International Trade and Political Independence

Evidence from Catalonia

Ibrahim Gunay *

Department of Economics, University of Michigan

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Abstract

This paper analyzes the relationship between international trade and political independence movements. In order to test this relationship I use a municipal level dataset from Catalonia. I assume that secession of Catalonia from Spain would lead to higher sectoral trade costs between these two regions, and I compute the counterfactual effects of a secession of Catalonia from Spain on sectors in Catalonia using a standard international trade model with data on bilateral trade flows and production. I find average exposure to Catalan independence in each municipality and test the effect of the variation of exposure to Catalan independence on pro-independence opinions. In order to forge a causal link between these two variables, I use exogenous changes of bilateral sectoral trade costs between Western European countries as an instrument. The estimation results show that municipalities with higher exposure to secession have 9.2% lower pro-independence opinions controlling for other factors. Previous cross-country studies, which do not take into account heterogeneity within a region and endogeneity issues, indicate that there need not be a causal link between international trade and political separatism. In this work, by exploiting tools from international trade models for effects of policy changes, and using a dataset that allows for variation among agents within a region, I fill the gap and show that exposure to international and interregional trade does matter for explaining the variation of political opinions for separatism.

*PhD Candidate, Department of Economics, University of Michigan, igunay@umich.edu

1 Introduction

Over recent decades the world has gone through a massive transformation of higher globalization and international trade. Not only have countries signed trade agreements, and lowered quotas and tariffs with each other that led to higher exchange of goods and factors, but they have also formed political and economic entities such as the European Union. Similar political and economic unions with similar ambitions have been on the agenda for some other regions. Yet, several authors such as Alesina, Spolaore and Wacziarg (2000) have suggested that globalization and economic integration decreases economic incentives for staying in a larger jurisdiction, i.e. a national state, and deeper economic integration could lead to higher demands for political separatism and secession.

Indeed, separatist movements have gained momentum in various regions such as Catalonia, Quebec, Scotland and Belgium with the aim of creating new national states. In addition, several political movements that are critical of the European Union, usually referred to as Eurosceptics, have been urging their governments to exit the EU. They argue that the gains from global free trade dominate gains from regional free trade agreements, i.e. the EU, and instead of remain in a political union with others, they can instead control their domestic economic or social policies autonomously. While political unions such as the EU, or trade agreements such as the WTO have been formed in order to reduce the effect of borders and economic barriers between nations, these very institutions ironically can lead to the formation of new sets of borders, and further impediments to free-trade and economic exchange.

In this paper, I analyze whether there is a relationship between economic integration and separatism by focusing on how potential economic costs and benefits due to secession affect opinions on political independence. In particular, I use a standard international trade model with a municipal level dataset that has production, trade and political independence opinion data from Catalonia in Spain, and test whether the sectoral variation in terms of being affected from independence on Catalonia is related to pro-independence opinions in Catalonia. I find under alternative specifications that moving from a 25th percentile to 75th percentile in terms of potential losses from independence increases pro-independence opinions by 9.2 percentage points.

I use a standard international trade model with trade and production data from Catalonia and rest of Spain to find the potential exposure of each Catalan sector to independence of Catalonia from Spain. I assume that the sole effect of Catalan independence are increases in trade costs between Catalonia and the rest of Spain. Second, I find the average exposure of each Catalan municipality to independence of Catalonia depending on the size of each sector's employment in this municipality. Finally, I empirically test the effect of exposure of municipalities to Catalan independence on the

political opinions of their residents for independence, which I compute by using vote shares of pro-independence parties in the general and local elections in a municipality.

The main contribution of this paper is that it links potential effects due to a change in trade policy to the political opinions for that policy at a municipality level geographical boundary. Standard trade policy exercises test predictions of trade models for how an agent would shape her opinions about a trade policy depending on her skills, income level or sectoral specialization. However, it is not straightforward to map economic characteristics of a region to opinions on trade policy outcomes since electoral outcomes for trade policies almost do not exist as trade policies are not voted through a referendum, or do not stand as the main factor of political debates in elections. As a result, these studies mostly rely on opinion surveys in which respondents are asked about their economic, demographic and political opinions. The main drawback with opinion surveys besides the cost and sample size is that most of them do not contain formation on all of the economic, demographic and political variables simultaneously unless the opinion survey itself is specifically designed by an agency to address the research question. In this study I utilize an alternative method to conduct a trade policy exercise based on characteristics of local geographies without relying on opinion surveys. I work with same geographical boundaries for economic census and political districts, hence have a one-to-one connection. Furthermore, the policy in question, Catalan independence, is an issue that dominates other policies in elections in Catalonia. Hence, opinions on Catalan independence in every election does contain significant information about this policy. The advantage of following this approach is that it allows us to map economic and political variables within a local geography that has data on sectoral employment and political outcomes. The main disadvantages are that the economic and voting outcomes are averaged out and hence we do not know which resident is voting for which outcome, and second is that people change their residences over time.

