

Spain, Split and Talk: Quantifying Regional Independence

Hanna Adam^a Mario Larch^{a,b} Jordi Paniagua^{c,d}

^aUniversity of Bayreuth

^bCEPR, CESifo and ifo Institute, GEP

^cUniversity of Valencia

^dKellogg Institute, University of Notre Dame

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How did we get there?

FINAL CLASH / September 6, 2017

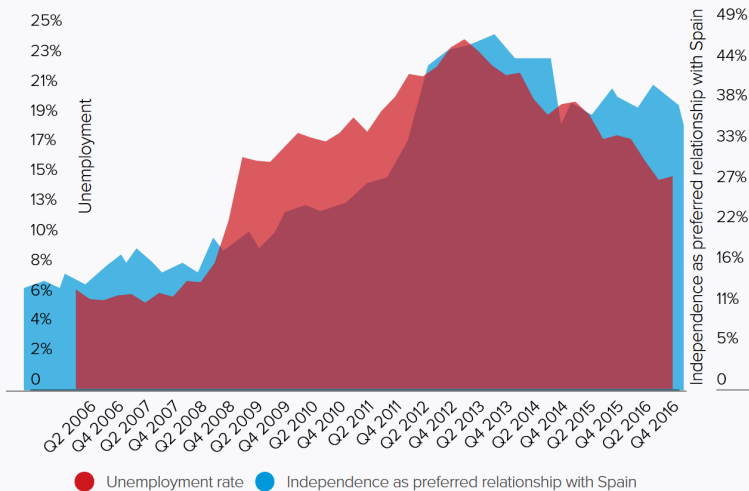
The Catalan parliament passes a referendum law and the regional government **formally calls the October 1 referendum** on secession from Spain. The parliament also passes a law that would regulate the transition to independence if there was a Yes vote. Madrid's central government says these laws represent the **"death of democracy"** and brings them to the Constitutional Court, which calls for an immediate suspension. The Socialists and Ciudadanos support Rajoy's call to **stop the vote**.



government. *La Diada* **mass rallies** continue in the following years, with

RECESSION HITS HARD / 2009

The **unemployment** rate in Catalonia jumps to 16 percent in the first quarter of 2009, ten points higher than just two years before. Unemployment will peak at 24.5 percent at the beginning of 2013.



DEAL OVERRULED / June 28, 2010

In a split vote, the Spanish **Constitutional Court rewrites** 14 articles of the autonomy statute and disputes the interpretation of 27 more. Most of them relate to justice and financial regulation. The mention of Catalonia as a "nation" has no legal meaning and the Catalan language isn't given the same status as Spanish.

FIRST MASS MARCH / July 10, 2010

Around 1 million citizens take to the streets of Barcelona under the slogan **"We are a nation. We decide!"** to protest the court ruling.



AUSTERITY REJECTION / June 11, 2011

Hundreds of supporters of the 15-M movement **against austerity**, also known as *indignados*, block the entrance of the Catalan parliament to stop a debate on the regional budget. Catalan President Artur Mas and other MPs access the building by helicopter.

RAJOY TRIUMPHS / November 20, 2011

Mariano Rajoy wins the general election with an **absolute majority** and becomes Spain's prime minister.

CASH ... AND CONTROL / July 14, 2012

The Spanish government creates a line of credit (known as FLA) for regional governments, which benefit from smaller interest rates than those offered by banks. Madrid **checks and approves** all payments made with FLA funds. In 2012, Catalonia receives 40 percent of all FLA funds. By the end of 2016, about 66 percent of Catalonia's public debt is owed to Spain through the FLA funding.

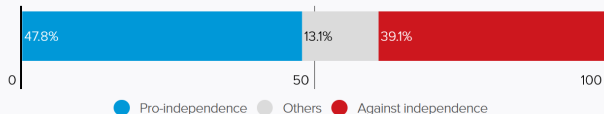
NEW STATE, PLEASE / September 11, 2012

Pro-independence grassroots organizations call a protest on Catalonia's national day, *La Diada*. About 1.5 million gather in the center of Barcelona, according to local police, and 600,000 according to the central government. *La Diada* **mass rallies** continue in the following years, with

How did we get there?

SECESSIONIST MAJORITY / September 27, 2015

Pro-independence parties win 48 percent of the vote and an **absolute majority in a Catalan regional election**, presented as a de facto plebiscite by secession supporters. Unionist parties get 39 percent of the vote. This is the first election where Artur Mas' *Convergència* openly calls for secession, as part of the *Junts pel Sí* coalition. The Catalan Socialists no longer support Catalan self-determination.



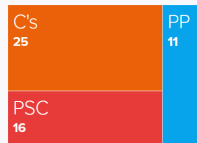
Pro-independence MPs



Pro-referendum MPs



Against referendum MPs



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Referendum



Referendum



Referendum



“El Clásico”



“El Clásico”



Outline

- 1 Motivation
 - Spain, Sit and Talk
 - Contributions
 - Results
- 2 Background
- 3 Theoretical Foundation and Empirical Strategy
 - Theory
 - Empirical strategy
 - Data
- 4 Results: Borders
 - Borders
- 5 Results: General Equilibrium
 - CF1: Catalonia's regional border as EU country border
 - CF2: Catalonia's regional border as PRT (in EU)
 - CF3: Catalonia as Switzerland (not EU)
 - CF4: Catalonia not in WTO and not in EU
 - Dynamic effects
- 6 Conclusions

