

Adjusting to Transitory Shocks: Worker Impact, Firm Channels, and (Lack of) Income Support

Ana Margarida Fernandes (World Bank)
Joana Silva (World Bank, Catolica Lisbon, CEPR)

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Motivation

- ▶ Economic crises can lead to firm closure and job displacement, resulting in scarring effects
- ▶ Yet, the magnitude and duration of these effects for workers depends on
 - ▶ **How firms adjust:** effects on exit, revenue, employment and productivity
 - ▶ **Local labor market conditions:** informality, market concentration
 - ▶ **Cushioning effects of policies:** can amplify or reduce employment and wage costs and alter the nature of post-crisis recovery

Evidence on Effects of Transitory Shocks

- ▶ Worker scarring in response to permanent shocks (Autor et al.(2014), Utar (2018), Dix-Carneiro and Kovak (2019))
 - ▶ **What about temporary shocks? What about informality?**
- ▶ Responsive **compensatory mechanisms** and training in the US (Yagan 2019, Autor et al. 2013, 2014, Hyman, 2018)
 - ▶ **What is their role in developing countries?**
- ▶ Trade shocks affect–temporarily–firms’ sales and employment growth and volatility (Brambilla at al.(2012), Utar (2014), Kurz and Senses (2016), Pierce and Schott (2016), Garin and Silverio (2022))
 - ▶ **Does it lead to firm scarring? Does it increase long-run inequality?**

This paper

- ▶ Exploits quasi-experimental variation in firms' foreign demand resulting from the Global Financial Crisis
- ▶ Empirical Strategy: Firm GFC shocks based on decline in destinations' GDP growth given pre-GFC export destinations portfolios
 - ▶ Exploits differences in the intensity of the shock across firms
 - ▶ Worker-level analysis: Employment, wages and cushioning effect of policies
 - ▶ Firm-level analysis: performance measured by exit and revenue, employment, and productivity downsizing
- ▶ Data
 - ▶ Admin Data for Brazil: RAIS, SECEX, UI records, PBF, SENAI
 - ▶ Statistical Census Bureau (IBGE): PIA, CENSO

Findings

- ▶ GFC shock (temporary shock) induces firm restructuring that scars incumbent workers and increases long-run inequality (permanent effects)
 - ▶ Foreign shocks lead to persistent reductions in worker employment (for the lower-skilled).
 - ▶ Employment and wage losses are smaller in highly informal locations and concentrated sectors.
 - ▶ Underlying labor scarring is firm scarring driven by exit and revenue, employment, and productivity downsizing.
 - ▶ Unemployment insurance and cash transfers yield limited wage loss replacement.

Outline

Data

Worker effects

Mechanisms

Responses in a different labor market

Compensatory Mechanisms

Conclusion

Data

- ▶ Administrative longitudinal worker-firm data for Brazil over the period 2004-2017 linking:
 - ▶ Relacao Annual de Informacoes Sociais (RAIS)
 - ▶ Customs export and import data from Secretariat of Foreign Trade (SECEX)
 - ▶ Manufacturing census (Pesquisa Industrial Anual) for 2004-2014
- ▶ We link this data with beneficiary records:
 - ▶ Unemployment Insurance (UI): Covers all workers that received UI
 - ▶ PBF: all payment records of Bolsa Familia program for 2007-2012
 - ▶ SENAI: Beneficiary records of training delivered from Brazil's main training provider for 2009-2012

▶ Worker Summary Stats

▶ Firm Summary Stats

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Empirical design: firm GFC foreign shock measure

- ▶ Firm-specific export-weighted destination market GDP decline measure based on customs data and annual GDP growth data:

$$shock_{j2008} = - \sum_d GDPgr_{d2008} * w_{jd2007}$$

- ▶ $GDPgr_{d2008}$: 2007-2008 growth in destination d 's GDP
 - ▶ w_{jd2007} : share of exports to destination d in total firm j 2007 exports
 - ▶ **Larger** values of GFC foreign shock indicate that a firm faces a **worse** foreign shock
- ▶ Shock is exogenous to firms and workers in Brazil
 - ▶ Quasi-experimental variation in foreign demand caused by sudden and unexpected GFC (Aghion et al. (2021))
 - ▶ Use of pre-GFC firm export portfolio weights

Empirical design: main specification

- ▶ What are workers' margins of adjustment to GFC foreign shocks?
- ▶ Compare evolution of outcomes for **workers in firms facing larger vs. smaller GFC foreign shocks**

$$y_{ijt} = \theta_t shock_{j2008} + \gamma_1 X_{i2007} + \gamma_2 X_{js2007} + I^{st} + I^{rt} + \varepsilon_{ijt}$$

- ▶ i : worker, j : firm, t : year, s : sector, r : region
- ▶ y_{ijt} : worker employment or wage outcomes
- ▶ X_{i2007} worker controls as of 2007: gender, age, age squared, higher education, past formal sector attachment
- ▶ X_{j2007} firm controls as of 2007: firm size, importer status, past growth in firm total employment and average wages
- ▶ Sector*year fixed effects (I^{st}) region*year fixed effects (I^{rt}) (based on 2007 firm's 2-digit sector and region)
- ▶ Robust standard errors clustered by firm

Empirical design: worker outcome variables

- ▶ Average months worked per year (cumulative until year t):

$$\frac{1}{t-2008} \sum_{s=2009}^t months_{is}$$

where $months_{is}$ is the number of months worker i was formally employed in year s

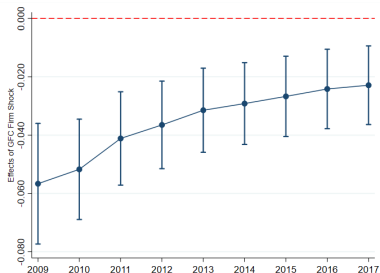
- ▶ Average real wages (cumulative until year t) as multiples of pre-GFC average wages:

$$\left(\frac{1}{t-2008}\right) \frac{\sum_{s=2009}^t wage_{is}}{avgwage_{i2004-07}}$$

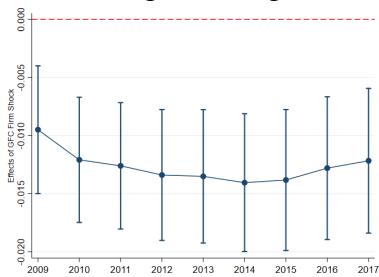
where $wage_{is}$ is the monthly wage of worker i in year s deflated by a Consumer Price Index

Impact of GFC foreign shocks on workers

Average months worked



Average real wages



Note: Confidence intervals shown based on robust standard errors clustered by firm. The two regressions are based on a sample with about 3 million worker-year observations.

