How Resilient are Exporting Firms? Evidence from Chavez's Trade War with Colombia

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Motivation

- There is a large literature documenting the positive effect of exporting on firm outcomes.
  - Quality (Verhoogen 2008, Atkin et al. 2017)
  - Technology adoption (Bustos 2011, Lileeva and Trefler 2010)
  - Productivity (De Loecker 2007, Park et al. 2010, Garcia-Marin and Voigtländer 2019)

- What happens to firms when they lose access to foreign markets?
  - Does ceasing to export undo its positive effects?
  - What is the effect in the medium and long term?

- Hard to find sources of exogenous variation.
  - "Trump Shock" (Fajgelbaum et al. 2019).
  - Short term only.

This Paper

We study the effect of Hugo Chavez' trade war with Colombia on Colombian exporting firms.

- Use aggregate trade data to document a targeted reduction in Venezuelan imports from Colombia after 2009 (synthetic control).
- Difference-in-difference design compares firms with varying levels of exposure based on (pre-period) share of firm exports to Venezuela.
  - Use customs data at the transaction level from DIAN and plant-level data from the manufacturing census (EAM).
  - Study the effects on exporting survival and other measures of firm performance (including productivity).
  - Explore dimensions of heterogeneity (e.g., export diversification).

Main Findings

- After 2009, Venezuelan imports from Colombia decreased dramatically compared to a synthetic control.
- In the customs data:
  - Persistent negative effect on the probability of exporting.
  - Effect is driven by exports to Venezuela.
  - Effect is smaller for exposed firms exporting to more countries.
  - Exposed firms increase exports to other destinations.
- In the EAM data (very preliminary):
  - No effect on measures of productivity.
  - No effect on firm size or wages.

Context

- Until 2009, Venezuela was Colombia's second-largest trade partner after the US (approx. 10% of yearly exports).
- In July 2009, bilateral relations reach a breaking point:
  - Swedish weapons originally sold to Venezuela found in FARC camp.
  - Colombian government announces a military agreement with US.
- Hugo Chavez responds by breaking diplomatic relations and imposing restrictions on trade (NTBs):
  - Import licenses, food sanitation rules, currency restrictions.
- Diplomatic relations reestablished in August 2010 under incoming Santos administration in Colombia.

Synthetic Control

- Aim: Document targeted reduction of Venezuelan imports from Colombia after 2009
- Use data from UN Comtrade to measure imports to Venezuela.
- Synthetic Control Approach with a donor pool of 72 countries from which Venezuela consistently imports between 1994 and 2013.
- Matching variables:
  - Lags of the imports value to Venezuela. We use only *even* years to avoid cherry-picking and overfitting.
  - Real GDP per capita.
  - Distance to Venezuela.