Our Contributions

- ① We quantify the economic consequences of regional independence (Catalonia, Spain, EU, World)
 - ① using the theoretical properties of the gravity equation: exports, output, consumer & producers prices
- ② We apply methods to study regional economic disintegration
 - ① Three layers of trade borders: country \longleftrightarrow country, region \longleftrightarrow country, region \longleftrightarrow region
 - Trade data of +150 countries and 17 Spanish regions

Key findings

- Trade border coefficients are heterogeneous and normally distributed.
 - Regional borders are significant, but “shallower” than international
- GE counterfactual experiments were Catalonia secedes from Spain and
 - joins the EU and only increases regional border (CAT: -5.1% ESP: -1.1%)
 - joins the EU in similar terms as Portugal (CAT: -5.9% ESP: -1.1%)
 - outside the EU as Switzerland (CAT: -10.2% ESP: -1.1%)
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 - Distributional & dynamic effects

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Related literature

- **Law:** Voting rights, sovereignty limits, and the EU. Madiès et al., (2018), Bossacoma Busquets (2017), Piris (2017).
- **Political Science:** Polarization, political support, and the EU. Barrio and Field (2018), Barrio et al., (2018), Rodríguez-Teruel and Barrio (2021), Holesch and Jordana (2021), Hierro and Queralt (2021).
- **Economics:**
 - **Brexit:** Dhingra et al. (2017), Breinlich et al. (2020, 2022), Mcgrattan and Waddle (2020), Abramson and Shayo (2022)
 - **State fragmentation:** Reynaerts and Vanschoonbeek (2021); Yugoslavia: Rodríguez-Pose and Stermsek (2015), Monastiriotis and Zilic (2020)
 - **Borders:** Coughlin & Novy (2021), Santamaria et al., (2023)
 - **Catalan independence:** Comerford et al., (2014; 2019)
 - **Great Recession:** Fetzer (2019); Almunia et al., (2021)

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Structural Gravity equation

$$X_{ij} = \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} Y_i E_j, \quad (1)$$

$$P_j^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_i} \right)^{1-\sigma} Y_i, \quad (2)$$

$$\Pi_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j} \right)^{1-\sigma} E_j, \quad (3)$$

$$P_j = \frac{Y_j^{\frac{1}{1-\sigma}}}{\chi_j \Pi_j}. \quad (4)$$

where P_j is the CES consumer price index given by $P_j = \left[\sum_i (\chi_i p_{ij})^{1-\sigma} \right]^{\frac{1}{1-\sigma}}$.

Empirically (3) becomes:

$$X_{ij} = \exp(\mathbf{T}_{ij} + \pi_i + \chi_j) \times \varepsilon_{ij} \quad (5)$$

GEPPML

- For our counterfactual analysis, we rely on the structure of the theoretical model described above and PPML's property highlighted by Fally (2015 JIE) that the estimates of the fixed effects from gravity estimations are perfectly consistent with the structural gravity terms.
- The MRT $\Pi_i^{1-\sigma}$ and $P_j^{1-\sigma}$ can be recovered from the fixed effects as follows:

$$\widetilde{\Pi_i^{1-\sigma}} = E_0 Y_i \exp(-\tilde{\pi}_i), \quad (6)$$

and

$$\widetilde{P_j^{1-\sigma}} = \frac{E_j}{E_0} \exp(-\tilde{\chi}_j), \quad (7)$$

where $\tilde{\pi}_i$ and $\tilde{\chi}_j$ are the estimated fixed effects from Equation (5), and E_0 denotes the expenditure of the country chosen as numéraire.

- The three-step GEPPML procedure from Anderson et al., (2018), uses equations (1), (6) and (7) to calculate counterfactual effects by changing the trade cost vectors and then obtain counterfactual values for
 - output, $Y_i^c = (p_i^c / p_i) Y_i$,
 - expenditures, $E_i^c = (p_i^c / p_i) E_i$
 - trade flows, \tilde{X}_{ij}^c .
 - consumer and producer prices ($\left(\widetilde{\Pi_i^{1-\sigma}} \right)^c$ and $\left(\widetilde{P_j^{1-\sigma}} \right)^c$)
- The reported results are then the percentage changes between baseline and counterfactual values, i.e., for output

$$\text{Output}\% = (Y_i^c - Y_i) / Y_i \times 100.$$

Symmetrical trade borders in structural gravity

$$\begin{aligned} X_{ij} &= \exp(\mathbf{T}_{ij} + \pi_i + \chi_j) \times \varepsilon_{ij} \\ &= \exp(\mathbf{T}'_{ij} + \text{INTL_BRDR_ALL}_{ij} + \pi_i + \chi_j) \times \varepsilon_{ij} \end{aligned}$$

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 &= \exp\left(\begin{matrix} \mathbf{T}'_{ij} + \pi_i + \chi_j \\ \text{INTL_BRDR}_{ij} + \\ \text{INTL_SPAIN}_{ij} + \\ \text{INTER_REGION}_{ij} \end{matrix}\right) \times \varepsilon_{ij}
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 &= \exp\left(\begin{array}{c} \mathbf{T}'_{ij} + \pi_i + \chi_j \\ \text{INTL_BRDR_EU}_{ij} + \text{INTL_BRDR_nonEU}_{ij} + \\ \text{INTL_SPAIN_EU}_{ij} + \text{INTL_SPAIN_nonEU}_{ij} + \\ \text{INTER_REGION}_{ij} \end{array}\right) \times \varepsilon_{ij}
 \end{aligned}$$