- ▶ Long-lasting negative effects of GFC foreign shocks on months worked and on real wages

Economic magnitude of impacts

- ▶ Focus on estimated coefficients for 2017
- ▶ Consider a worker whose initial firm faced a 10 percentage point worse (larger) GFC foreign shock

Impact between 2009 and 2017	
Months worked	2.1 fewer months (2.7%)
Average real wage	1.1 times pre-GFC earnings (6%)

Robustness of impact of GFC foreign shocks on workers

- ▶ Estimate specification separately for each year
- ▶ Dropping sectors most affected by commodity price boom
- ▶ Dropping years 2015-2017 of major domestic recession
- ▶ Dropping vector of firm controls in 2007
- ▶ Including separate sector, state, and year fixed effects
- ▶ Using worker employment and wage measures as in Yagan (2019)
- ▶ Using alternative firm GFC foreign shock measures varying weights for export-weighted average
- ▶ Using indicator variables for worker dismissal by employer

Heterogeneity of impact of GFC foreign shocks across worker characteristics

	Average months worked		Average real wages	
	Coefficient	Test eq. of coeff	Coefficient	Test eq. of coeff
		t-test		t-test
	(1)	p-value (2)	(3)	p-value (4)
GFC firm shock	-0.0357*** (0.0073)		-0.0116*** (0.0030)	
Observations		3,046,074		3,030,524
R-squared		0.1274		0.2757
GFC firm shock*Female	-0.0454*** (0.0098)		-0.0105*** (0.0039)	
GFC firm shock*Male	-0.0328*** (0.0080)	1.250 (0.2114)	-0.0114*** (0.0033)	-0.194 (0.8459)
Observations		3,046,074		3,030,524
R-squared		0.8543		0.6046
GFC firm shock*Higher education	-0.0128 (0.0111)		-0.0005 (0.0061)	
GFC firm shock*No higher education	-0.0378*** (0.0077)	-2.142 (0.0322)**	-0.0126*** (0.0031)	-1.890 (0.0588)*
Observations		3,046,074		3,030,524
R-squared		0.8547		0.6089
GFC firm shock*Young	-0.0334*** (0.0073)		-0.0123*** (0.0031)	
GFC firm shock*Old	-0.0762*** (0.0182)	2.460 (0.0139)***	-0.0158*** (0.0050)	0.7257 (0.4680)
Observations		3,046,074		3,030,524
R-squared		0.8546		0.5974
2-digit industry X Year FE		Yes		Yes
State X Year FE		Yes		Yes

- ▶ Strong negative response of employment and real wages only for less educated
- ▶ Stronger negative response of employment for older workers
- ▶ Similar adjustment for men and women

▶ Additional heterogeneity

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

Mediating role of informality

	Average months worked		Average real wages	
	Coefficient	Test eq. of coeff t-test p-value	Coefficient	Test eq. of coeff t-test p-value
	(1)	(2)	(3)	(4)
GFC firm shock*Low informality rate	-0.0446*** (0.0087)		-0.0122*** (0.0035)	
GFC firm shock*High informality rate	-0.0154 (0.0112)	2.0427 (0.0411)**	-0.0109** (0.0044)	0.2304 (0.8178)
Observations		3,016,941		2,982,180
R-squared		0.8546		0.6508
2-digit industry X Year FE		Yes		Yes
State X Year FE		Yes		Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

- ▶ Smaller responses in localities with higher informality
- ▶ Informality serves as a buffer providing de facto flexibility for firms and workers to cope with negative shocks

Mediating role of lack of competition

	Average months worked		Average real wages	
	Coefficient	Test eq. of coeff	Coefficient	Test eq. of coeff
		t-test p-value		t-test p-value
	(1)	(2)	(3)	(4)
GFC firm shock*Low sector concentration	-0.0344*** (0.0079)		-0.0116*** (0.0031)	
GFC firm shock*High sector concentration	0.0157 (0.0152)	2.9506 (0.0032)***	0.0026 (0.0066)	1.9968 (0.0459)**
Observations		3,046,074		3,011,056
R-squared		0.8549		0.6512
GFC firm shock*Not state-owned	-0.0344*** (0.0072)		-0.0124*** (0.0028)	
GFC firm shock*State-owned	0.0650 (0.0707)	1.4069 (0.1595)	0.0503 (0.0519)	1.2154 (0.2242)
Observations		3,019,199		2,984,438
R-squared		0.8543		0.6505
2-digit industry X Year FE		Yes		Yes
State X Year FE		Yes		Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

- ▶ Smaller/no responses in more concentrated sectors and for protected (state-owned) firms

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Reallocation of workers across firms and sectors

	Baseline effect	Initial firm	Other firm in same sector	Other firm in tradable sector	Other firm in non-tradable sector
	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Average months worked</i>					
GFC firm shock	-0.0226*** (0.0054)	-0.0535** (0.0210)	0.0187 (0.0152)	0.0085 (0.0053)	0.0036** (0.0018)
Observations	921,977	921,977	921,977	921,977	921,977
R-squared	0.0423	0.0452	0.0144	0.0259	0.0165
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes
<i>Panel B: Average real wages</i>					
GFC firm shock	-0.0089** (0.0036)	-0.0194*** (0.0056)	0.0066 (0.0040)	0.0030 (0.0025)	0.0009 (0.0012)
Observations	916,397	916,397	916,397	916,397	916,397
R-squared	0.4518	0.2404	0.0284	0.0508	0.0299
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

- ▶ Adjustment is mostly for workers remaining at initial firm
- ▶ Small counter-effect on months worked from reallocation to other firms in non-tradable sector

Hours worked and renewal of fixed-term contracts

	Average hours worked (1)	Indicator for not renewing fixed-term contract (2)
GFC firm shock*2009	-0.0048*** (0.0018)	0.0021** (0.0009)
GFC firm shock*2010	-0.0056*** (0.0019)	0.0008 (0.0011)
GFC firm shock*2011	-0.0052*** (0.0020)	0.0012 (0.0009)
GFC firm shock*2012	-0.0047** (0.0020)	0.0002 (0.0007)
GFC firm shock*2013	-0.0041** (0.0021)	0.0001 (0.0010)
GFC firm shock*2014	-0.0039* (0.0020)	0.0001 (0.0013)
GFC firm shock*2015	-0.0037* (0.0020)	-0.0008 (0.0018)
GFC firm shock*2016	-0.0032* (0.0020)	0.0001 (0.0015)
GFC firm shock*2017	-0.0031 (0.0019)	0.0005 (0.0019)
Observations	3,046,065	42,807
R-squared	0.3213	0.0371
2-digit industry X Year FE	Yes	Yes
State X Year FE	Yes	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

- Reduction in hours worked and in renewal of fixed-term contracts

Empirical design: firm specification

- ▶ What are mechanisms that drive persistent effects of GFC foreign shocks on labor market outcomes?
- ▶ Compare evolution of outcomes/responses for **firms facing larger vs. smaller GFC foreign shocks**

$$y_{jt} = \theta_t shock_{j2008} + \gamma Z_{js2007} + I^{st} + I^{rt} + \epsilon_{jt}$$

- ▶ i : firm, t : year, s : sector, r : region
- ▶ y_{it} : firm labor market aggregates or performance outcomes
- ▶ X_{i2007} firm controls as of 2007: firm size, importer status, pre-GFC growth in firm total employment and/or wages
- ▶ Sector*year fixed effects (I^{st}) and region*year fixed effects (I^{rt}) (based on 2007 firm's 2-digit sector and region)
- ▶ Robust standard errors clustered by firm

Empirical design: firm outcome variables

- ▶ Revenues, profit rate, and exit
- ▶ Size in terms of employment and wages
 - ▶ Total employment: sum of workers employed by firm (based on worker database)
 - ▶ Total wages: sum of monthly real wages across all workers employed by firm (based on worker database)
- ▶ Firm occupational structure of workforce: skilled and unskilled workers levels and shares
- ▶ Non-labor inputs (materials and capital), productivity, and relative prices