Synthetic Control Results - Levels

Figure 1: Levels - Synthetic Control

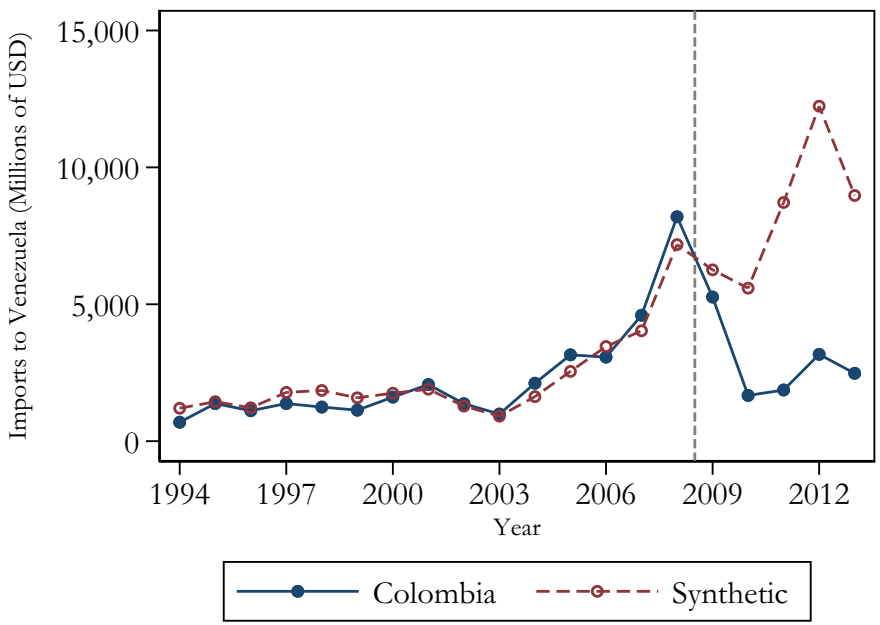
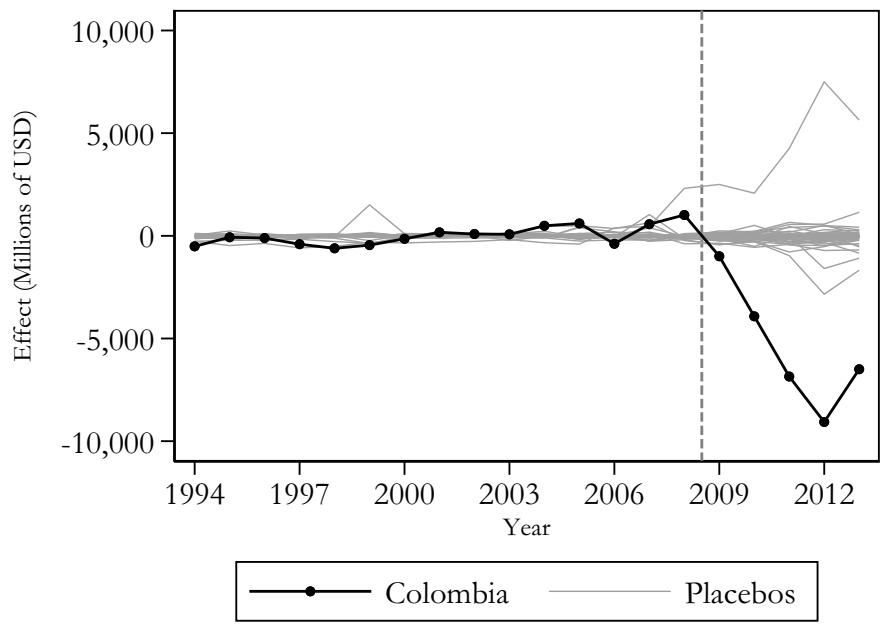


