Venting Out: Exports During a Domestic Slump

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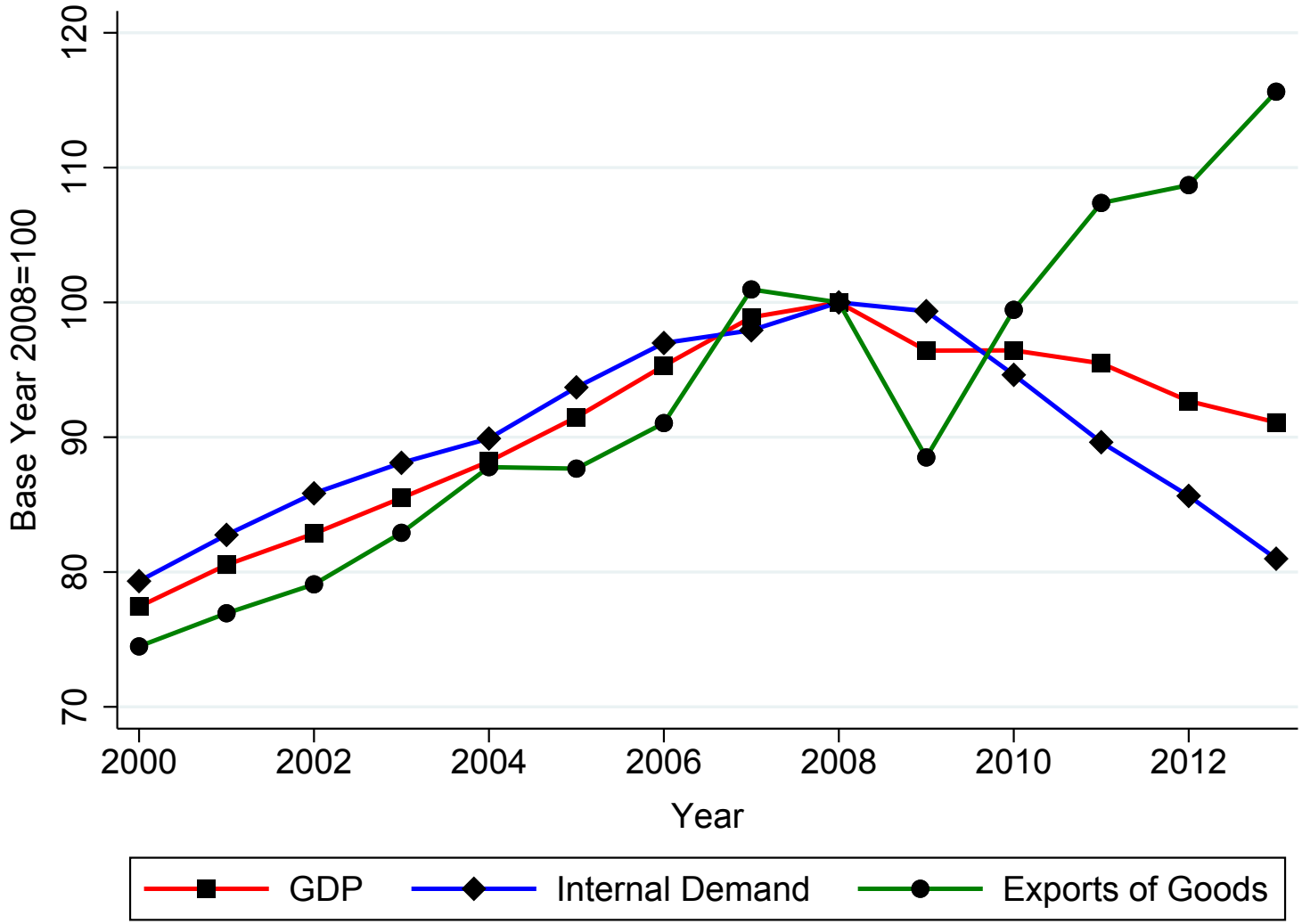
The Spanish Economy During the Great Recession

- Few countries experienced the Great Recession as intensively as Spain did...