Firms' adjustment in revenues, exit and size

	Net revenues	Profit rate	Firm exit	Firm size (log)	Total wages (log)	Total skilled based on education (log)	Total unskilled based on education (log)	Share of skilled based on education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GFC firm shock*2009	-0.0315*** (0.0044)	-0.0014 (0.0010)	-0.0003 (0.0006)	-0.0162*** (0.0027)	-0.0221*** (0.0031)	-0.0051* (0.0030)	-0.0191*** (0.0027)	0.0005 (0.0004)
GFC firm shock*2010	-0.0378*** (0.0047)	-0.0022** (0.0010)	0.0019*** (0.0006)	-0.0220*** (0.0033)	-0.0285*** (0.0034)	-0.0102*** (0.0032)	-0.0233*** (0.0032)	0.0006 (0.0004)
GFC firm shock*2011	-0.0393*** (0.0051)	-0.0035*** (0.0010)	0.0010* (0.0006)	-0.0263*** (0.0035)	-0.0292*** (0.0036)	-0.0119*** (0.0034)	-0.0260*** (0.0034)	0.0009** (0.0004)
GFC firm shock*2012	-0.0372*** (0.0053)	-0.0019* (0.0010)	0.0001 (0.0006)	-0.0262*** (0.0039)	-0.0307*** (0.0039)	-0.0111*** (0.0036)	-0.0271*** (0.0038)	0.0011*** (0.0004)
GFC firm shock*2013	-0.0382*** (0.0055)	-0.0016 (0.0010)	0.0010 (0.0006)	-0.0289*** (0.0041)	-0.0315*** (0.0042)	-0.0104*** (0.0037)	-0.0298*** (0.0040)	0.0013*** (0.0005)
GFC firm shock*2014	-0.0400*** (0.0053)	-0.0021* (0.0011)	-0.0004 (0.0007)	-0.0308*** (0.0044)	-0.0341*** (0.0043)	-0.0133*** (0.0038)	-0.0313*** (0.0042)	0.0016*** (0.0005)
GFC firm shock*2015			0.0015** (0.0007)	-0.0322*** (0.0045)	-0.0319*** (0.0046)	-0.0145*** (0.0040)	-0.0343*** (0.0043)	0.0014*** (0.0005)
GFC firm shock*2016			0.0012* (0.0007)	-0.0244*** (0.0048)	-0.0295*** (0.0049)	-0.0147*** (0.0041)	-0.0304*** (0.0045)	0.0013** (0.0006)
GFC firm shock*2017				-0.0236*** (0.0051)	-0.0285*** (0.0051)	-0.0150*** (0.0043)	-0.0295*** (0.0046)	0.0013** (0.001)
Observations	30,825	32,125	107,541	91,971	82,313	88,549	91,537	119,189
R-squared	0.6787	0.0817	0.0168	0.532	0.5301	0.6052	0.4983	0.4823
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

► Firm downsizing in revenues and employment and increase in firm exit

Firms' occupational restructuring

	Share of skilled based on occupations (1)	Share of professional, managerial, skilled (2)	Share of skilled white collar (3)	Share of skilled blue collar (4)	Share of unskilled based on occupations (5)	Share of unskilled white collar (6)	Share of unskilled blue collar (7)
GFC firm shock*2009	0.00212*** (0.000709)	0.00110*** (0.000361)	-0.000606 (0.000611)	0.00164** (0.000779)	-0.00345*** (0.000666)	-0.000983*** (0.000377)	-0.00247*** (0.000597)
GFC firm shock*2010	0.00281*** (0.000694)	0.00138*** (0.000441)	-0.000171 (0.000635)	0.00160** (0.000796)	-0.00335*** (0.000693)	-0.000764** (0.000382)	-0.00258*** (0.000630)
GFC firm shock*2011	0.00317*** (0.000692)	0.00164*** (0.000444)	0.000212 (0.000638)	0.00132 (0.000809)	-0.00364*** (0.000692)	-0.000874** (0.000390)	-0.00277*** (0.000622)
GFC firm shock*2012	0.00285*** (0.000705)	0.00174*** (0.000450)	0.000202 (0.000642)	0.000905 (0.000814)	-0.00346*** (0.000705)	-0.000936** (0.000396)	-0.00252*** (0.000638)
GFC firm shock*2013	0.00268*** (0.000710)	0.00157*** (0.000482)	0.000472 (0.000631)	0.000637 (0.000815)	-0.00349*** (0.000710)	-0.000994*** (0.000396)	-0.00250*** (0.000643)
GFC firm shock*2014	0.00259*** (0.000718)	0.00143*** (0.000472)	0.000816 (0.000639)	0.000344 (0.000815)	-0.00340*** (0.000719)	-0.000935** (0.000400)	-0.00247*** (0.000652)
GFC firm shock*2015	0.00221*** (0.000724)	0.00143*** (0.000507)	0.00121* (0.000642)	-0.000422 (0.000814)	-0.00277*** (0.000722)	-0.00114*** (0.000424)	-0.00163*** (0.000636)
GFC firm shock*2016	0.00154** (0.000723)	0.000904* (0.000539)	0.00114* (0.000653)	-0.000499 (0.000825)	-0.00214*** (0.000715)	-0.000929** (0.000408)	-0.00121* (0.000634)
GFC firm shock*2017	0.00120 (0.000739)	0.000635 (0.000565)	0.000869 (0.000665)	-0.000303 (0.000849)	-0.00196*** (0.000729)	-0.000356 (0.000414)	-0.00161** (0.000644)
Observations	119,189	119,189	119,189	119,189	119,189	119,189	119,189
R-squared	0.090	0.130	0.275	0.311	0.093	0.086	0.122
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

- ▶ Firms reduce employment of both skilled and unskilled workers but adjust occupational structure towards skilled workers

Firms' productivity and technology responses

	Materials (log) (1)	Materials per worker (log) (2)	Capital (log) (3)	Capital per worker (log) (4)	Labor productivity (log) (6)	TFP L-P (log) (5)	TFP ACF (log) (7)	TFP Wooldridge (log) (8)	Median of relative price (9)
GFC firm shock*2009	-0.0490*** (0.0080)	-0.0397*** (0.0075)	0.0013 (0.0138)	0.0148 (0.0136)	-0.0152*** (0.0041)	-0.0190*** (0.0045)	-0.0140*** (0.0020)	-0.0205*** (0.0046)	0.0312 (0.0265)
GFC firm shock*2010	-0.0482*** (0.0067)	-0.0332*** (0.0061)	0.0003 (0.0125)	0.0155 (0.0122)	-0.0164*** (0.0043)	-0.0242*** (0.0046)	-0.0165*** (0.0021)	-0.0241*** (0.0046)	0.0472* (0.0268)
GFC firm shock*2011	-0.0587*** (0.0081)	-0.0449*** (0.0072)	-0.0015 (0.0133)	0.0143 (0.0131)	-0.0198*** (0.0042)	-0.0269*** (0.0045)	-0.0148*** (0.0022)	-0.0267*** (0.0045)	0.0788*** (0.0272)
GFC firm shock*2012	-0.0465*** (0.0082)	-0.0343*** (0.0070)	-0.0063 (0.0109)	0.0093 (0.0106)	-0.0177*** (0.0043)	-0.0230*** (0.0048)	-0.0159*** (0.0021)	-0.0241*** (0.0046)	0.0411 (0.0407)
GFC firm shock*2013	-0.0500*** (0.0079)	-0.0351*** (0.0066)	-0.0100 (0.0093)	0.0054 (0.0091)	-0.0163*** (0.0043)	-0.0245*** (0.0050)	-0.0163*** (0.0022)	-0.0254*** (0.0047)	0.0897 (0.0573)
GFC firm shock*2014	-0.0586*** (0.0082)	-0.0425*** (0.0072)	-0.0164** (0.0081)	0.0019 (0.0079)	-0.0187*** (0.0045)	-0.0270*** (0.0050)	-0.0157*** (0.0022)	-0.0274*** (0.0049)	0.0686 (0.0644)
Observations	30,839	31,767	30,727	31,183	31,651	30,916	30,682	30,997	31,339
R-squared	0.4705	0.2653	0.5265	0.2849	0.3789	0.5138	0.6779	0.5201	0.0444
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. L-P refers to Levinsohn & Petrin (2003). ACF refers to Akerberg et al. (2015). Wooldridge refers to Wooldridge (2009). All specifications control for vectors of worker and firm characteristics as of 2007.