Figure 2: Levels - Placebo Inference



Synthetic Control Results - Logs

Figure 3: Logs - Synthetic Control

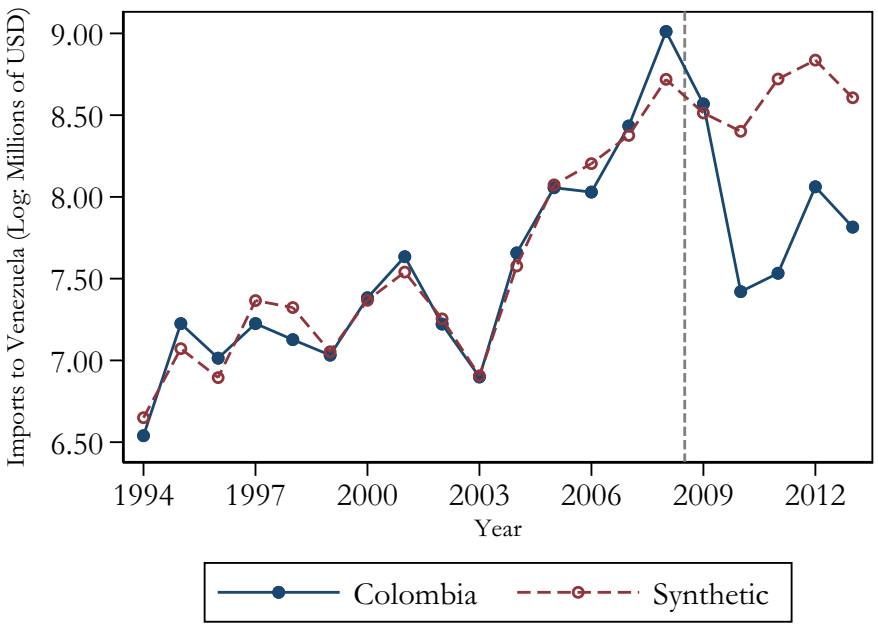
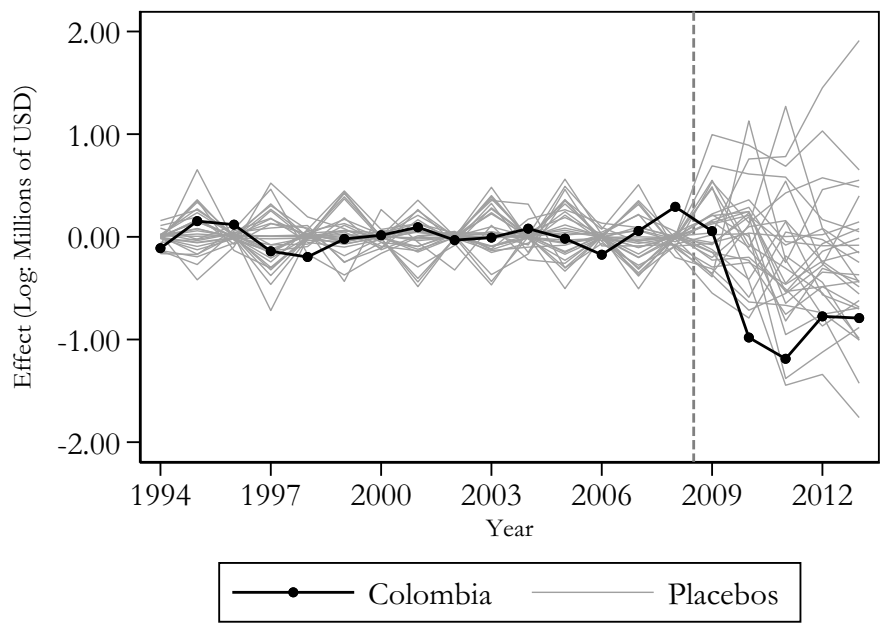


Figure 4: Logs - Placebo Inference



Synthetic Control Results - ATE

Table 1: Synthetic Control ATE

Model	R^2	Average effect	p-value	
			Unrestricted	Restricted
	Without Controls			
Levels	0.94	-5,464.92	0.082	0.083
Log	0.96	-0.74	0.000	0.000
	With Controls			
Levels	0.94	-5,039.66	0.063	0.065
Log	0.96	-0.75	0.000	0.000

Notes: Levels in Millions of 2019 USD. R^2 corresponds to 1994-2008 period. Controls include real GDP per capita and the geodesic distance to Venezuela. The Average effect is the average difference between Colombia and the synthetic control between 1994 and 2008. The p-value is computed based on placebo treatments. Restricted models uses only countries with a RMSPE in the pre-treatment period that is smaller than two times the one of Colombia.