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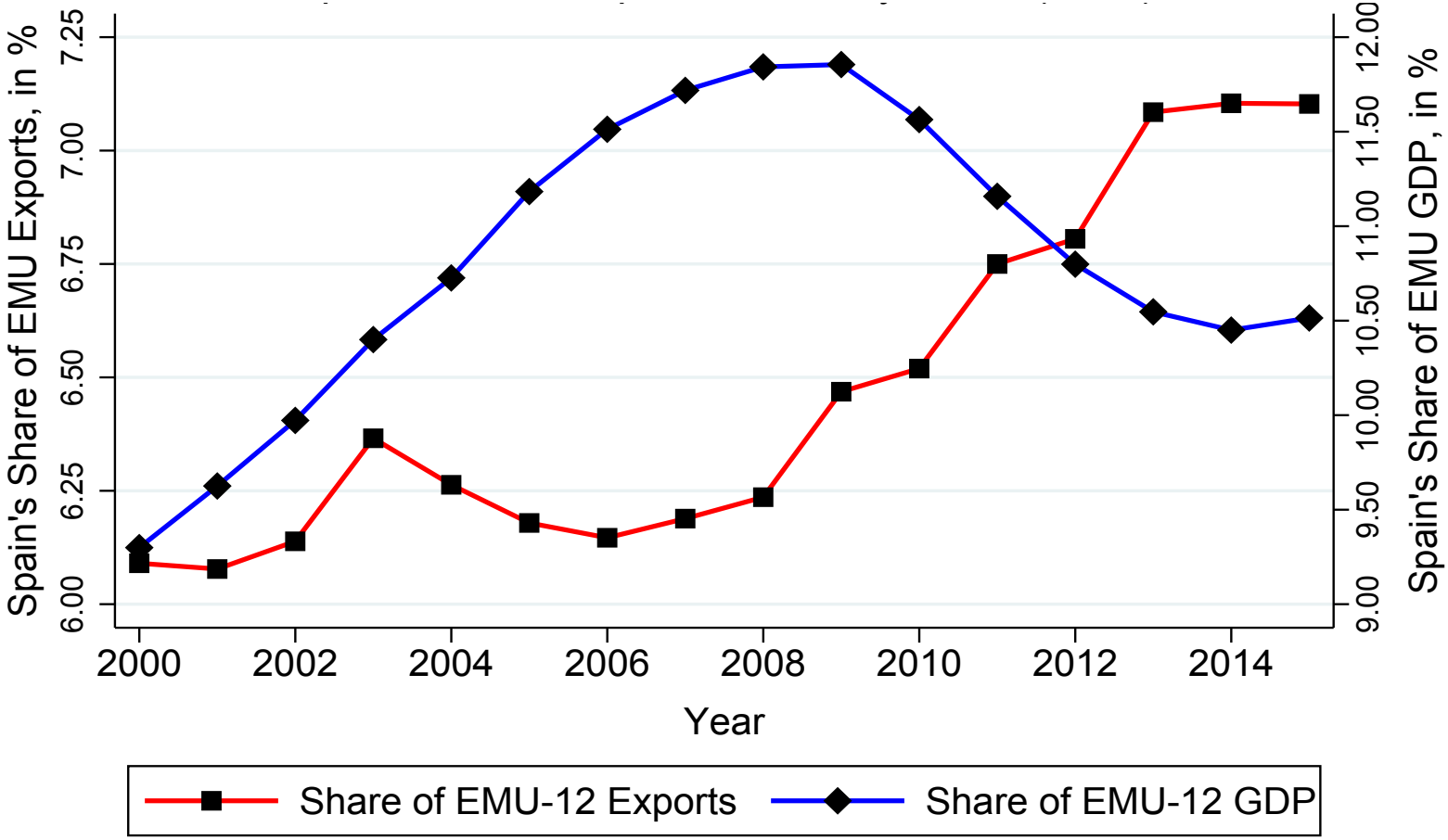
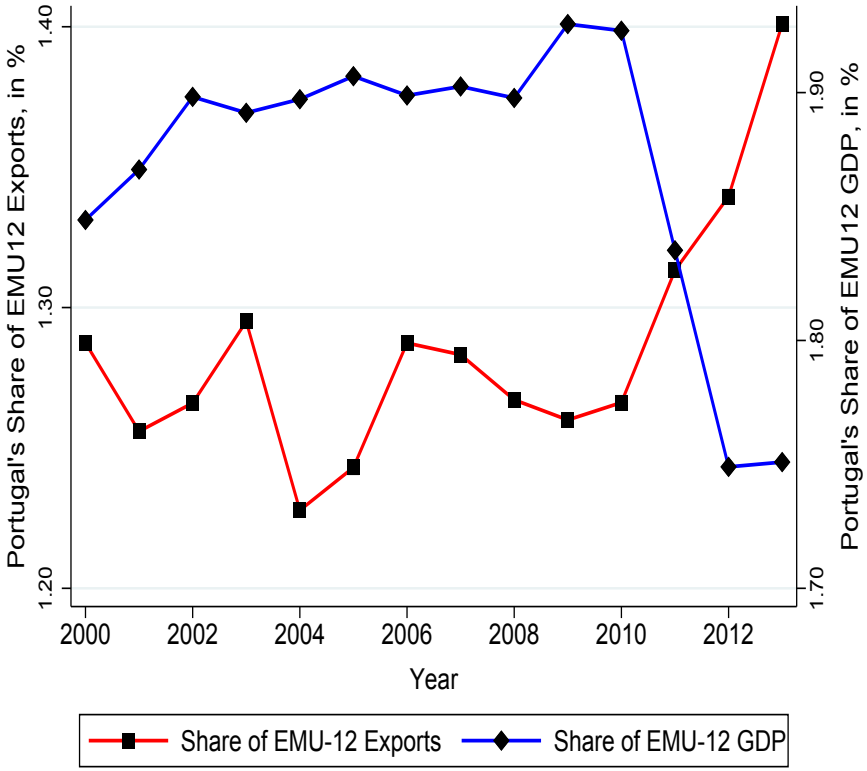
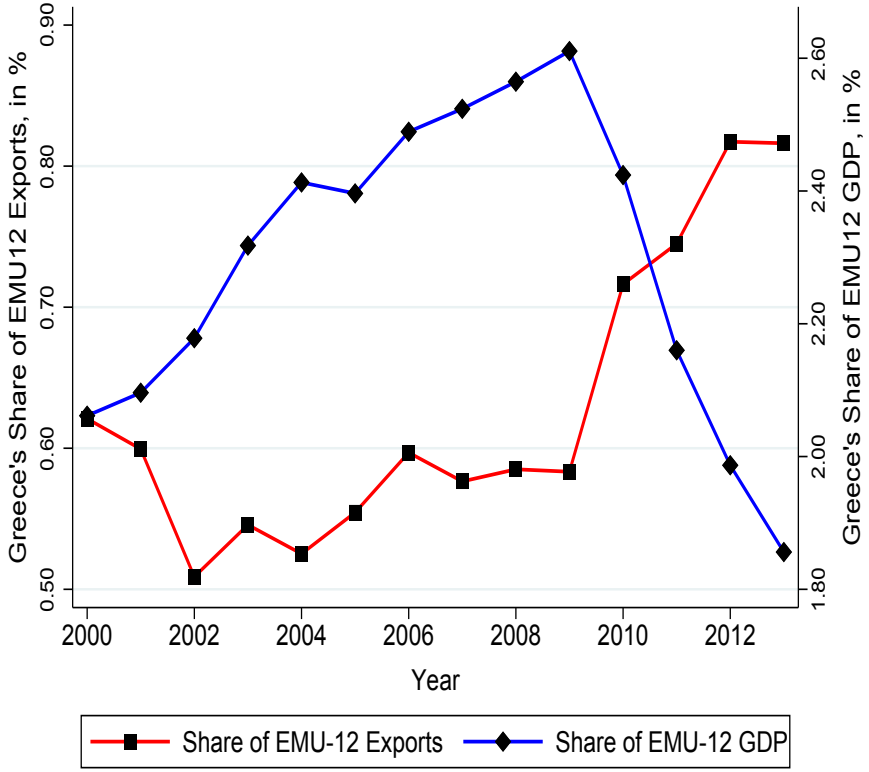


Other European Economies

- Spain is (not) different.





Explanations for the Spanish "Export Miracle"

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- "Vent-for-surplus" mechanism implies a negative *causal* relationship between domestic demand and exports operating through the firm's domestic sales:

$$\text{Domestic demand} \Downarrow \longrightarrow \text{Domestic sales} \Downarrow \longrightarrow \text{Exports} \Uparrow$$

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Holding factor prices and productivity fixed

- "Vent-for-surplus" mechanism is a *firm-level partial equilibrium* relationship.
- Contribution of this paper: test for the presence and quantify the contribution of the vent-for-surplus mechanism to the Spanish "export miracle".

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- As alternative instruments, we exploit differences across Spanish regions in exposure to factors believed to have caused the Great Recession:
  - differences in share of "buildable" urban land;
  - differences in importance of construction sector in employment;
  - differences in importance of tourism in overall economic activity.

Main Results

- Intensive margin results:
  - Robust negative causal relationship between firms' demand-driven changes in domestic sales and exports, controlling for firms' marginal cost shifters.
  - Elasticity of exports with respect to domestic sales is approximately -1.6.
  - A firm with a 25% initial export share will recoup €53.3 via exports for every €100 of lost domestic sales.

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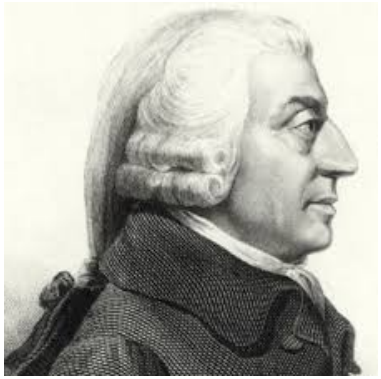
- Quantification:
  - "Vent-for-surplus" mechanism accounts for more than half of the 2009-13 increase in Spanish exports.

Literature: Adam Smith on Foreign Trade

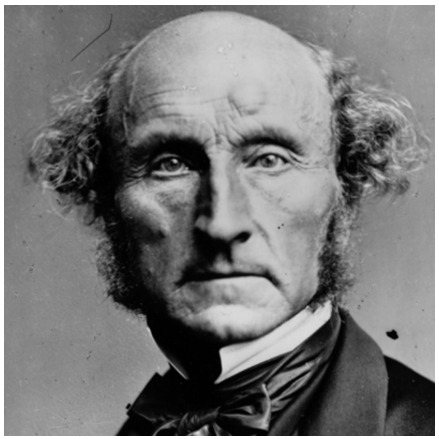
"When the produce of any particular branch of industry exceeds what the demand of the country requires, the surplus must be sent abroad, and exchanged for something for which there is a demand at home. Without such exportation, a part of the productive labour of the country must cease, and the value of its annual produce diminish [...] **The surplus part of them, therefore, must be sent abroad**, and exchanged for something for which there is a demand at home. It is by means of such exportation, that this surplus can acquire a value sufficient to compensate the labour and expense of producing it."