- ▶ Firm use of materials declines
- ▶ Persistent firm productivity declines (labor and TFP) and some relative prices increase

Evidence of cleansing due to GFC foreign shocks

Firm characteristic base	Firm exit PIA				
	Firm size (log)	Firm labor productivity (log)	Firm TFP L-P (log)	Firm TFP ACF (log)	Firm TFP Wooldridge (log)
GFC firm shock*2009	0.0023 (0.0020)	0.0170** (0.0080)	0.0107 (0.0061)	0.0088** (0.0038)	0.0106* (0.0060)
GFC firm shock*2010	0.0035** (0.0015)	0.0061 (0.0046)	0.0119*** (0.0045)	0.0096** (0.0039)	0.0044** (0.0044)
GFC firm shock*2011	0.0038** (0.0017)	0.0171 (0.0095)	0.0197* (0.0102)	0.0114* (0.0061)	0.0100* (0.0100)
GFC firm shock*2012	0.0038 (0.0019)	0.0074* (0.0042)	0.0101* (0.0053)	0.0075** (0.0034)	0.0052* (0.0052)
GFC firm shock*2013	0.0019 (0.0019)	0.0201** (0.0087)	0.0232** (0.0084)	0.0103** (0.0050)	0.0055*** (0.0055)
GFC firm shock*2009*Firm characteristic base 2007	-0.0002 (0.0004)	-0.0014** (0.0007)	-0.0007 (0.0005)	-0.0013** (0.0006)	-0.0008* (0.0005)
GFC firm shock*2010*Firm characteristic base 2007	-0.0007*** (0.0003)	-0.0006 (0.0004)	-0.0009*** (0.0003)	-0.0016** (0.0006)	-0.0009*** (0.0003)
GFC firm shock*2011*Firm characteristic base 2007	-0.0007*** (0.0003)	-0.0015* (0.0008)	-0.0015** (0.0008)	-0.0018** (0.0009)	-0.0015* (0.0008)
GFC firm shock*2012*Firm characteristic base 2007	-0.0008** (0.0003)	-0.0007* (0.0004)	-0.0008** (0.0004)	-0.0013*** (0.0005)	-0.0008* (0.0004)
GFC firm shock*2013*Firm characteristic base 2007	-0.0005 (0.0003)	-0.0019** (0.0008)	-0.0018*** (0.0006)	-0.0018** (0.0008)	-0.0013*** (0.0004)
Observations	26,054	26,787	26,178	25,981	26,244
R-squared	0.0129	0.0144	0.0148	0.0120	0.0139
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All firm characteristics in base year 2007 enter in logarithms. L-P refers to Levinsohn & Petrin (2003). ACF refers to Akerberg et al. (2015). Wooldridge refers to Wooldridge (2009).

Outline

Data

Worker effects

Mechanisms

Responses in a different labor market

Compensatory Mechanisms

Conclusion

What happens in a less flexible labor market such as Ecuador?

▶ Data

- ▶ Social Security records from IESS (2006-2017)
- ▶ Linked with Customs data from Servicio Nacional de Aduana (2006-2017) & firm business registry from Sistema de Rentas Internas del Ecuador (2009-2017)

▶ Main findings:

- ▶ Similar qualitative effects: persistent reduction in worker employment for lower-skilled
- ▶ Smaller magnitude when compared to Brazil
- ▶ No changes in firm extensive margin: no effect on firm exit or workforce composition
- ▶ Permanent fall in firm revenues and capital, resulting in lower firm productivity

Outline

Data

Worker effects

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Compensatory Mechanisms

Conclusion

Effectiveness of Compensation Mechanisms

	Average real wages (1)	Average number of months in UI (2)	Average earnings from UI (3)	Average number of months in PBF (4)	Average earnings from PBF (5)	Indicator for receiving training (6)	Indicator for receiving technical training (7)
GFC firm shock*2009	-28.6391*** (6.3102)	0.0104*** (0.0031)	12.6110*** (3.1702)	0.0073* (0.0045)	0.7037*** (0.2723)	-0.0001 (0.0004)	-0.0001 (0.0003)
GFC firm shock*2010	-28.4306*** (6.3088)	0.0005 (0.0020)	-0.6657 (2.0105)	0.0128*** (0.0046)	0.9880*** (0.2958)	0.0004 (0.0004)	0.0005 (0.0003)
GFC firm shock*2011	-28.3811*** (6.2924)	-0.0008 (0.0019)	-1.9912 (2.0108)	0.0148*** (0.0046)	1.2547*** (0.3350)	0.0002 (0.0003)	0.0003 (0.0003)
GFC firm shock*2012	-28.2186*** (6.2794)	0.0008 (0.0018)	0.2453 (2.0030)	0.0146*** (0.0046)	1.3997*** (0.3693)	0.0001 (0.0004)	0.0002 (0.0003)
GFC firm shock*2013	-27.9682*** (6.2490)	-0.0004 (0.0018)	-0.6452 (2.0402)				
GFC firm shock*2014	-27.6736*** (6.1863)	0.0002 (0.0016)	-1.0784 (1.9543)				
GFC firm shock*2015	-27.0546*** (6.1000)	-0.0002 (0.0016)	-1.1020 (1.9736)				
GFC firm shock*2016	-26.9920*** (6.0603)	0.0014 (0.0017)	1.2943 (2.1482)				
GFC firm shock*2017	-26.2731*** (5.9758)	0.0023* (0.0013)	2.0523 (1.7051)				
Observations	3,046,074	3,046,074	3,046,074	1,365,282	1,365,282	3,046,074	3,046,074
R-squared	0.4228	0.0266	0.0186	0.1337	0.0637	0.0367	0.0262
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

- UI and PBF transfer payments replaced 6% of lost earnings: 4.3% from UI and 1.7% from Bolsa Familia. Training does not increase.

Outline

Data

Worker effects

Mechanisms

Responses in a different labor market

Compensatory Mechanisms

Conclusion

Conclusion

- ▶ **Transitory** shocks have **permanent** effects, even in a setting characterized by a large informal sector:
 - ▶ Long-lasting impacts (**worker** and **firm scarring**) of GFC foreign shocks.
 - ▶ **Informality** provides a buffer, but is not sufficient to compensate worker and firm scarring
 - ▶ Labor scarring occurs for **incumbent workers** (not just displaced workers) & **low-skilled** workers only
- ▶ Assistance programs fail to mitigate adjustment:
 - ▶ **Training** does not respond. **Unemployment insurance** compensates 4% of worker losses and **welfare programs** 2%.
- ▶ Firms:
 - ▶ **SOE & firms in highly concentrated sectors** do not adjust
 - ▶ Others bear burden—**exit or restructure** (downsizing employment and productivity)—**scarring** workers & increasing **inequality**.