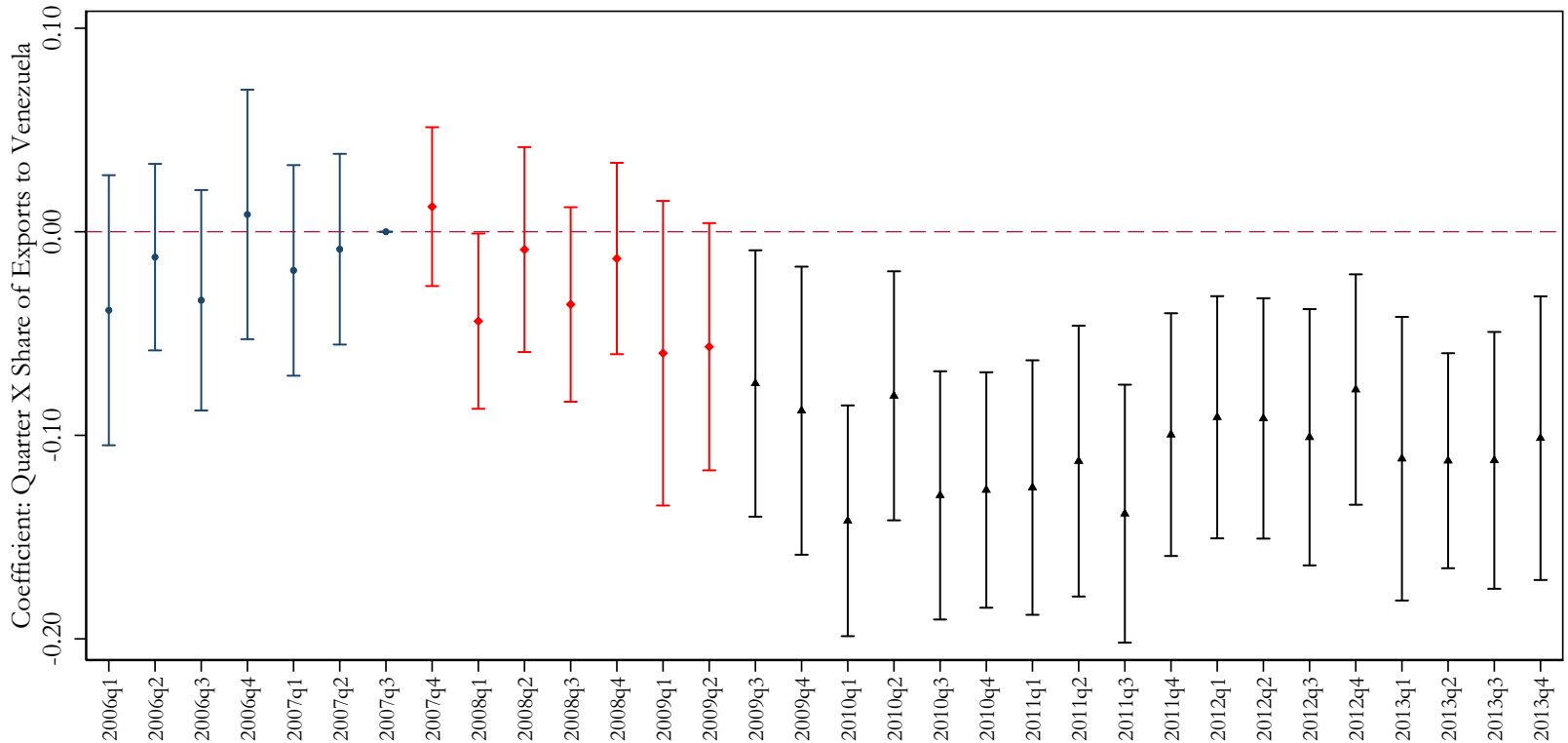
Customs Data

- Use transaction level data from DIAN from 2000 to 2013.
- We restrict the sample to firms exporting to any destination at least once per year in 2003-2005 (established exporters)
- We measure exposure to Venezuela shock as the share of firm exports in 2003-2005 to Venezuela.

$$Y_{its} = \gamma_i + \delta_{ts_2} + \tau \left(\text{Share Venezuela}_i \cdot 1\{t \geq 2009q3\}_t\right) + \varepsilon_{its_2} \tag{1}$$

Customs - Effect on Exports Survival

Figure 5: DD Results on Exports Survival



Customs - Effect on Exports Survival

Table 2: Models Comparison Effect on Exports Survival

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5	(6) Model 6
Share of Exports to Venezuela x Post 2007q3					-0.016	-0.016
					(0.020)	(0.020)
Share of Exports to Venezuela x Post 2009q2	-0.064***	-0.077***	-0.084***	-0.086***	-0.094***	-0.095***
	(0.018)	(0.017)	(0.018)	(0.018)	(0.025)	(0.026)
Share of Exports to Venezuela x Post 2010q4						-0.093***
						(0.025)
Firm's FE	✓	✓	✓	✓	✓	✓
Time-sector FE	✓	✓				
Time-size FE		✓				
Time-sector-size FE			✓	✓	✓	✓
Quarter-treatment FE				✓	✓	✓
Observations	129,504	129,504	128,640	128,640	128,640	128,640
Dep. Var. Mean	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409