The Wealth of Nations, 1776, Book II, Chapter V

Literature: A 19th Century Referee Report

"Adam Smith's theory of the benefit of foreign trade was that it afforded an outlet for the surplus produce of a country, and enabled a portion of the capital of the country to replace itself with a profit. **These expressions suggest ideas inconsistent with a clear conception of the phenomena.**"



Principles of Political Economy, 1848, Book III, Ch. XVIII

Literature

- "Vent-for-surplus" theory:
  - Adam Smith (1776), Williams (1929), Myint (1958), Fisher and Kakkar (2004)
  - **Contribution:** we apply the "vent-for-surplus" intuition at the firm level and illustrate its importance as a mechanism to smooth out local shocks.
- Firm-level interdependencies across markets:
  - Trade models with increasing marginal costs: Vannoorenberghe (2002), Blum et al. (2013), Soderbery (2014), Blanchard and Portugal (2016), Ahn and McQuoid (2017), Liu (2017).
  - Impact of export demand on domestic sales: Berman et al. (2015).
  - Extensive margin complementarities: Antràs et al (2017), Morales et al (2017)
  - **Contribution:** study export impact of a large domestic demand shock.
- Exploiting spatial variation in the impact of the Great Recession:
  - Mian and Sufi (2009, 2014), Mian, Rao and Sufi (2013).
  - **Contribution:** exploit link between housing net worth and consumption shown in this prior work to look at impact of domestic demand on firms' exports

Road Map

- Baseline Model: Partial-equilibrium Version of Melitz (2003)
- Data
- Identification Approach
- Results
- Robustness
- Model with Increasing Marginal Costs
- Quantification
- Summary

BASELINE MODEL:
PARTIAL-EQUILIBRIUM VERSION OF MELITZ (2003)

Market-Specific Sales Revenue

- CES demand, constant marginal costs, monopolistic competition. ▸ Environment
- Model predicts that log-changes in sales between two periods are given by

$$\widehat{R}_{ij} = (\sigma - 1)\left[\widehat{\xi}_{ij} + \widehat{\varphi}_i - \widehat{\omega}_i\right] - (\sigma - 1)\left(\widehat{\tau}_{sj} - \widehat{P}_{sj}\right) + \widehat{E}_{sj},$$

- $\widehat{R}_{ix}$ is not impacted by $\widehat{R}_{id}$; thus, this model implies $\beta = 0$.

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- $\widehat{R}_{ix}$ is not impacted by $\widehat{R}_{id}$; thus, this model implies $\beta = 0$.
- To understand properties of $\hat{\beta}_{ols}$ and $\hat{\beta}_{iv}$, useful to decompose

$$\begin{aligned}
\widehat{\xi}_{ij} &= \xi_{sj} + \xi_{\ell j} + u^{\xi}_{ij}, \\
\widehat{\varphi}_i &= \varphi_s + \varphi_\ell + \delta_\varphi \widehat{\varphi}^*_i + u^{\varphi}_i, \\
\widehat{\omega}_i &= \omega_s + \omega_\ell + \delta_\omega \widehat{\omega}^*_i + u^{\omega}_i,
\end{aligned}$$

and, thus, we can rewrite

$$\widehat{R}_{ij} = \gamma_{sj} + \gamma_{\ell j} + (\sigma - 1)\,\delta_\varphi \widehat{\varphi}^*_i - (\sigma - 1)\,\delta_\omega \widehat{\omega}^*_i + \underbrace{(\sigma - 1)\left(u^{\xi}_{ij} + u^{\varphi}_i - u^{\omega}_i\right)}_{\varepsilon_{ij}}.$$

Properties of OLS Estimator

- Consider using OLS to estimate the parameter β in a regression of $\widehat{R}_{ix}$ on $\widehat{R}_{id}$ controlling for sector fixed effects, region fixed effects, and our proxies for productivity and production factor costs.
- Given this model, the probability limit of the OLS estimator of β is

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$$plim(\hat{\beta}_{ols}) = \frac{cov(\widehat{\mathcal{R}}_{ix}, \widehat{\mathcal{R}}_{id})}{var(\widehat{\mathcal{R}}_{id})} = \frac{cov(u_{ix}^{\xi} + u_i^{\varphi} - u_i^{\omega}, u_{id}^{\xi} + u_i^{\varphi} - u_i^{\omega})}{var(u_{id}^{\xi} + u_i^{\varphi} - u_i^{\omega})}.$$

- Therefore, $plim(\hat{\beta}_{ols}) > 0$ as long as firms'
  - productivity and production factor costs are not perfectly observable; and/or
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  - productivity and production factor costs are not perfectly observable; and/or
  - market- and firm-specific residual demand positively correlated across markets.
- The OLS estimator $\hat{\beta}_{ols}$ is likely to be upward biased; thus
  - $\hat{\beta}_{ols} > 0$ is not very informative about the true value β.
  - $\hat{\beta}_{ols} < 0$ is informative: it suggests the need for a different model.

Properties of IV Estimator

- Consider an instrumental variable approach with an instrument $\widehat{Z}_i$ for the log change in domestic sales $\widehat{R}_{id}$.
- We then have

$$plim(\hat{\beta}_{iv}) = \frac{cov(\widehat{\mathcal{R}}_{ix}, \widehat{\mathcal{Z}}_i)}{cov(\widehat{\mathcal{R}}_{id}, \widehat{\mathcal{Z}}_i)} = \frac{cov(u_{ix}^{\xi} + u_i^{\varphi} - u_i^{\omega}, \widehat{\mathcal{Z}}_i)}{cov(u_{id}^{\xi} + u_i^{\varphi} - u_i^{\omega}, \widehat{\mathcal{Z}}_i)}.$$

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- Note that $plim(\hat{\beta}_{iv}) = 0$ if $\widehat{\mathcal{Z}}_i$ is:
  1. correlated with the firm's idiosyncratic domestic demand;
  2. uncorrelated with the firm's idiosyncratic export demand;
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- If $\widehat{\mathcal{Z}}_i$ satisfies these three conditions, $\hat{\beta}_{iv} \neq 0$ is informative in that it suggests the need for a different model as framework to understand the properties of our estimators.