Appendix

Descriptive statistics: worker-level

	Mean	Std. Dev.
Outcomes		
Months worked per year (2004-2007)	9.96	3.53
Monthly real wages (2004-2007)	2724.74	3817.85
Average months worked per year (2009 onward)	8.5	3.8
Average monthly real wages (2009 onward)	1.9	2.1
Average number of months in Bolsa Familia program (2009-2012)	2.5	9.4
Average payments from Bolsa Familia program (2009-2012)	28.0	221.0
Average number of months with unemployment insurance	0.5	0.9
Average payments from unemployment insurance (in local currency)	522.7	909.5
Share of workers trained (2009-2012)		3.22%
Share of workers in technical upgrading training (2009-2012)		1.84%
Number of workers trained (2009-2012)		59672
Number of workers in technical upgrading training (2009-2012)		34128
Firm shock		
Firm shock in 2008 (negative of growth in GDP of destinations)	-3.1	2.0
Total number of worker-year observations	3046074	
Total number of unique worker IDs	342574	
Total number of unique firm IDs	11453	
Share of observations with 0 months worked per year		19.0%

Note: the worker-level statistics are based on the samples of workers in firms with a non-missing GFC firm shock measure in 2008 included in the main regressions. For Bolsa Familia, unemployment insurance, and training programs the statistics are based only on beneficiaries. Real wages are expressed in local currency in 2010 prices. All statistics other than average real wages pre-GFC or the GFC firm shock cover the 2009-2017 period.

Descriptive statistics: firm-level

	Mean	Std. Dev.
Outcomes		
Total employment	91.7	109.0
Total employment (log)	4.6	2.4
Total real wages (log)	11.8	2.1
Avg. wages (log)	7.8	0.6
Net revenue (log) (2009-2014)	59.9	103.5
Materials (log) (2009-2014)	2.4	1.5
Materials per worker (2009-2014)	-1.1	1.1
Capital (log) (2009-2014)	3.5	1.0
Capital per worker (2009-2014)	0.0	0.6
Labor productivity (2009-2014)	60.5	105.4
Profit rate (2009-2014)	-1.5	1.6
Median of relative price (2009-2014)	1.0	0.1
Firm shock		
Firm shock in 2008 (negative of growth in GDP of destinations)	-3.2	2.7
Total number of firm-year observations	119189	
Total number of unique firm IDs	15087	

Note: The firm-level statistics cover all firms with non-missing GFC shock measure in 2008 included in the main regressions.

Worker panel database and random sample

Brazil

- ▶ Starting database includes for individuals in cohort employed in tradables sector in 2004 or entrants into tradables sector after 2004 all their working lives until 2017
 - ▶ Working life may include employment in non-tradables sector
 - ▶ Highest paid job in December identifies wage, firm, and sector of worker
- ▶ Intermediate database selects from starting database workers 16-65 years old employed at least once in an exporting firm (in tradables sector)
- ▶ Final database is a 10% random sample of workers in intermediate database
 - ▶ If worker ID is selected for random sample entire working life is included
- ▶ Expanded final database is needed to construct worker cumulative employment and wages and it adds observations with 0 months worked and 0 wages:
 - ▶ to intervening years between first and last year an individual is observed
 - ▶ after an individual is last observed until 2017 if age is below 65
- ▶ Characteristics of workers in expanded final database are similar to those of workers in starting and intermediate databases

Additional descriptive statistics

	Mean	Std. Dev.
Worker panel		
<i>Controls (pre-global financial crisis)</i>		
Male	75.2%	43.2%
Age	32.98	9.62
Higher education or more	16.1%	36.8%
Previous formal sector attachment	67.3%	32.8%
<i>Other</i>		
Young (16-34)	61.5%	48.7%
Middle age (35-49)	33.6%	47.2%
Old (50-65)	5.0%	21.8%
Low informality rate	57.8%	49.4%
High informality rate	42.2%	49.4%
Low share of agriculture	60.7%	48.8%
High share of agriculture	39.3%	48.8%
Low sector concentration	76.5%	42.4%
High sector concentration	23.5%	42.4%
Not-State owned	98.5%	12.2%
State-owned	1.5%	12.2%
Low informality rate	57.8%	49.4%
High informality rate	42.2%	49.4%

Note: the worker statistics are based on the samples of workers in firms with a non-missing shock measure in 2008.

Additional descriptive statistics

	Mean	Std. Dev.	N
Firm panel			
<i>Controls (pre-global financial crisis)</i>			
Importer dummy	59.6%	49.1%	
Firm avg. growth in total employment	10.7%	30.8%	
Firm avg. growth in total wages	13.1%	32.3%	
Worker panel - full RAIS			
Male	72%	45%	240 669 880
Age	33.9	10.4	241 057 542
Higher education	10%	30%	241 057 542
Previous labor attachment	37%	37%	241 057 542
Average months worked per year	6.9	3.8	177 895 587
Average monthly real wages	2.3	2.1	98 146 366

Note: the worker statistics are based on the samples of workers in firms with a non-missing shock measure in 2008.

Robustness

	Average months worked				Average real wages			
	Dropping commodity boom-affected sectors	Dropping recent domestic recession years	Dropping Firms controls	Separate sector, state and year fixed effects	Dropping commodity boom-affected sectors	Dropping recent domestic recession years	Dropping Firms controls	Separate sector, state and year fixed effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GFC firm shock*2009	-0.0464*** (0.0110)	-0.0575*** (0.0105)	-0.0504*** (0.0107)	-0.0512*** (0.0112)	-0.0038 (0.0031)	-0.0090*** (0.0031)	-0.0076** (0.0031)	-0.0024 (0.0031)
GFC firm shock*2010	-0.0415*** (0.0088)	-0.0525*** (0.0087)	-0.0462*** (0.0088)	-0.0426*** (0.0089)	-0.0064** (0.0029)	-0.0118*** (0.0029)	-0.0103*** (0.0030)	-0.0056* (0.0029)
GFC firm shock*2011	-0.0311*** (0.0081)	-0.0419*** (0.0081)	-0.0359*** (0.0082)	-0.0300*** (0.0081)	-0.0065** (0.0029)	-0.0119*** (0.0029)	-0.0103*** (0.0030)	-0.0060** (0.0029)
GFC firm shock*2012	-0.0267*** (0.0075)	-0.0373*** (0.0076)	-0.0313*** (0.0077)	-0.0244*** (0.0075)	-0.0074** (0.0030)	-0.0126*** (0.0030)	-0.0109*** (0.0030)	-0.0070** (0.0030)
GFC firm shock*2013	-0.0219*** (0.0072)	-0.0323*** (0.0073)	-0.0263*** (0.0074)	-0.0200*** (0.0071)	-0.0084*** (0.0031)	-0.0134*** (0.0031)	-0.0118*** (0.0031)	-0.0082*** (0.0031)
GFC firm shock*2014	-0.0202*** (0.0070)	-0.0300*** (0.0071)	-0.0239*** (0.0072)	-0.0188*** (0.0069)	-0.0086*** (0.0031)	-0.0136*** (0.0032)	-0.0119*** (0.0032)	-0.0088*** (0.0031)
GFC firm shock*2015	-0.0177** (0.0069)	-0.0214*** (0.0070)	-0.0170** (0.0069)	-0.0170** (0.0069)	-0.0082*** (0.0032)	-0.0114*** (0.0032)	-0.0114*** (0.0033)	-0.0088*** (0.0032)
GFC firm shock*2016	-0.0151** (0.0068)		-0.0189*** (0.0070)	-0.0153** (0.0069)	-0.0074** (0.0032)		-0.0104*** (0.0032)	-0.0085*** (0.0032)
GFC firm shock*2017	-0.0141** (0.0068)		-0.0177** (0.0069)	-0.0152** (0.0069)	-0.0067** (0.0033)		-0.0096*** (0.0033)	-0.0083** (0.0033)
Observations	2,753,645	2,042,335	3,076,506	2,753,663	2,739,082	2,031,597	3,060,819	2,739,100
R-squared	0.105	0.123	0.126	0.104	0.2946	0.2714	0.2748	0.2944
2-digit industry X Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
State X Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Municipality X Year FE	No	No	No	No	No	No	No	No
4-digit industry X Year FE	No	No	No	No	No	No	No	No
2-digit industry FE	No	No	No	Yes	No	No	No	Yes
State FE	No	No	No	Yes	No	No	No	Yes
Year FE	No	No	No	Yes	No	No	No	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