Symmetrical trade borders in structural gravity

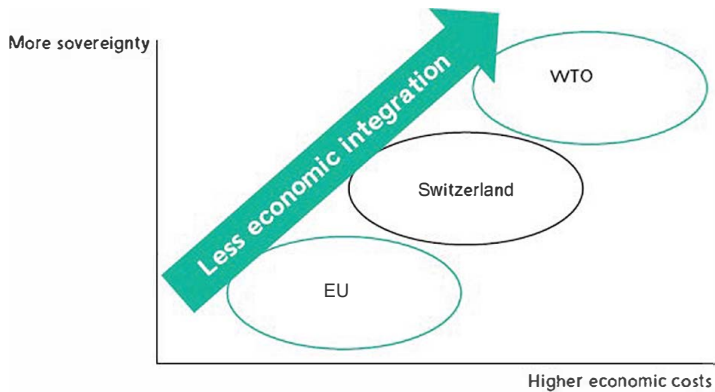
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 \end{aligned}$$

Counterfactual with trade borders

$$t_{ij}^b = \exp \left(\begin{array}{c} T'_{ij} + \\ \sum \hat{\beta}_{Country_{n-1}} INT_BRDR_{ij} + \hat{\beta}_{PRT} PRT_INT_BRDR_{ij} \\ \sum \hat{\beta}_{Region_n} INTL_SPAIN_{ij} + \\ \sum \hat{\beta}_{Region_{n-1}} INTER_REGION_{ij} + \hat{\beta}_{CAT} CAT_INTER_REGION_{ij} \end{array} \right)$$

Counterfactual with trade borders

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 \mathbf{t}_{ij}^{\mathbf{b}} &= \exp \left(\begin{aligned} &\mathbf{T}'_{ij} + \\ &\sum \hat{\beta} \text{Country}_{n-1} \text{INT_BRDR}_{ij} + \hat{\beta}_{PRT} \text{PRT_INT_BRDR}_{ij} \\ &\sum \hat{\beta} \text{Region}_n \text{INTL_SPAIN}_{ij} + \\ &\sum \hat{\beta} \text{Region}_{n-1} \text{INTER_REGION}_{ij} + \hat{\beta}_{CAT} \text{CAT_INTER_REGION}_{ij} \end{aligned} \right) \\
 \mathbf{t}_{ij}^{\mathbf{c}} &= \exp \left(\begin{aligned} &\mathbf{T}'_{ij} + \\ &\sum \hat{\beta} \text{Country}_{n-1} \text{INT_BRDR}_{ij} + \hat{\beta}_{PRT} \text{PRT_INT_BRDR}_{ij} \\ &\sum \hat{\beta} \text{Region}_n \text{INTL_SPAIN}_{ij} + \\ &\sum \hat{\beta} \text{Region}_{n-1} \text{INTER_REGION}_{ij} + \hat{\beta}_{PRT}^c \text{CAT_INTER_REGION}_{ij} \end{aligned} \right)
 \end{aligned}$$



Data

- There is neither an official source of administrative interregional trade data nor a consensus on constructing them.
 - Some authors rely on gravity-like methods to construct regional trade data. However, gravity estimates with these data are not reliable.
- Region-to-region intra- and inter-national trade flows for the 17 Spanish regions (Nuts 2) came from the C-Intereg project¹.
 - These data is gravity “free”
 - The C-Intereg merges freight datasets by transport mode (roads, railway, sea, and air) and type of products with product-specific price vectors and imposes output and trade constraints at the national and regional level.
- Country-to-country international trade flows came from the ITPD-E dataset of the US International Trade Commission (USITC).
- Both datasates provide domestic data!!

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Figure: Country Borders (year 2012)

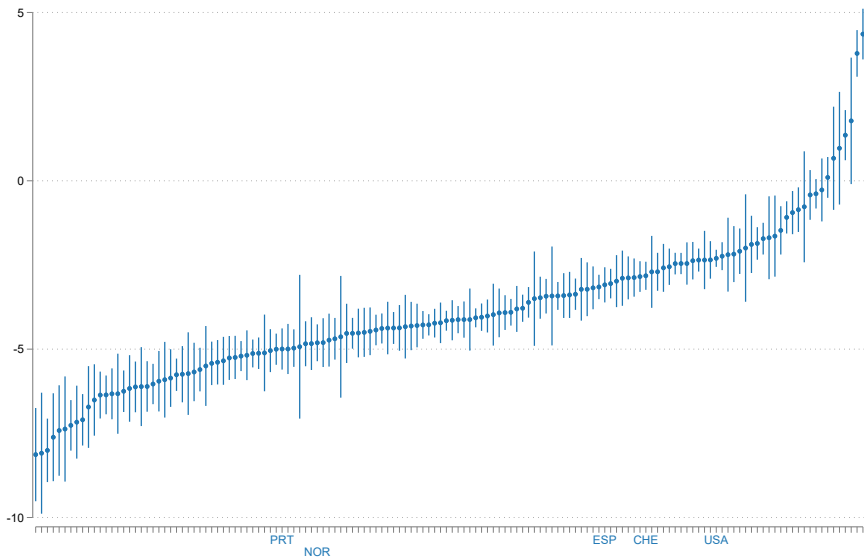


Figure: Country and Region Borders (year 2012)