DATA

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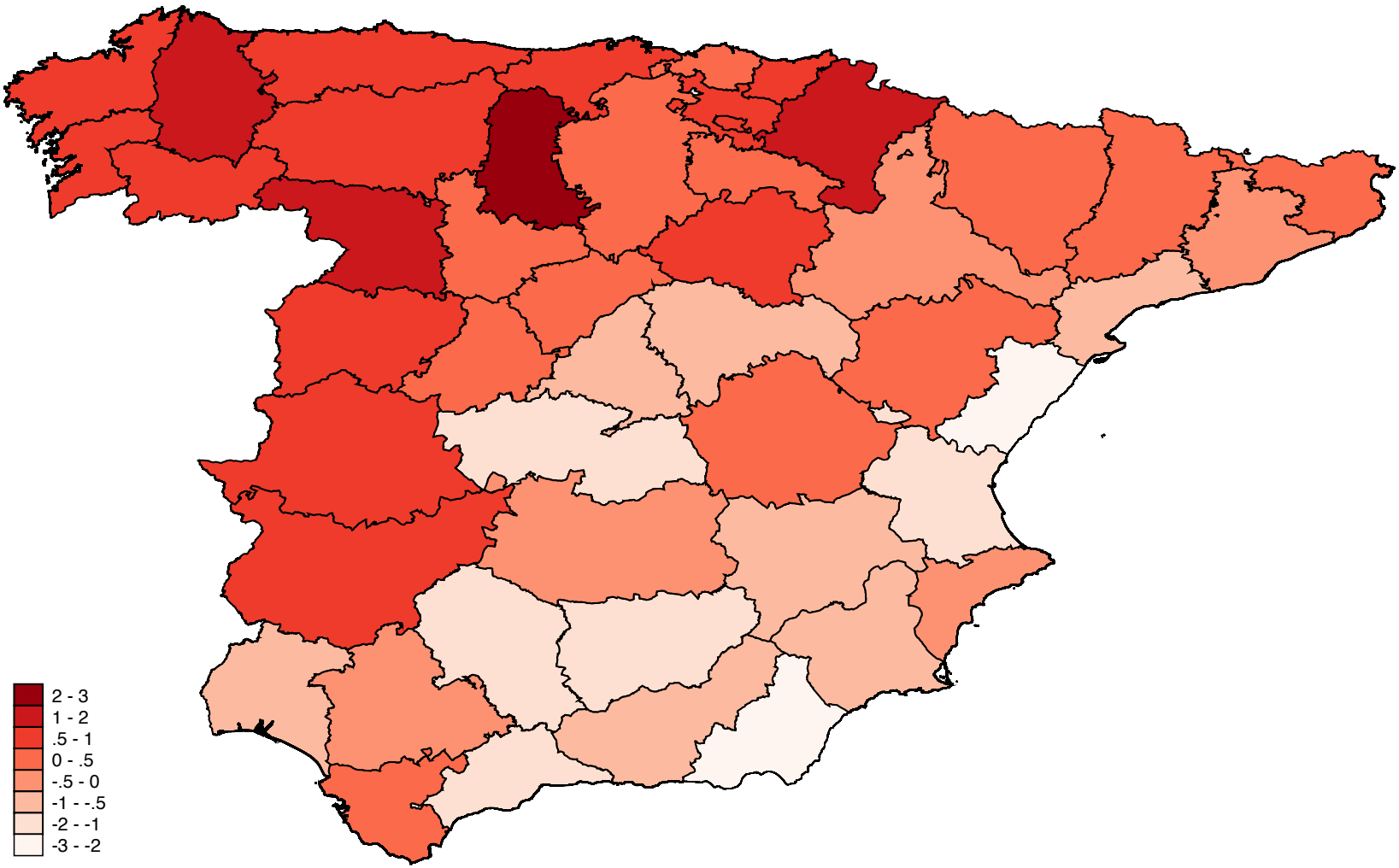
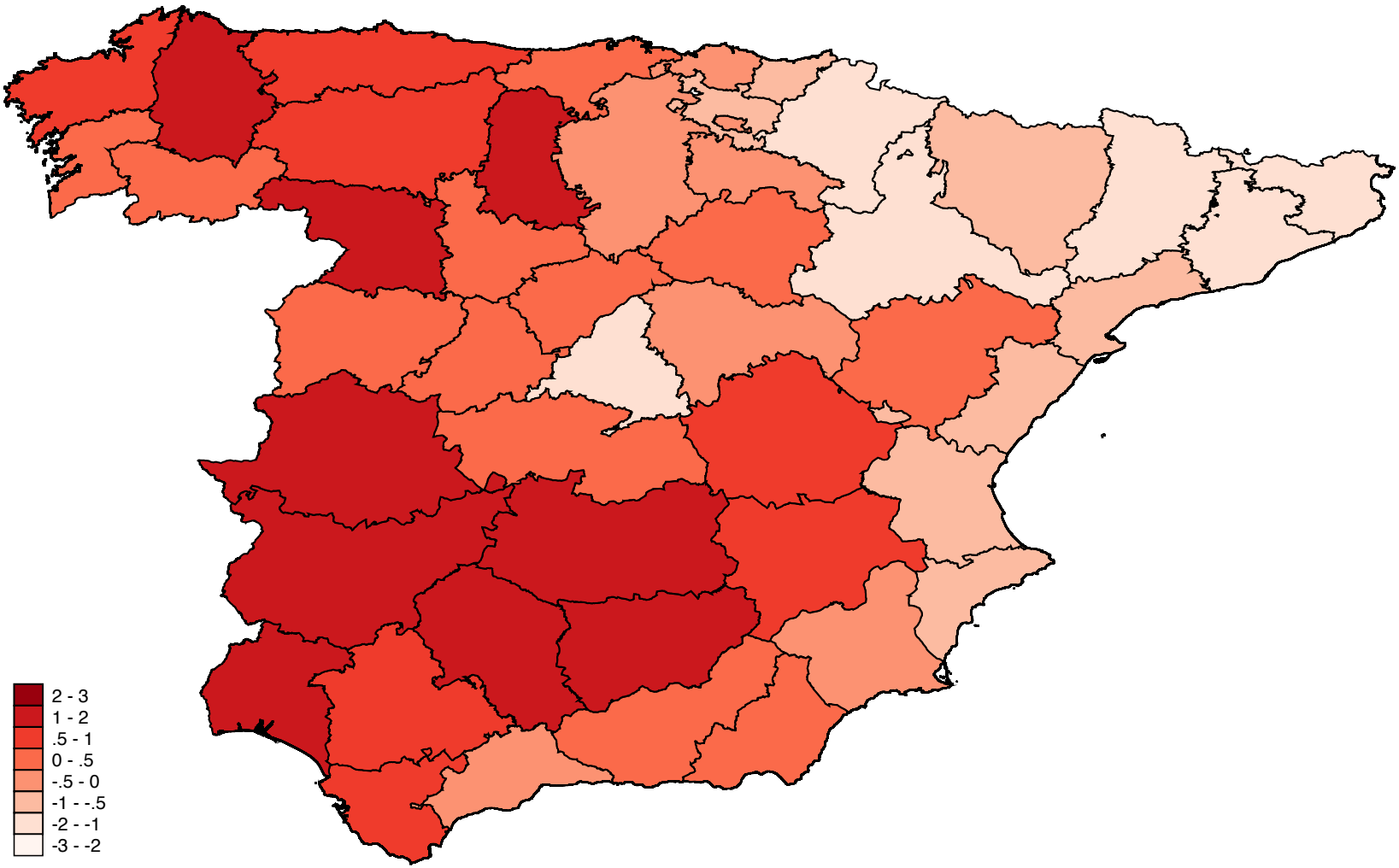
- For each firm and year, we observe
  - Sector of activity (4-digit) and 5-digit zip code of location;
  - Total sales revenue and aggregate export revenue;
  - Input measures: labor expenditures (including social security contributions); number of workers, material expenditures, total value of fixed assets.