Notes: Standard errors clustered by sector in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Customs - Effect on Exports Survival - Heterogeneity

Table 3: Heterogenous Effect on Exports Survival

	(1) Exports (=1)	(2) Exports (=1)	(3) Exports (=1)	(4) Exports (=1)	(5) Exports (=1)	(6) Exports (=1)
Share of Exports to Venezuela x Post 2009q2 [a]	-0.111***	-0.110***	-0.094***	-0.090**	-0.113***	-0.091**
	(0.026)	(0.037)	(0.019)	(0.037)	(0.025)	(0.038)
Share of Exports to Venezuela x Post 2009q2 x # Countries [b]	0.007*			0.011***	0.006*	0.010**
	(0.003)			(0.004)	(0.003)	(0.004)
Share of Exports to Venezuela x Post 2009q2 x # Regions [b]		0.012		-0.017		-0.017
		(0.013)		(0.017)		(0.017)
Share of Exports to Venezuela x Post 2009q2 x # Products [b]			0.001		0.000	0.000
			(0.001)		(0.001)	(0.001)
Firm's FE	✓	✓	✓	✓	✓	✓
Time-sector-size FE	✓	✓	✓	✓	✓	✓
Observations	128,640	128,640	128,640	128,640	128,640	128,640
Singletons	49428	49428	49428	49428	49428	49428
Exports Mean	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409
p-value: [a]+[b]=0	0.000	0.000	0.000			

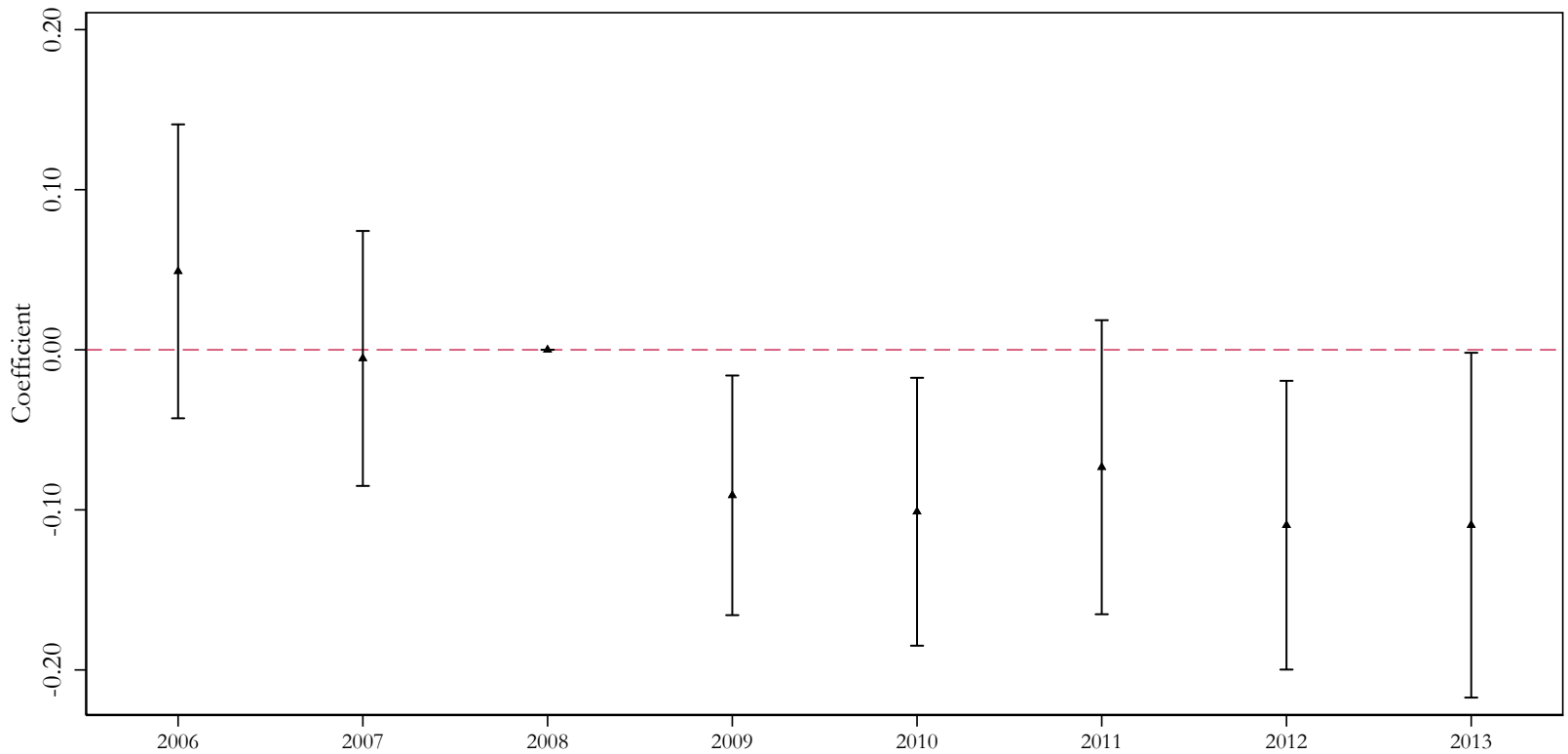
Notes: Standard errors clustered by sector in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