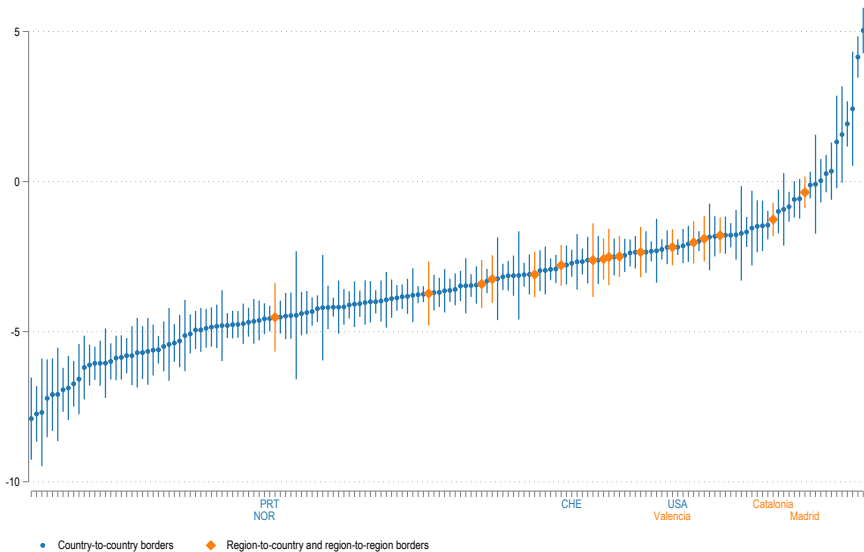


Figure: Country, Region-to-Country, and Region-to-Region Borders (year 2012)

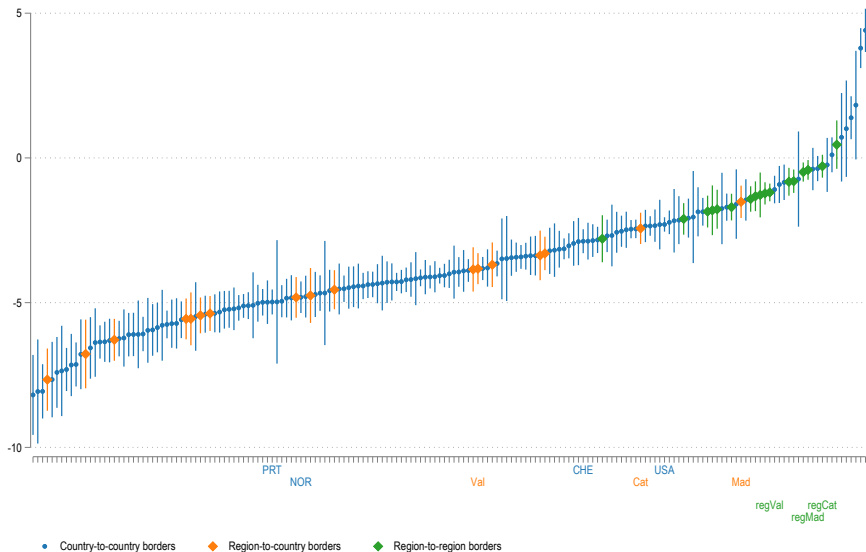


Figure: EU vs. non-EU Country and Region Borders (year 2012)

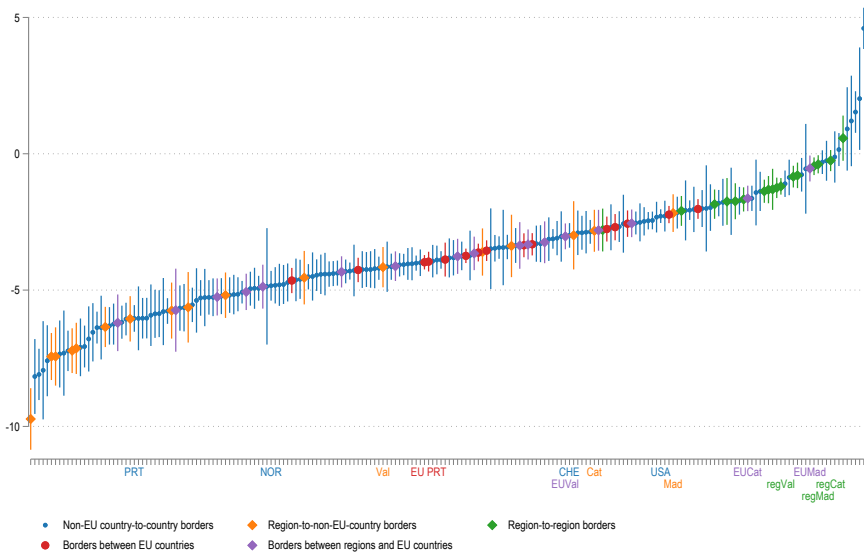


Figure: Border coefficients, heat map (year 2012).