Robustness

	Average months worked following Yagan (2019)	Average real wages following Yagan (2019)	Indicator for being fired (Definition 1)	Indicator for being fired (Definition 2)
	(1)	(2)	(3)	(4)
GFC firm shock*2009	-0.0544*** (0.0108)	-28.6391*** (6.3102)	0.0003* (0.0002)	0.0003* (0.0002)
GFC firm shock*2010	-0.0441*** (0.0104)	-28.4306*** (6.3088)	0.0000 (0.0002)	0.0000 (0.0002)
GFC firm shock*2011	-0.0186* (0.0098)	-28.3811*** (6.2924)	-0.0002 (0.0002)	-0.0002 (0.0002)
GFC firm shock*2012	-0.0192** (0.0089)	-28.2186*** (6.2794)	-0.0003 (0.0002)	-0.0003 (0.0002)
GFC firm shock*2013	-0.0089 (0.0084)	-27.9682*** (6.2490)	0.0001 (0.0002)	0.0001 (0.0002)
GFC firm shock*2014	-0.0163** (0.0083)	-27.6736*** (6.1863)	-0.0000 (0.0002)	0.0000 (0.0002)
GFC firm shock*2015	-0.0088 (0.0088)	-27.0546*** (6.1000)	0.0002 (0.0003)	0.0002 (0.0003)
GFC firm shock*2016	-0.0081 (0.0089)	-26.9920*** (6.0603)	0.0000 (0.0003)	0.0000 (0.0003)
GFC firm shock*2017	-0.0121 (0.0087)	-26.2731*** (5.9758)	0.0002 (0.0003)	0.0002 (0.0003)
Observations	3,046,074	3,046,074	2,463,396	2,463,396
R-squared	0.3118	0.4228	0.0161	0.0162
2-digit industry X Year FE	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

Robustness

	Average months worked		Average real wages	
	Shock GDP growth export destinations fixing weights to 2004-2007	Shock GDP growth export destinations using weights in t-1 and t-2	Shock GDP growth export destinations fixing weights to 2004-2007	Shock GDP growth export destinations using weights in t-1 and t-2
	(1)	(2)	(3)	(4)
GFC firm shock*2009	-0.0534*** (0.0099)	-0.0565*** (0.0103)	-0.0067** (0.0029)	-0.0075*** (0.0029)
GFC firm shock*2010	-0.0514*** (0.0084)	-0.0504*** (0.0085)	-0.0101*** (0.0027)	-0.0106*** (0.0027)
GFC firm shock*2011	-0.0431*** (0.0078)	-0.0413*** (0.0079)	-0.0106*** (0.0027)	-0.0110*** (0.0028)
GFC firm shock*2012	-0.0390*** (0.0073)	-0.0373*** (0.0074)	-0.0113*** (0.0027)	-0.0120*** (0.0029)
GFC firm shock*2013	-0.0340*** (0.0070)	-0.0329*** (0.0071)	-0.0125*** (0.0028)	-0.0132*** (0.0030)
GFC firm shock*2014	-0.0310*** (0.0068)	-0.0309*** (0.0069)	-0.0132*** (0.0029)	-0.0138*** (0.0031)
GFC firm shock*2015	-0.0287*** (0.0067)	-0.0285*** (0.0068)	-0.0131*** (0.0030)	-0.0137*** (0.0031)
GFC firm shock*2016	-0.0267*** (0.0067)	-0.0261*** (0.0067)	-0.0127*** (0.0030)	-0.0130*** (0.0032)
GFC firm shock*2017	-0.0252*** (0.0066)	-0.0249*** (0.0067)	-0.0122*** (0.0031)	-0.0126*** (0.0032)
Observations	3,349,256	3,163,251	3,332,057	3,147,149
R-squared	0.1254	0.1272	0.2784	0.2765
2-digit industry X Year FE	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

Heterogeneity of impact of GFC foreign shocks across worker characteristics II

	Average months worked		Average real wage	
	Coefficient	Test eq. of coeff. t-test p-value	Coefficient	Test eq. of coeff. t-test p-value
	(1)	(2)	(3)	(4)
GFC firm shock*Low previous formal sector attach.	-0.0270*** (0.0097)		-0.0146*** (0.0051)	
GFC firm shock*High previous formal sector attach.	-0.0377*** (0.0082)	-1.0231 (0.3063)	-0.0082*** (0.0017)	1.2577 (0.2085)
Observations		3,046,074		3,030,524
R-squared		0.8541		0.5698
GFC firm shock*AKM below median	-0.0444*** (0.0084)		-0.0077*** (0.0027)	
GFC firm shock*AKM above median	-0.0260*** (0.0077)	-2.2585 (0.0239)**	-0.0078*** (0.0029)	0.0105 (0.9916)
Observations		2,298,119		2,297,958
R-squared		0.8729		0.7082
2-digit industry X Year FE		Yes		Yes
State X Year FE		Yes		Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007. AKM stands for worker fixed effects estimated following Abowd et al (1999).

- ▶ Smaller response of employment for higher ability workers

Robustness Firms 1

	Panel A: Firm size					Panel B: Firm total real wages				
	Dropping commodity boom-affected sectors	Dropping resent domestic recession years	Dropping Firms controls	Separate sector, state and year fixed effects	More disaggregated fixed effects	Dropping commodity boom-affected sectors	Dropping recent domestic recession years	Dropping Firms controls	Separate sector, state and year fixed effects	More disaggregated fixed effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
GFC firm shock*2009	-0.0157*** (0.0028)	-0.0152*** (0.0026)	-0.0230*** (0.0050)	-0.0107*** (0.0028)	-0.0113*** (0.0029)	-0.0161*** (0.0035)	-0.0173*** (0.0033)	-0.0308*** (0.0051)	-0.0189*** (0.0034)	-0.0119*** (0.0038)
GFC firm shock*2010	-0.0214*** (0.0033)	-0.0210*** (0.0032)	-0.0295*** (0.0052)	-0.0197*** (0.0033)	-0.0174*** (0.0036)	-0.0231*** (0.0037)	-0.0244*** (0.0036)	-0.0376*** (0.0053)	-0.0260*** (0.0036)	-0.0197*** (0.0041)
GFC firm shock*2011	-0.0253*** (0.0036)	-0.0254*** (0.0035)	-0.0314*** (0.0053)	-0.0250*** (0.0035)	-0.0213*** (0.0039)	-0.0243*** (0.0039)	-0.0257*** (0.0039)	-0.0376*** (0.0054)	-0.0274*** (0.0038)	-0.0205*** (0.0044)
GFC firm shock*2012	-0.0254*** (0.0040)	-0.0253*** (0.0039)	-0.0315*** (0.0056)	-0.0241*** (0.0038)	-0.0201*** (0.0044)	-0.0265*** (0.0042)	-0.0280*** (0.0041)	-0.0378*** (0.0056)	-0.0285*** (0.0040)	-0.0228*** (0.0048)
GFC firm shock*2013	-0.0276*** (0.0042)	-0.0280*** (0.0041)	-0.0344*** (0.0056)	-0.0284*** (0.0040)	-0.0240*** (0.0046)	-0.0267*** (0.0045)	-0.0282*** (0.0044)	-0.0370*** (0.0057)	-0.0282*** (0.0043)	-0.0257*** (0.0050)
GFC firm shock*2014	-0.0297*** (0.0044)	-0.0300*** (0.0044)	-0.0350*** (0.0057)	-0.0300*** (0.0042)	-0.0273*** (0.0049)	-0.0284*** (0.0046)	-0.0304*** (0.0045)	-0.0394*** (0.0057)	-0.0279*** (0.0044)	-0.0298*** (0.0051)
GFC firm shock*2015	-0.0300*** (0.0045)	-0.0300*** (0.0045)	-0.0390*** (0.0058)	-0.0305*** (0.0043)	-0.0281*** (0.0050)	-0.0275*** (0.0048)	-0.0275*** (0.0048)	-0.0407*** (0.0058)	-0.0255*** (0.0045)	-0.0295*** (0.0054)
GFC firm shock*2016	-0.0226*** (0.0048)	-0.0226*** (0.0048)	-0.0328*** (0.0059)	-0.0244*** (0.0046)	-0.0224*** (0.0053)	-0.0238*** (0.0051)	-0.0238*** (0.0051)	-0.0385*** (0.0059)	-0.0246*** (0.0048)	-0.0269*** (0.0057)
GFC firm shock*2017	-0.0215*** (0.0051)	-0.0215*** (0.0051)	-0.0322*** (0.0061)	-0.0252*** (0.0049)	-0.0229*** (0.0056)	-0.0233*** (0.0053)	-0.0233*** (0.0053)	-0.0380*** (0.0050)	-0.0228*** (0.0050)	-0.0255*** (0.0058)
Observations	89,161	64,541	91,971	92,003	86,858	79,312	58,146	82,313	82,338	77,049
R-squared	0.5413	0.5915	0.1211	0.5293	0.6124	0.4797	0.5196	0.1306	0.4692	0.5638
Year FE	No	No	No	Yes	No	No	No	No	Yes	No
2-digit industry FE	No	No	No	Yes	No	No	No	No	Yes	No
State FE	No	No	No	Yes	No	No	No	No	Yes	No
2-digit industry X Year FE	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
State X Year FE	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
Municipality X Year FE	No	No	No	No	Yes	No	No	No	No	Yes
4-digit industry FE	No	No	No	No	No	No	No	No	No	No
4-digit industry X Year FE	No	No	No	No	Yes	No	No	No	No	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