EAM Data

- Use data from Colombia's Manufacturing Census from 2003 to 2013.
- Merge with the administrative customs data.
- Use the share of exports to Venezuela between 2003 and 2005 as a measure of **plants**' exposure to the trade war.

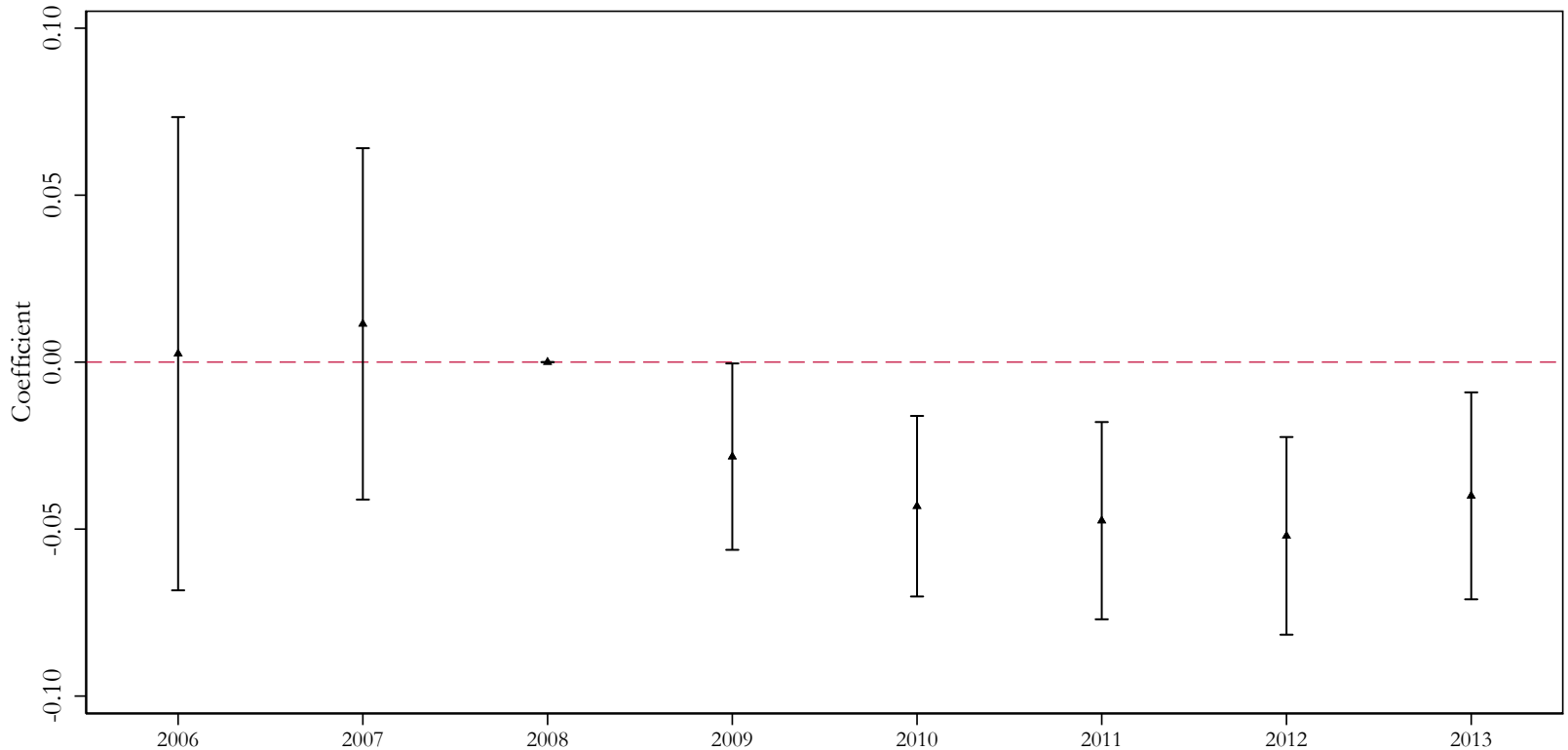
EAM Data - Exports

Figure 6: DD Results on Export Survival (EAM data)



EAM Data - Export Share

Figure 7: DD Results on Share of Production Exported



EAM Data - Results - Labor and Wages

Table 4: Results EAM - Labor

	(1) Total Workers	(2) White Collar Workers	(3) Blue Collar Workers	(4) Salaries	(5) White Collar Wages	(6) Blue Collar Wages
Share of Exports to Venezuela x Post 2009q2	-7.646	-5.509	-2.137	-114,472	-133,082**	-71,863
	(13.83)	(4.507)	(10.74)	(98,978)	(63,984)	(54,229)
Firm's FE	✓	✓	✓	✓	✓	✓
Time-sector-size FE	✓	✓	✓	✓	✓	✓
Observations	15,905	15,905	15,905	15,926	15,926	15,926
Dep Var Mean	184.2	49.17	135	1,266,000	686,099	835,216

Notes: Standard errors clustered by sector in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