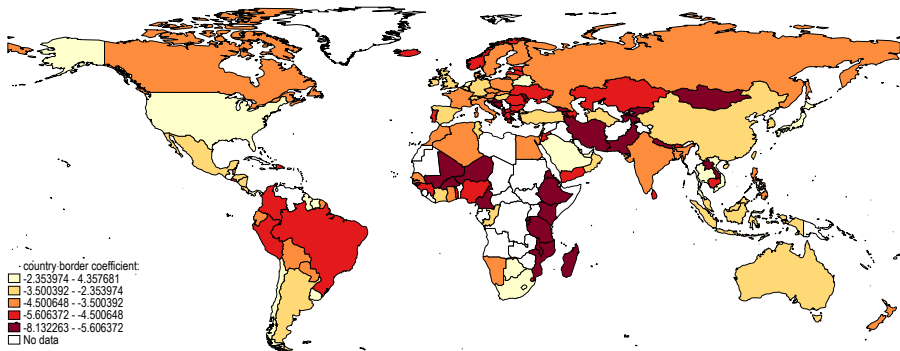


Figure: Region-to-country border coefficients, heat map (year 2012).

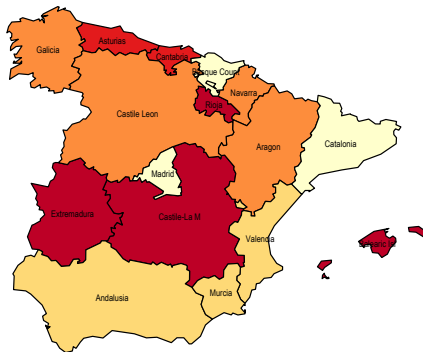
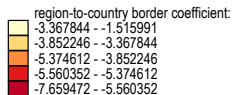


Figure: Country Borders (years 2001-2017)

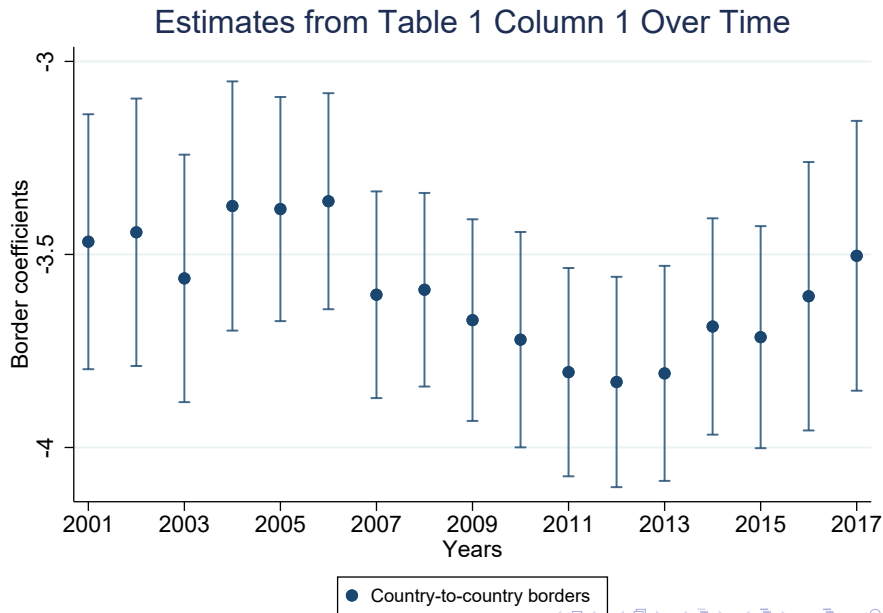


Figure: Country and Region Borders (years 2001-2017)

Estimates from Table 1 Column 2 Over Time

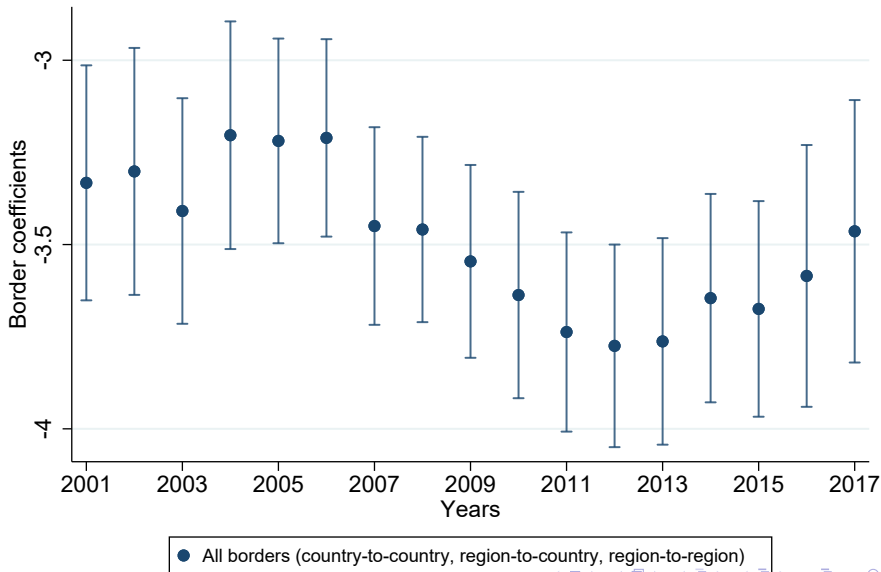


Figure: Country and Region Borders (years 2001-2017)