Average Log Change in Domestic Sales by Province

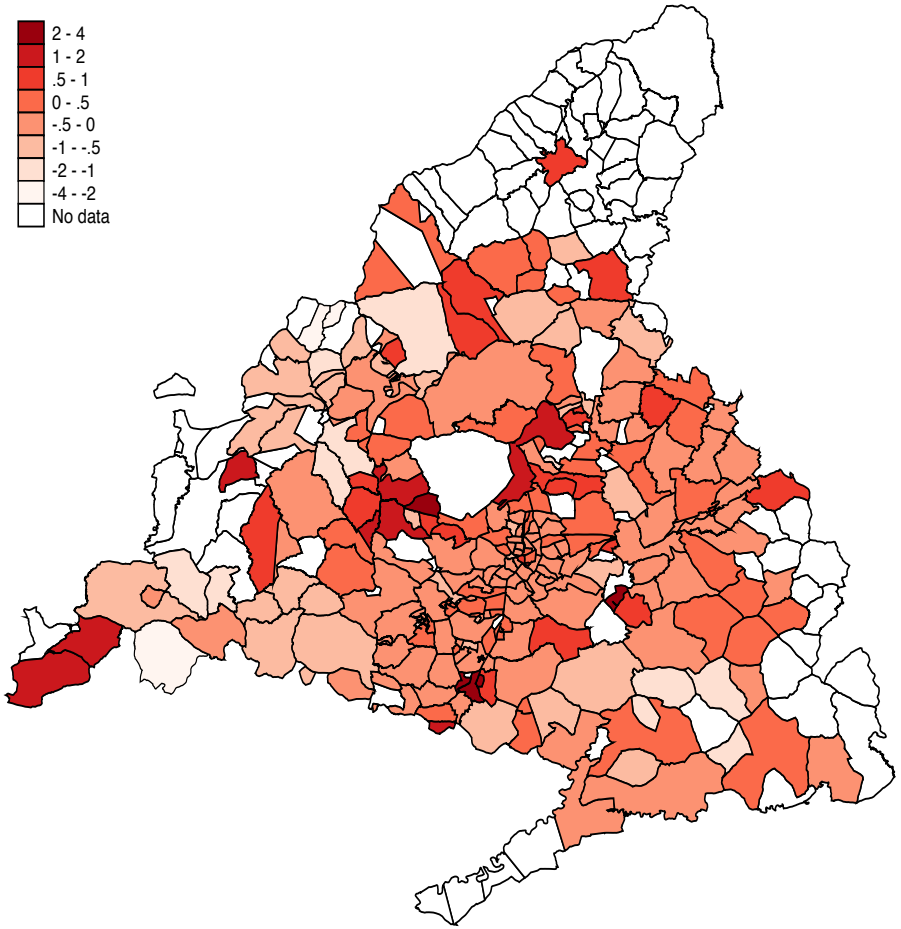


Average Log Change in Stock of Cars per Capita

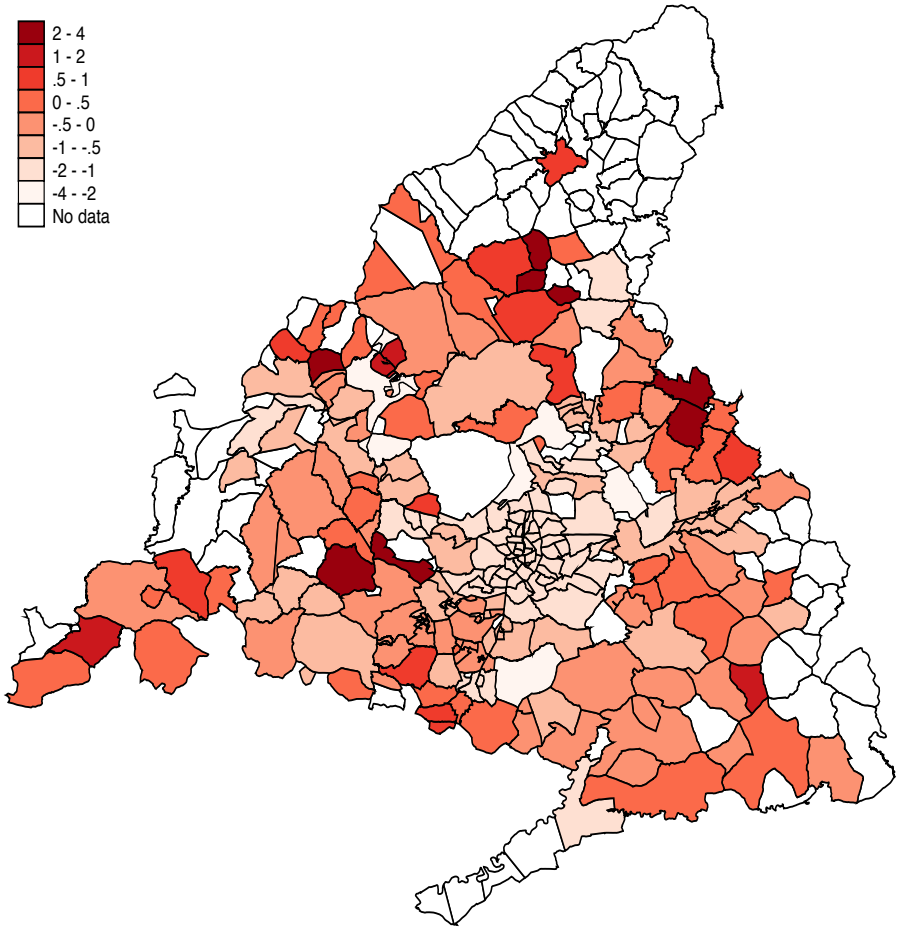


Variation Across Zip Codes: Madrid

Relative Change in Domestic Sales

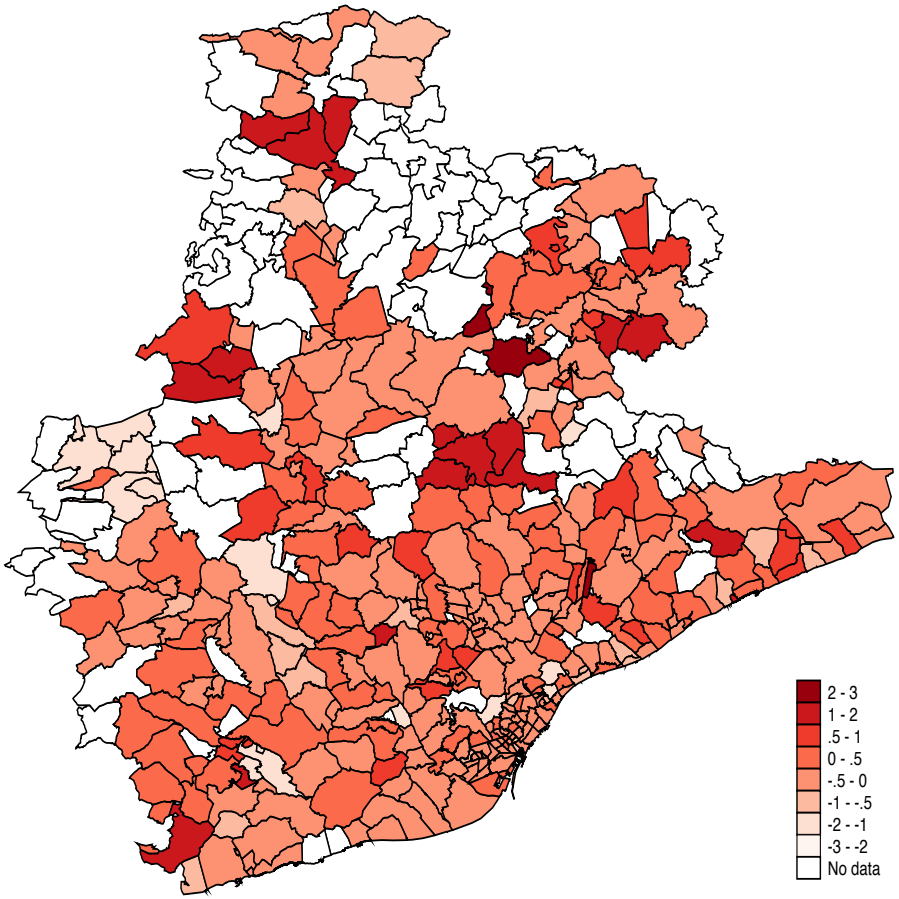


Relative Change in Vehicles per Capita



Variation Across Zip Codes: Barcelona

Relative Change in Domestic Sales



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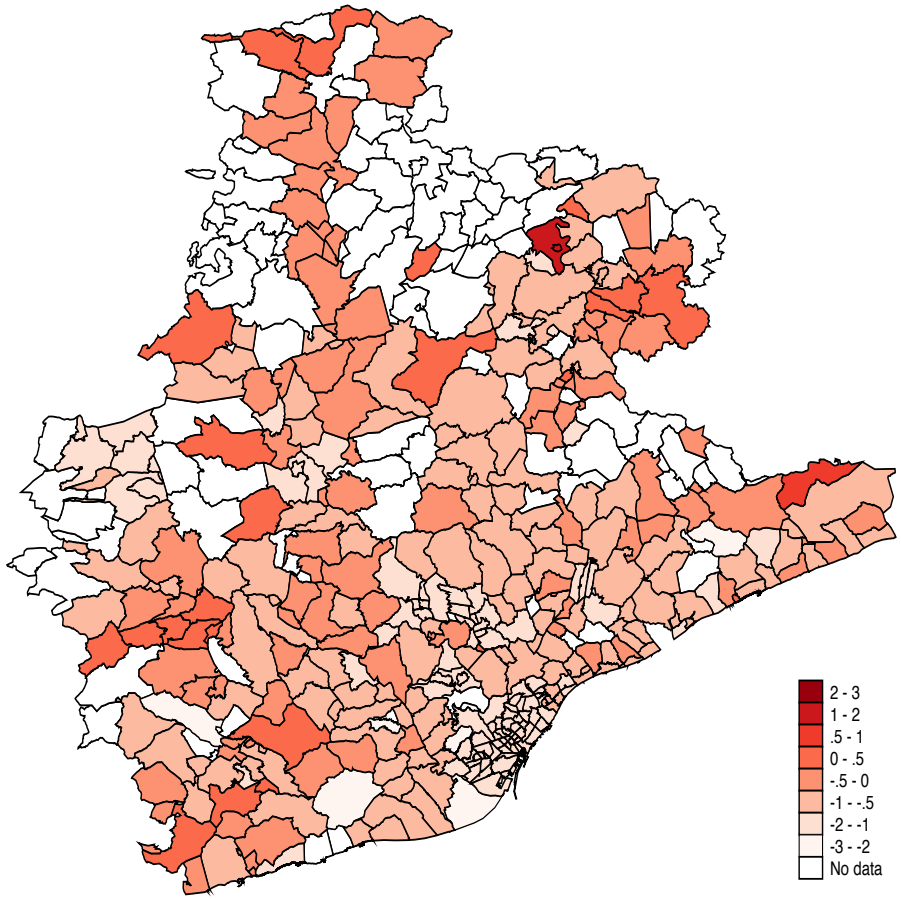

EXPORTS AND DOMESTIC SALES: EXPLOITING A PROXY FOR LOCAL DEMAND

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- First two requirements: stock of vehicles per capita is a relevant instrument.
- Last requirement: stock of vehicles per capita is a valid instrument.

Intensive-Margin OLS Estimates

Dependent Variable:	ΔLn(Exports)					
	(1)	(2)	(3)	(4)	(5)	(6)
ΔLn(Domestic Sales)	0.131[a]	-0.147[a]	-0.228[a]	-0.217[a]	-0.204[a]	-0.186[a]
	(0.025)	(0.028)	(0.027)	(0.027)	(0.027)	(0.030)
ΔLn(TFP)		1.057[a]	1.298[a]	1.375[a]	1.357[a]	1.336[a]
		(0.045)	(0.052)	(0.051)	(0.051)	(0.053)
ΔLn(Avg. Wages)			-0.590[a]	-0.540[a]	-0.525[a]	-0.482[a]
			(0.047)	(0.051)	(0.051)	(0.054)
Observations	8,018	8,018	8,018	8,018	8,018	7,507
R-squared	0.005	0.088	0.106	0.146	0.158	0.265
Sector FE	No	No	No	Yes	Yes	Yes
Province FE	No	No	No	No	Yes	No
Municipality FE	No	No	No	No	No	Yes

2SLS with Municipality Stock of Vehicles p.c. as IV

Dependent Variable:	ΔLn(Domestic Sales)				ΔLn(Exports)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔLn(Domestic Sales)					-2.185[a]	-1.346[a]	-1.393[a]	-1.602[a]
					(0.622)	(0.359)	(0.350)	(0.437)
ΔLn(Vehicles p.c. in municipality)	0.336[a]	0.447[a]	0.437[a]	0.363[a]				
	(0.060)	(0.066)	(0.065)	(0.068)				
ΔLn(TFP)		0.785[a]	0.948[a]	0.936[a]		1.991[a]	2.396[a]	2.657[a]
		(0.025)	(0.029)	(0.030)		(0.286)	(0.339)	(0.409)
ΔLn(Avg. Wages)			-0.544[a]	-0.447[a]			-1.225[a]	-1.149[a]
