,816	15,504
Firm, Sector & Year FE	YES	YES	YES
R-squared	0.444	0.367	0.560

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

firms in sectors that require high liquidity benefit more after the free trade agreement came into force. Finally, columns (5) and (6) report the results for the tangibility variable. The results are insignificant, though coefficients in front of the interaction terms have the expected negative sign.

7 Conclusion

This paper demonstrates some of the externalities associated with the US-Colombia trade agreement that entered into force in 2012; specifically, the reduced credit constraints on firms in financially vulnerable sectors. The agreement catalyzed financial reforms, opening the Colombian financial services market to foreign firms. Colombian firms in financially vulnerable sectors benefited from the agreement more so than firms in less financially dependent sectors, with a one unit

Table 7: Alternative vulnerability and size measures. Dependent variable: log of export of firm i in sector s at time t

VARIABLES	(1) y_{ist}	(2) y_{ist}	(3) y_{ist}	(4) y_{ist}	(5) y_{ist}	(6) y_{ist}
	ExtFinDep		InventRatio		Tangibility	
$Liberalization \times FinVuln_s$	0.206***	0.219***	1.873***	1.857***	-0.409	-0.452
	(0.0700)	(0.0772)	(0.495)	(0.553)	(0.298)	(0.307)
$log(Sales)_{it}$	0.245***		0.246***		0.247***	
	(0.0409)		(0.0409)		(0.0410)	
$log(Sales)_{it} \times FinVuln_s$		-0.0342		0.197		0.487*
		(0.0841)		(0.429)		(0.242)
Firm, Sector & Year FE	YES	YES	YES	YES	YES	YES
Observations	59,738	59,738	59,738	59,738	59,738	59,738
R-squared	0.367	0.367	0.367	0.367	0.367	0.367

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

increase in financial vulnerability associated with an 18% increase in firm exports. Our results suggest that negotiators who concentrate on protecting domestic financial services may be preventing growth in the most financially constrained parts of the economy.

The analysis does not take into account firm selection, which credit constraints may have an important role in determining. Future research can put the financial liberalization model into the context of Helpman et al. (2008) to better understand the selection effects. It may be that following liberalization with the US, only certain firms benefit. The Melitz (2003) model suggests the least productive Colombian exporters will exit the market while surviving exporters will export more as more resources are allocated to them. If this holds in Colombia, the results may be driven by the least productive exporters in financially vulnerable sectors exiting the market, and the most productive exporters (who may not be as restricted by credit constraints) export more. However, Manova (2013) suggests that liberalization would make firms in financially vulnerable sectors more likely to export.

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