Estimates from Table 1 Column 3 Over Time

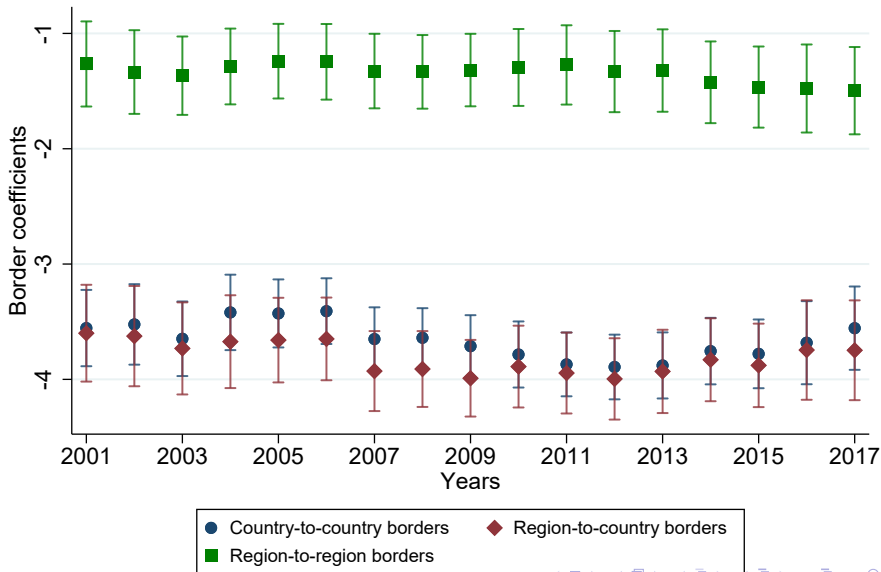


Figure: EU vs. non-EU Country and Region Borders (years 2001-2012)

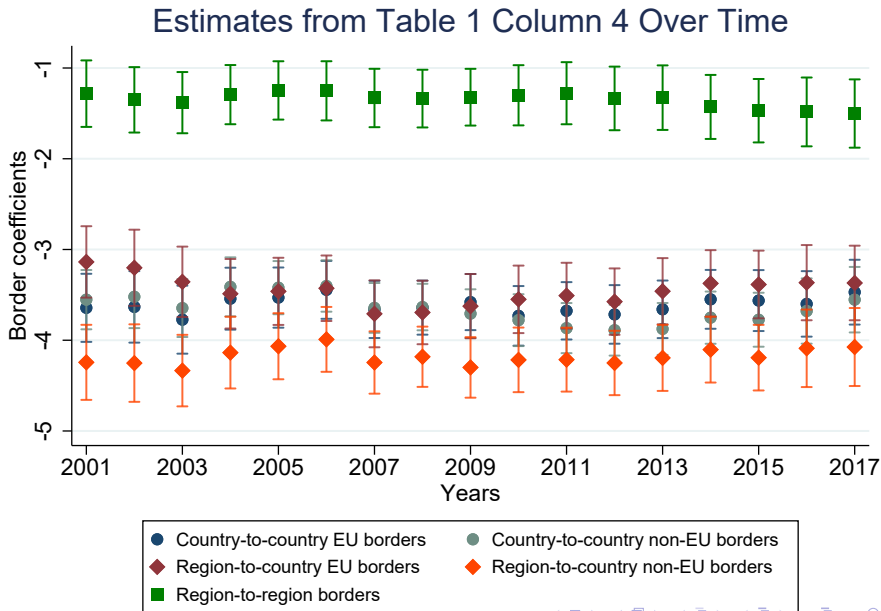
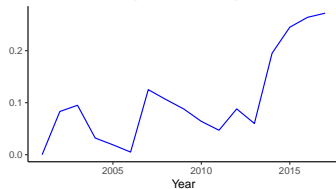
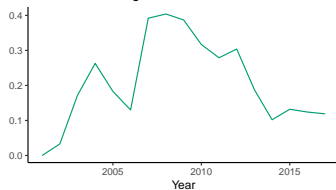


Figure: Catalonia's borders over time

Cumulative change of Catalan regional border thickness



Cumulative change of Catalan international EU border thickness



Cumulative change of Catalan international non-EU border thickness

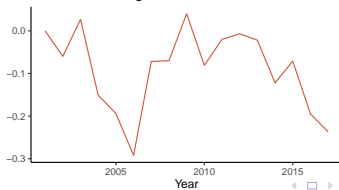


Figure: Counterfactual 1: Catalonia's regional border as EU country border.

Catalonia in the EU, year 2012

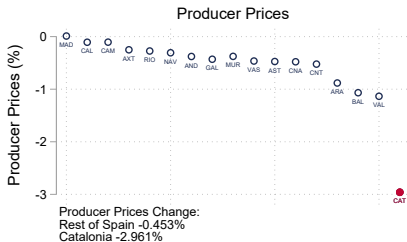
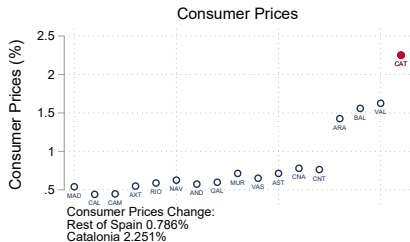
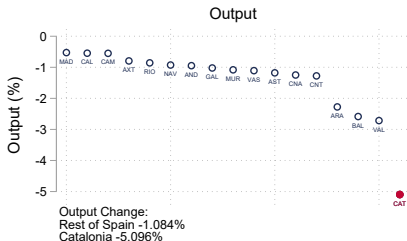
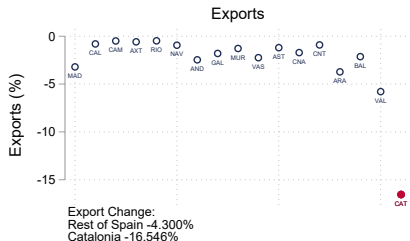


Figure: Counterfactual 1: Catalonia's regional border as EU. Change (in %) of real output for regions in the dataset.