			(0.031)	(0.036)			(0.205)	(0.206)
F-statistic	31.17	46.39	45.00	28.32				
Observations	8,018	8,018	8,018	8,018	8,018	8,018	8,018	8,018
Sector FE	No	No	No	Yes	No	No	No	Yes
Province FE	No	No	No	Yes	No	No	No	Yes

Magnitude of Results

- Elasticity of -1.6 does not imply a more-than-complete substitution of exports for domestic sales.
- If domestic demand falls by €100:
  - a firm with 25% export share recoups €53.3;
  - a firm with 33% export share recounts €80.
- Median export share in the sample is 16.5%.

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- Estimates are incompatible with the implications of the model with constant marginal costs: an alternative model is needed to explain the relationship between demand-driven changes in domestic sales and exports.

Extensive Margin

Dependent Variable:		Export Dummy		Proportion of Years	
	1st Stage	OLS	2nd Stage	OLS	2nd Stage
	(1)	(2)	(3)	(4)	(5)
Ln(Domestic Sales)		0.040[a]	-0.107	0.021[a]	-0.071
		(0.003)	(0.181)	(0.002)	(0.094)
Ln(Vehicles p.c. in municipality)	0.089[a]				
	(0.023)				
Ln(TFP)	1.075[a]	0.038[a]	0.196	0.050[a]	0.148
	(0.016)	(0.005)	(0.195)	(0.003)	(0.101)
Ln(Average Wages)	-0.408[a]	-0.024[a]	-0.084	-0.031[a]	-0.068[c]
	(0.011)	(0.004)	(0.074)	(0.003)	(0.038)
Observations	125,808	125,808	125,808	125,808	125,808
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector-Period FE	Yes	Yes	Yes	Yes	Yes
Province-Period FE	Yes	Yes	Yes	Yes	Yes
F-statistic on IV	14.49				
Mean of Dep. Var.		0.183	0.183	0.113	0.113
Ext-Margin Elasticity		0.221	-0.584	0.181	-0.622

ROBUSTNESS

Robustness

1. Eliminate zip codes exposed to supply shocks in the motor vehicles industry.
2. Heterogeneous Effects.
3. Alternative instruments.
4. Confounding Factors: Controls for additional marginal cost shifters.
5. Confounding Factors: Alternative measure of productivity
6. Placebo exercise for first stage regression.