EAM Data - Production and Inputs

Table 5: Results EAM - Production and Inputs

	(1) Total Production	(2) Log: Total Production	(3) Total Imported Inputs Used	(4) Log: Total Imported Inputs Used	(5) Total Materials Used	(6) Log: Total Materials Used
Share of Exports to Venezuela x Post 2009q2	-15.43	0.0256	-0.357	-0.289	-8.786	0.00659
	(14.45)	(0.310)	(1.048)	(0.481)	(8.300)	(0.243)
Firm's FE	✓	✓	✓	✓	✓	✓
Time-sector-size FE	✓	✓	✓	✓	✓	✓
Observations	17,397	17,397	17,397	17,397	17,397	17,397
Dep Var Mean	35.5	13.70	3.924	4.469	1.74	13.31

Notes: Standard errors clustered by sector in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

EAM Data - Productivity

Table 6: Results EAM - TFP

	(1) Olley and Pakes (1996)	(2) Levinsohn and Petrin (2003)
Share of Exports to Venezuela x Post 2009q2	0.114	0.0606
	(0.105)	(0.0686)
Firm's FE	✓	✓
Time-sector-size FE	✓	✓
Observations	13,355	13,355
Dep Var Mean	3.958	4.675

Notes: Standard errors clustered by sector in parentheses.* p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01.