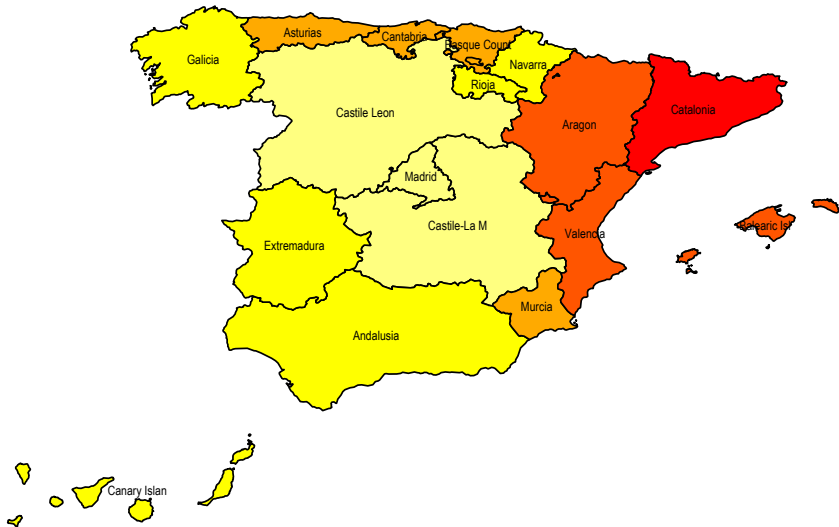


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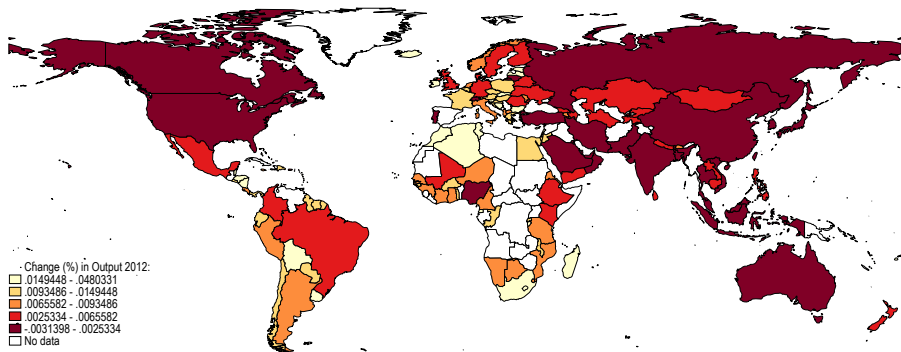


Figure: Counterfactual 2: Catalonia's regional border as Portugal's EU border.

Catalonia in the EU as PRT, year 2012

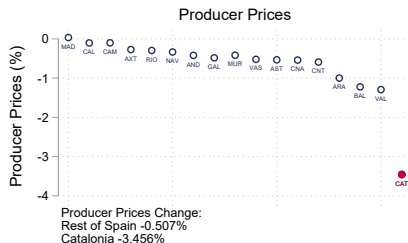
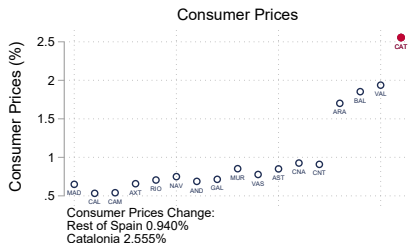
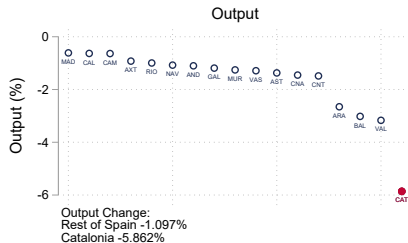
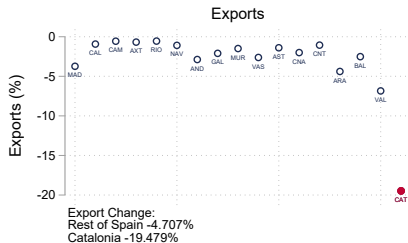


Figure: Counterfactual 3: Catalonia outside the EU, same border as Switzerland.

Catalonia not in the EU as CHE, year 2012

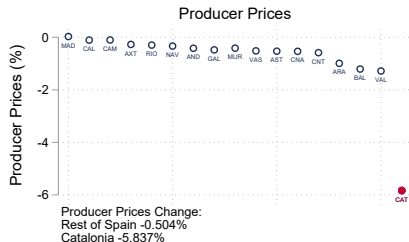
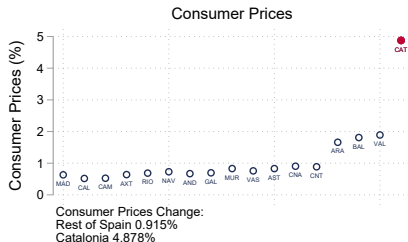
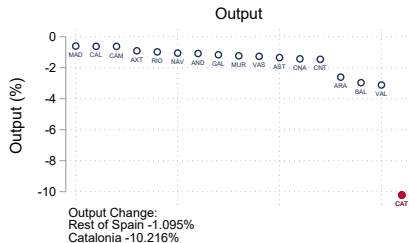
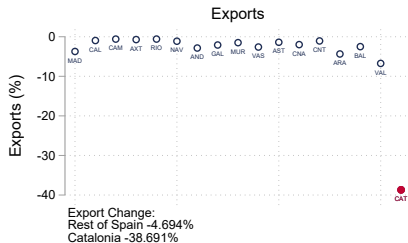