Robustness Firms 1

	Panel C: Firm exit					Panel D: Firm share of skilled workers				
	Dropping commodity boom-affected sectors	Dropping resent domestic recession years	Dropping Firms controls	Separate sector, state and year fixed effects	More disaggregated fixed effects	Dropping commodity boom-affected sectors	Dropping resent domestic recession years	Dropping Firms controls	Separate sector, state and year fixed effects	More disaggregated fixed effects
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
GFC firm shock*2009	-0.0004 (0.0006)	-0.0003 (0.0006)	-0.0002 (0.0006)	-0.0002 (0.0006)	-0.0007 (0.0007)	0.0005 (0.0004)	0.0006 (0.0004)	0.0024*** (0.0005)	0.0010** (0.0004)	0.0009* (0.0005)
GFC firm shock*2010	0.0020*** (0.0006)	0.0019*** (0.0006)	0.0020*** (0.0006)	0.0021*** (0.0005)	0.0019*** (0.0006)	0.0006 (0.0004)	0.0007 (0.0004)	0.0025*** (0.0005)	0.0010** (0.0004)	0.0010** (0.0005)
GFC firm shock*2011	0.0009 (0.0007)	0.0010* (0.0006)	0.0011* (0.0006)	0.0012* (0.0006)	0.0012 (0.0007)	0.0010** (0.0004)	0.0010** (0.0004)	0.0028*** (0.0005)	0.0012*** (0.0004)	0.0013*** (0.0005)
GFC firm shock*2012	0.0001 (0.0007)	0.0001 (0.0006)	0.0002 (0.0006)	-0.0003 (0.0006)	0.0002 (0.0007)	0.0012*** (0.0004)	0.0012*** (0.0004)	0.0031*** (0.0005)	0.0013*** (0.0004)	0.0017*** (0.0005)
GFC firm shock*2013	0.0009 (0.0006)	0.0010 (0.0006)	0.0010* (0.0006)	0.0010* (0.0006)	0.0009 (0.0007)	0.0014*** (0.0005)	0.0014*** (0.0005)	0.0033*** (0.0005)	0.0013*** (0.0004)	0.0018*** (0.0005)
GFC firm shock*2014	-0.0003 (0.0007)	-0.0004 (0.0007)	-0.0004 (0.0007)	-0.0004 (0.0007)	-0.0004 (0.0008)	0.0017*** (0.0005)	0.0016*** (0.0005)	0.0037*** (0.0006)	0.0014*** (0.0005)	0.0023*** (0.0005)
GFC firm shock*2015	0.0017** (0.0007)	0.0016** (0.0007)	0.0014** (0.0007)	0.0014** (0.0007)	0.0011** (0.0008)	0.0015*** (0.0005)	0.0015*** (0.0005)	0.0036*** (0.0006)	0.0011** (0.0005)	0.0020*** (0.0006)
GFC firm shock*2016	0.0012* (0.0007)	0.0012* (0.0007)	0.0012* (0.0007)	0.0010 (0.0007)	0.0013 (0.0008)	0.0014** (0.0006)	0.0014** (0.0006)	0.0036*** (0.0006)	0.0010* (0.0005)	0.0022*** (0.0006)
GFC firm shock*2017						0.0014** (0.0006)		0.0034*** (0.0007)	0.0007 (0.0006)	0.0022*** (0.0007)
Observations	103,325	83,085	107,541	107,554	102,303	114,510	83,085	119,189	119,204	113,341
R-squared	0.0162	0.0162	0.0123	0.0104	0.1037	0.4843	0.4899	0.2121	0.4807	0.5540
Year FE	No	No	No	Yes	No	No	No	No	Yes	No
2-digit industry FE	No	No	No	Yes	No	No	No	No	Yes	No
State FE	No	No	No	Yes	No	No	No	No	Yes	No
2-digit industry X Year FE	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
State X Year FE	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
Municipality X Year FE	No	No	No	No	Yes	No	No	No	No	Yes
4-digit industry FE	No	No	No	No	No	No	No	No	No	No
4-digit industry X Year FE	No	No	No	No	Yes	No	No	No	No	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

Robustness Firms 2

	Panel A: Firm size		Panel B: Firm total real wages	
	Shock GDP growth export destinations fixing weights to 2004-2007	Shock GDP growth export destinations using weights in t-1 and t-2	Shock GDP growth export destinations fixing weights to 2004-2007	Shock GDP growth export destinations using weights in t-1 and t-2
	(1)	(2)	(3)	(4)
GFC firm shock*2009	-0.0130*** (0.0021)	-0.0164*** (0.0024)	-0.0165*** (0.0026)	-0.0206*** (0.0030)
GFC firm shock*2010	-0.0138*** (0.0025)	-0.0206*** (0.0029)	-0.0173*** (0.0028)	-0.0255*** (0.0032)
GFC firm shock*2011	-0.0157*** (0.0027)	-0.0243*** (0.0031)	-0.0183*** (0.0030)	-0.0271*** (0.0035)
GFC firm shock*2012	-0.0144*** (0.0030)	-0.0242*** (0.0035)	-0.0192*** (0.0032)	-0.0293*** (0.0037)
GFC firm shock*2013	-0.0173*** (0.0032)	-0.0267*** (0.0037)	-0.0195*** (0.0034)	-0.0297*** (0.0039)
GFC firm shock*2014	-0.0175*** (0.0035)	-0.0270*** (0.0040)	-0.0207*** (0.0036)	-0.0309*** (0.0041)
GFC firm shock*2015	-0.0196*** (0.0036)	-0.0284*** (0.0041)	-0.0183*** (0.0037)	-0.0281*** (0.0042)
GFC firm shock*2016	-0.0130*** (0.0038)	-0.0219*** (0.0044)	-0.0171*** (0.0039)	-0.0255*** (0.0046)
GFC firm shock*2017	-0.0117*** (0.0040)	-0.0211*** (0.0046)	-0.0153*** (0.0041)	-0.0234*** (0.0048)
Observations	144,464	108,960	132,562	98,686
R-squared	0.5358	0.5366	0.4796	0.4807
2-digit industry X Year FE	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes

Note: Robust standard errors clustered at the firm level in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for vectors of worker and firm characteristics as of 2007.