Excluding Zip Codes Linked to Auto Industry

	Panel A: Exclude zipcodes w/ high auto employment share			*Panel B: Exclude zipcodes with at least one sizeable auto maker*		
Dependent Variable:	ΔLn(Exp)	ΔLn(DSales)	ΔLn(Exp)	ΔLn(Exp)	ΔLn(DSales)	ΔLn(Exp)
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	1st Stage	2nd Stage	OLS	1st Stage	2nd Stage
ΔLn(Domestic Sales)	-0.218[a]		-2.382[a]	-0.235[a]		-2.787[a]
	(0.030)		(0.535)	(0.038)		(0.694)
ΔLn(Vehicles p.c. in municipality)		0.328[a]			0.318[a]	
		(0.075)			(0.088)	
ΔLn(TFP)	1.349[a]	0.936[a]	3.361[a]	1.348[a]	0.898[a]	3.624[a]
	(0.057)	(0.032)	(0.501)	(0.072)	(0.043)	(0.630)
ΔLn(Avg. Wages)	-0.487[a]	-0.436[a]	-1.428[a]	-0.526[a]	-0.408[a]	-1.561[a]
	(0.052)	(0.037)	(0.253)	(0.071)	(0.047)	(0.322)
F-statistic	-	19.04	-	-	13.11	-
Observations	7,178	7,178	7,178	4,613	4,613	4,613

Excluding Zip Codes Linked to Auto Industry

	Panel C: Exclude zipcodes 'neighboring' those in Panel A			*Panel D: Exclude sectors w/ I-O links to automakers*		
Dependent Variable:	ΔLn(Exp)	ΔLn(DSales)	ΔLn(Exp)	ΔLn(Exp)	ΔLn(DSales)	ΔLn(Exp)
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	1st Stage	2nd Stage	OLS	1st Stage	2nd Stage
ΔLn(Domestic Sales)	-0.204[a]		-2.487[a]	-0.179[a]		-2.443[a]
	(0.033)		(0.632)	(0.031)		(0.579)
ΔLn(Vehicles p.c. in municipality)		0.332[a]			0.339[a]	
		(0.085)			(0.067)	
ΔLn(TFP)	1.324[a]	0.928[a]	3.428[a]	1.298[a]	0.933[a]	3.396[a]
	(0.062)	(0.032)	(0.583)	(0.063)	(0.035)	(0.538)
ΔLn(Avg. Wages)	-0.471[a]	-0.404[a]	-1.390[a]	-0.520[a]	-0.413[a]	-1.448[a]
	(0.058)	(0.037)	(0.276)	(0.060)	(0.037)	(0.252)
F-statistic	-	15.42	-	-	25.32	-
Observations	6,137	6,137	6,137	6,080	6,080	6,080

Heterogeneous Effects

Sample	Small Firms $L \leq 25$ (1)	Medium Firms $L \in (25, 50)$ (2)	Large Firms $L > 50$ (3)	Low prov/sec X share (4)	High prov/sec X share (5)	Low labor elasticity (6)	High labor elasticity (7)
OLS Elasticity	-0.201^a	-0.282^a	-0.175^a	-0.239^a	-0.162^a	-0.169^a	-0.249^a
	(0.042)	(0.054)	(0.045)	(0.040)	(0.037)	(0.038)	(0.037)
IV Elasticity	-1.221^a	-2.271^b	-1.247^b	-3.034^b	-0.839^c	-1.606^a	-1.350^b
	(0.449)	(1.037)	(0.625)	(1.177)	(0.460)	(0.684)	(0.645)
1st Stage Coef.	0.520^a	0.294^a	0.331^a	0.235^a	0.477^a	0.372^a	0.333^a
	(0.117)	(0.113)	(0.095)	(0.073)	(0.095)	(0.084)	(0.095)
1st Stage *F*-Stat.	19.86	6.71	12.19	10.23	24.98	19.76	12.22
Observations	2,657	2,183	3,190	4,005	4,009	3,914	3,914

Alternative Instruments

Dependent Variable:	ΔLn(Domestic Sales)					
	(1)	(2)	(3)	(4)	(5)	(6)
ΔLn(Vehicles p.c. in province)	0.853[a]					
	(0.223)					
ΔLn(Distance-Population weighted vehicles p.c. in other zip codes)		0.260[a]	0.184[a]			
		(0.028)	(0.040)			
ΔLn(Vehicles p.c. in municipality)			0.296[a]			
			(0.086)			
Ln(Urban land supply ratio in 1996)				0.029[b]		
				(0.012)		
ΔLn(construction wage bill) × 2002 wage bill share in municipality					0.331[a]	
					(0.054)	
ΔLn(foreign tourists) × 2002 foreign tourists p.c. in province						0.280[a]
						(0.098)
F-statistic	14.61	86.02	43.02	6.36	38.33	8.18
	ΔLn(Exports)					
ΔLn(Domestic Sales)	-1.425[a]	-1.628[a]	-1.336[a]	-1.595[c]	-1.568[a]	-1.179[a]
	(0.400)	(0.527)	(0.395)	(0.927)	(0.535)	(0.257)
p-value for Sargan Overid test	0.46	0.34	0.34	0.51	0.99	0.97
Observations	8,018	7,949	7,949	6,940	7,928	8,018

Confounding Factors: Labor Markets

Dependent Variable:	ΔLn(Exports)				
	(1)	(2)	(3)	(4)	(5)
ΔLn(Domestic Sales)	-1.602[a]	-1.443[a]	-1.655[a]	-1.657[a]	-1.677[a]
	(0.437)	(0.434)	(0.480)	(0.484)	(0.478)
ΔShare of Temporary Workers (firm-level)		-0.302[b]			
		(0.118)			
ΔShare of Temporary Workers (municipality-level)			-0.068		
			(0.194)		
ΔManufacturing Average Wages (municipality-level)				0.083	
				(0.140)	
ΔManufacturing Employment p.c. (municipality-level)					-0.266[a]
					(0.057)
F-Statistic	28.32	25.83	25.34	25.16	24.82
Observations	8,018	7,649	7,746	7,748	7,748

Confounding Factors: Financial Costs

Dependent Variable:	ΔLn(Exports)				
	(1)	(2)	(3)	(4)	(5)
ΔLn(Domestic Sales)	-1.602[a]	-1.457[a]	-1.424[a]	-1.606[a]	-1.667[a]
	(0.437)	(0.455)	(0.440)	(0.472)	(0.481)
ΔLn(Financial Costs) at firm level		-0.024			
		(0.015)			
Financial Costs in Boom at firm level			0.002		
			(0.015)		
ΔLn(Financial Costs) at municipality level				-0.038	
				(0.032)	
Financial Costs in Boom at municipality level					0.023
					(0.035)
F-Statistic	28.32	23.22	23.90	24.70	25.26
Observations	8,018	6,924	6,994	7,742	7,743

Alternative TFP Measures

Dependent Variable:	ΔLn(Exports)			
	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
ΔLn(Dom. Sales)	-0.204[a]	-1.602[a]	0.105[a]	-1.285[a]
	(0.027)	(0.437)	(0.026)	(0.486)
ΔLn(Avg. Wages)	-0.525[a]	-1.149[a]	-0.514[a]	-0.873[a]
	(0.051)	(0.206)	(0.064)	(0.152)
ΔLn(TFP Sales)	1.357[a]	2.657[a]		
	(0.051)	(0.409)		
ΔLn(TFP Value Added)			0.807[a]	1.218[a]
			(0.060)	(0.161)
F-Statistic		28.32		24.99
Observations	8,018	8,018	8,018	8,018

1st Stage Placebo

Dependent Variable:	ΔLn(Domestic Sales)			
Sample:	Boom firms		Bust firms	
	Within Boom	Boom vs. Bust	Within Bust	Boom vs. Bust
	(1)	(2)	(3)	(4)
ΔLn(Vehicles p.c. in municipality)	-0.041	0.184[b]	-0.009	0.277[a]
	(0.080)	(0.074)	(0.071)	(0.070)
Observations	5,344	5,344	5,245	5,245
F-statistic	0.27	6.19	0.02	15.63