Figure: Counterfactual 4: Catalonia outside the EU and the WTO

Catalonia not in the EU and WTO, year 2012

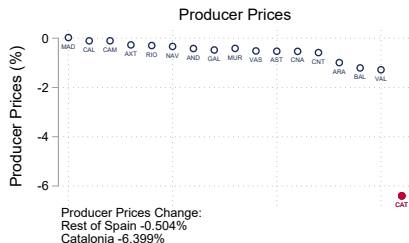
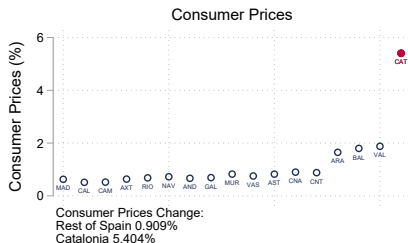
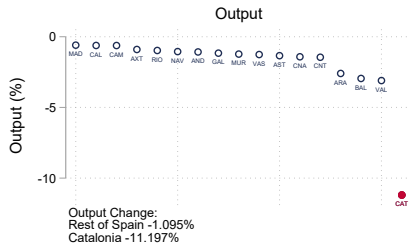
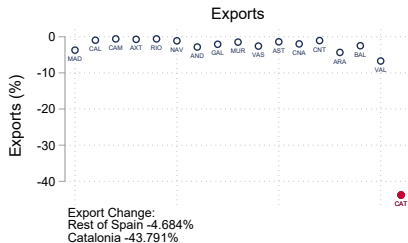


Figure: Welfare Change for Catalonia and the Remaining Spanish Regions Over Time

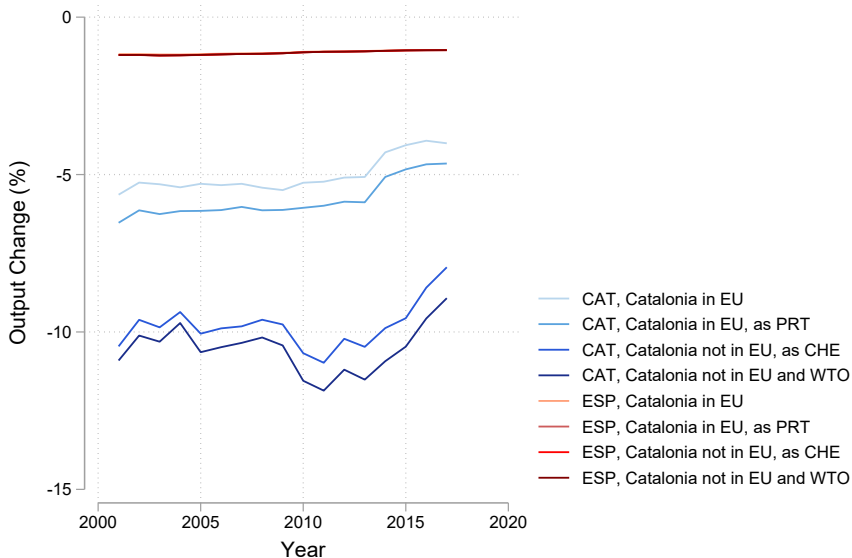
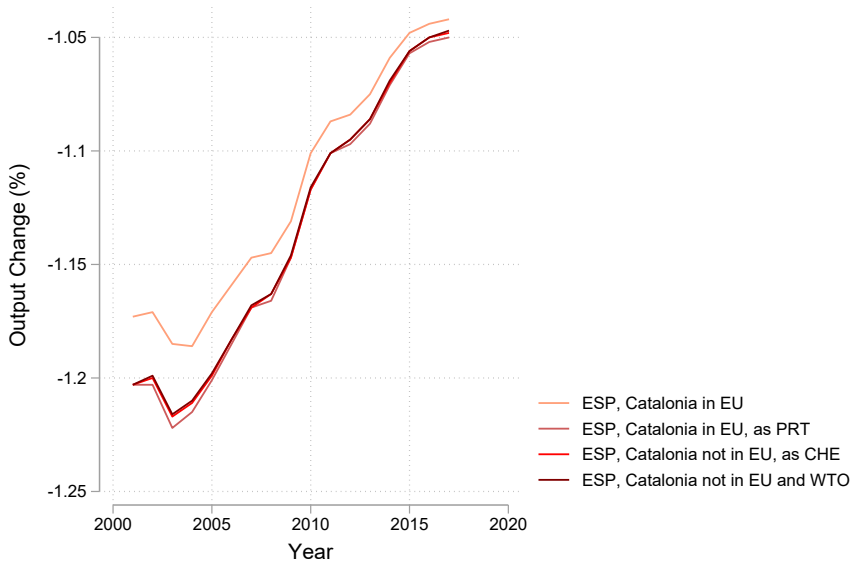


Figure: Welfare Change for the Remaining Spanish Regions Over Time



Take-aways

- This paper develops applied methods to study the economics of regional independence under the lens of trade borders
 - International trade borders are heterogeneous
 - We show that regional borders matter (even in the EU)
- An independent Catalonia would hit Catalan and Spanish welfare (and EU & World)
 - Consumers and producers would be affected
 - Madrid has leverage
- We provide some economic rationale (austerity, “venting out”) to regional independence movement.

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