Descriptive Statistics - Ecuador

	Mean	Std. Dev.
Panel A: Worker panel		
Outcomes		
Months worked per year	9.2	4.7
Monthly real wages (in local currency)	1 059.3	2 052.4
Average months worked per year (2009 onward)	9.7	3.7
Average monthly real wages (2009 onward)	1.6	2.4
Firm shock		
Firm shock in 2008 (negative of growth in GDP of destinations)	-3.0	2.5
Total number of worker-year observations		794948
Total number of unique worker IDs		89385
Total number of unique firm IDs		887
Share of observations with 0 months worked per year		12.9%
Panel B: Firm panel		
Outcomes		
Total employment	128.9	221.3
Total employment (log)	3.8	1.6
Total real wages (log)	10.5	1.8
Avg. wages (log)	6.7	0.6
Net revenues (log)	12.0	2.1
Materials (log)	14.3	1.9
Materials per worker	10.4	1.5
Capital (log)	13.7	2.1
Capital per worker	9.3	1.4
TFP	10.4	1.1
Labor productivity	10.3	0.9
Profit rate	0.3	0.2
Firm shock		
Firm shock in 2008 (negative of growth in GDP of destinations)	-1.0	2.2
Total number of firm-year observations		24094
Total number of unique firm IDs		2859

Note: the statistics are based on the samples of workers in firms with a non-missing GFC firm shock measure in 2008. Real wages are expressed in USD in 2010 prices. All statistics other than average real wages pre-GFC or the GFC firm shock cover the 2009-2017 period.

Firm's adjustment in revenues, exit and size - Ecuador

	Net revenues	Profit rate	Firm exit	Firm size (log)	Total wages (log)	Total skilled based on education (log)	Total unskilled based on education (log)	Share of skilled based on education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GFC firm shock*2009	-0.0293* (0.0150)	-0.0007 (0.0015)	-0.0010 (0.0010)	-0.0145** (0.0070)	-0.0454*** (0.0094)	-0.0186** (0.0079)	-0.0156** (0.0074)	0.0008 (0.0012)
GFC firm shock*2010	-0.0584*** (0.0147)	0.0006 (0.0016)	-0.0009 (0.0012)	-0.0148** (0.0075)	-0.0429*** (0.0098)	-0.0185** (0.0082)	-0.0154* (0.0079)	0.0008 (0.0011)
GFC firm shock*2011	-0.0526*** (0.0150)	0.0019 (0.0018)	0.0004 (0.0010)	-0.0114 (0.0088)	-0.0362*** (0.0103)	-0.0157* (0.0087)	-0.0148* (0.0089)	-0.0000 (0.0012)
GFC firm shock*2012	-0.0473*** (0.0146)	0.0001 (0.0016)	-0.0020 (0.0013)	-0.0025 (0.0097)	-0.0257** (0.0108)	-0.0164* (0.0095)	-0.0129 (0.0089)	-0.0012 (0.0014)
GFC firm shock*2013	-0.0548*** (0.0166)	-0.0002 (0.0016)	-0.0003 (0.0014)	-0.0052 (0.0097)	-0.0276** (0.0109)	-0.0148 (0.0095)	-0.0139 (0.0091)	-0.0017 (0.0015)
GFC firm shock*2014	-0.0512*** (0.0172)	0.0015 (0.0017)	-0.0012 (0.0013)	0.0007 (0.0098)	-0.0182* (0.0110)	-0.0109 (0.0098)	-0.0051 (0.0096)	-0.0001 (0.0013)
GFC firm shock*2015	-0.0453** (0.0195)	-0.0003 (0.0018)	0.0004 (0.0015)	0.0003 (0.0103)	-0.0218* (0.0116)	-0.0123 (0.0099)	-0.0048 (0.0103)	-0.0009 (0.0014)
GFC firm shock*2016	-0.0250 (0.0196)	0.0011 (0.0022)	0.0008 (0.0011)	0.0042 (0.0103)	-0.0246** (0.0119)	-0.0142 (0.0101)	-0.0035 (0.0101)	-0.0022 (0.0017)
GFC firm shock*2017	-0.0449** (0.0190)	-0.0007 (0.0022)		0.0102 (0.0114)	-0.0161 (0.0132)	-0.0058 (0.0104)	0.0007 (0.0105)	-0.0020 (0.0018)
Observations	18,216	21,894	21,640	23,702	23,731	21,175	23,512	24,094
R-squared	0.4922	0.3520	0.0618	0.6294	0.5809	0.5995	0.6327	0.3464
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for a vector of firm characteristics as of 2007.

Firm's performance impacts - Ecuador

	Materials (log) (1)	Materials per worker (log) (2)	Capital (log) (3)	Capital per worker (log) (4)	TFP (log) (5)	Labor productivity (log) (6)
GFC firm shock*2009	-0.0408*** (0.0122)	-0.0243** (0.0112)	-0.0497*** (0.0168)	-0.0423*** (0.0147)	-0.0327*** (0.0088)	-0.0204*** (0.0069)
GFC firm shock*2010	-0.0519*** (0.0123)	-0.0335*** (0.0106)	-0.0535*** (0.0178)	-0.0376** (0.0159)	-0.0364*** (0.0083)	-0.0177** (0.0069)
GFC firm shock*2011	-0.0430*** (0.0133)	-0.0375*** (0.0116)	-0.0616*** (0.0190)	-0.0511*** (0.0162)	-0.0198** (0.0096)	-0.0158** (0.0069)
GFC firm shock*2012	-0.0376*** (0.0125)	-0.0384*** (0.0109)	-0.0530*** (0.0178)	-0.0346** (0.0161)	-0.0228*** (0.0081)	-0.0124* (0.0074)
GFC firm shock*2013	-0.0380*** (0.0130)	-0.0322*** (0.0110)	-0.0522*** (0.0169)	-0.0267* (0.0150)	-0.0280*** (0.0082)	-0.0153** (0.0073)
GFC firm shock*2014	-0.0440*** (0.0140)	-0.0462*** (0.0115)	-0.0467*** (0.0177)	-0.0211 (0.0143)	-0.0217*** (0.0080)	-0.0171*** (0.0064)
GFC firm shock*2015	-0.0226 (0.0145)	-0.0269** (0.0113)	-0.0485** (0.0192)	-0.0283** (0.0153)	-0.0220*** (0.0085)	-0.0153** (0.0065)
GFC firm shock*2016	-0.0179 (0.0152)	-0.0240** (0.0114)	-0.0408** (0.0196)	-0.0214 (0.0160)	-0.0200** (0.0095)	-0.0155** (0.0070)
GFC firm shock*2017	-0.0293* (0.0159)	-0.0312** (0.0124)	-0.0452** (0.0204)	-0.0260 (0.0164)	-0.0246** (0.0098)	-0.0150** (0.0072)
Observations	18,184	18,303	9,870	9,916	9,772	21,757
R-squared	0.5341	0.4691	0.5543	0.2855	0.6484	0.3925
2-digit industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State X Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. All specifications control for a vector of firm characteristics as of 2007.