MODEL WITH INCREASING MARGINAL COSTS

Increasing Marginal Costs

- Prior results are inconsistent with a model with constant marginal costs.
- Maintain CES demand function and monopolistic competition.
- More general cost structure: total variable cost of producing Q_{id} for the domestic market and Q_{ix} for the foreign market is equal to

$$\frac{1}{\varphi_i}\omega_i \frac{1}{\lambda+1}\left(\tau_{sd}Q_{id}+\tau_{sx}Q_{ix}\right)^{\lambda+1}, \quad \lambda \geq 0.$$

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- This model leads to the following expression for market-specific sales:

$$\widehat{R}_{ij} = d_s + d_\ell + \frac{(\sigma-1)}{1+\lambda}\delta_\varphi \widehat{\varphi}_i^* - \frac{(\sigma-1)}{1+\lambda}\delta_\omega \widehat{\omega}_{it}^* - \frac{(\sigma-1)\lambda}{1+\lambda}\widehat{R}_i + \varepsilon_{ij},$$

  where $R_i \equiv R_{id} + R_{ix}$ and $\varepsilon_{ix} \equiv u_{ix}^{\xi} + \frac{(\sigma-1)}{1+\lambda}(u_i^{\varphi} - u_i^{\omega})$.
- Specification identical to that in prior regressions but introducing the change in total sales $\widehat{R}_i$ (instead of domestic sales $\widehat{R}_{id}$) as RHS variable.

Estimation: Relevant Elasticity

	Intensive Margin		
Dependent Variable:	ΔLn(Exp)	ΔLn(TotSales)	ΔLn(Exp)
	(1)	(2)	(3)
	OLS	1st Stage	2nd Stage
ΔLn(Total Sales)	0.785[a]		-2.624[a]
	(0.037)		(0.916)
Δ Ln(Vehicles p.c. in municipality)		0.221[a]	
		(0.046)	
ΔLn(TFP)	0.397[a]	0.985[a]	3.741[a]
	(0.053)	(0.024)	(0.900)
ΔLn(Avg. Wages)	-0.095[b]	-0.432[a]	-1.567[a]
	(0.047)	(0.031)	(0.408)
F-statistic	-	23.42	-
Observations	8,018	8,018	8,018

QUANTIFICATION

Quantification Exercise

- We attempt to evaluate the quantitative importance of the "vent-for-surplus" channel for explaining Spanish export growth during period 2009-13.

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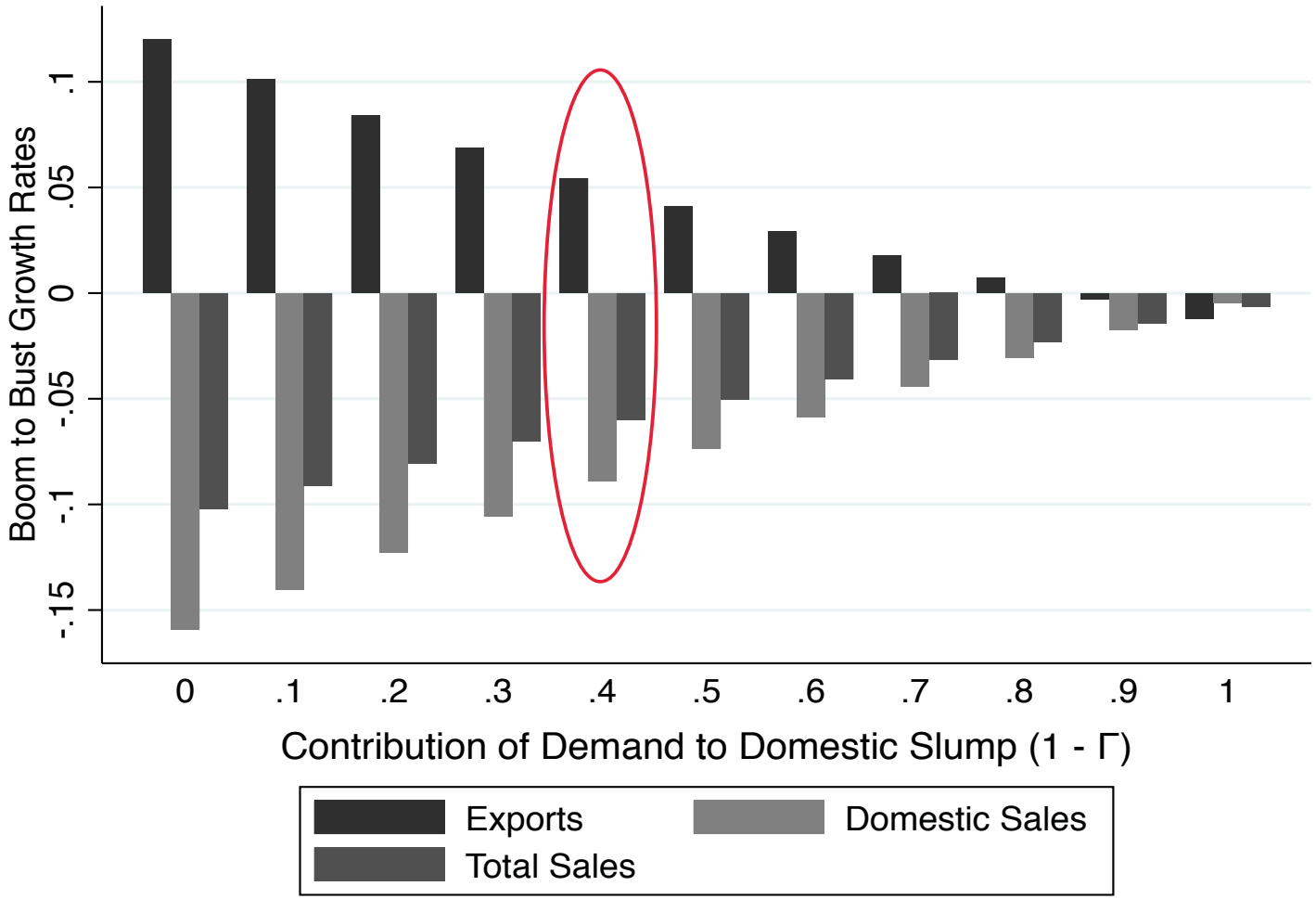
3. Finally, we perform a variance decomposition of the observed change in firms' total sales with the aim of informing the degree to which the boom-to-bust observed changes in Q_{sd} are truly due to demand or supply shocks

Quantification: Results



- We explain about 55% of growth in exports

Summary and Next Steps

- We have provided evidence for the substitutability between domestic and foreign markets at short/medium-term horizons.
- If a model with constant marginal costs does not fit the data, perhaps trade economists should embrace models with variable marginal costs (e.g., due to capacity constraints).
- Quantification: the vent-for-surplus channel can explain a substantial part of the Spanish "export miracle" of 2009-13.

EXTRA SLIDES

Environment

- Each firm i in sector s faces the following demand in market $j = \{d, x\}$,

$$Q_{ij} = \frac{P_{ij}^{-\sigma}}{P_{sj}^{1-\sigma}} E_{sj} \xi_{ij}^{\sigma-1}, \qquad \sigma > 1.$$

- Firm i's total cost of producing Q_{ij} for market j is,

$$c_{ij} Q_{ij} \qquad \text{with} \qquad c_{ij} \equiv \tau_{sj} \frac{1}{\varphi_i} \omega_i.$$

- Firm i needs to pay an exogenous fixed cost F_{ij} to sell in market j.
- Firm i chooses optimally the quantity offered in each market j, Q_{ij}, taking the price index, P_{sj}, as given.
- As marginal production costs are constant and per-market fixed costs are independent of the firm's participation in other markets, the optimization problem of the firm is separable across markets.

Back