The local labor market effects of international trade shocks have become a point of interest in the trade literature, where Autor, Dorn and Hanson (2013) show the effect of China's increased competitiveness on the labor outcomes of commuting zones in the United States. Kovak (2013) shows the effect of trade liberalization by Brazil on its local labor markets. I follow a similar method and use independence of Catalonia as the main policy change by assuming that secession of Catalonia from Spain would impose additional trade barriers, as a deliberalization, between rest of Spain and Catalonia.

In addition, this paper contributes to the political economy of country formation and nationalism and globalization literature that explore the question whether there is a relationship between international trade and political opinions on separatism. While multiple explanations are provided for this relationship in theoretical papers, only a

few empirical tests are implemented. Cross-country tests are conducted by Brancati (2014), Sorens (2004), Zinn (2006), where the authors of these studies ask whether there is a causal relationship between trade openness and separatist movements. This relationship is not always supported by data and also depends on other country and region-specific factors. In this study I improve this analysis using a cross-sectional dataset from a single region. By exploiting the variation within Catalonia, I forge a causal link between the variables of interest. While I focus on evidence from a single region, I believe that this is a further step in analyzing the relationship between international trade and its effects on policy choices and opinions on political separatism.

Section 2 provides a brief review on the international trade literature on trade costs and border effects, and the political economy literature on country formation and decentralization. Section 3 presents a standard Armington international trade model that allows me to compute potential exposure of sectors to Catalan independence, and relate it to the political decision making problem of an agent. Section 4 provides information on the empirical strategy and data. Section 5 presents empirical results, and section 6 concludes.

2 Independence and Trade Costs

Several authors have argued about the benefits of centralization, decentralization and full independence of countries, and how globalization has been affecting economic and political institutions of countries. Alesina et. al. (2000) stated that economic integration leads to political disintegration since benefits of belonging to a larger market through a unitary state diminishes with higher international trade integration that creates more economic opportunities with the rest of the world. They assume that every agent has a desired preference point based on ideology, ethnicity, or another characteristic, and therefore that agents will be closer to their ideal policy preferences in a smaller jurisdiction. Bolton and Roland (1997) provide an example on heterogeneous preferences on tax policy, and how differences in the ideal tax policy and redistribution choices could lead to higher demands for independence while taking into account the potential losses from separation. They describe the sources of the efficiency losses due to a breakup as lower economic activity resulting from having a separate currency, lower trade volume with the rest of the former union, and higher costs of public good provision. Meadwell and Martin (1996) stated that higher international trade with the rest of the world for a region lowers the barriers to exit and the short-term transition cost of independence, and enhances the long-term viability of a region upon independence. Shulman (2000) pointed out that nationalist political movements

might be pro-trade because foreign ties of a minority region within a national state increases diversification and reduces the dependency of the minority region on the national state. For instance international regulations such as the EU treaties limit the power of a centralized state on its regions and minorities. Shulman (2000) additionally provides examples from Quebec, India and Ukraine on how nationalist parties react to globalization and international trade.

However some authors have also elaborated on the benefits of staying in larger jurisdictions and centralized states. Persson and Tabellini (1996) assert that larger fiscal units are more effective at risk sharing and pooling economic resources to provide insurance for regions that are adversely affected by unexpected economic shocks. Rodrik (1998), and Scheve and Slaughter (2004) argue that globalization increases volatility and aggregate economic risk.

Atkeson and Bayoumi (1993) state that integrated capital markets are likely to produce large flows of capital across regions or national boundaries, but they are unlikely to provide a substantial degree of insurance against regional economic fluctuations, except to the extent that capital income flows become more correlated across regions. Therefore, this task will continue to be primarily the business of the government. Krugman (1991) argues that as regions become more specialized, they become increasingly vulnerable to the global market shocks, and therefore will have fewer incentives to rely solely on themselves to provide insurance. Garrett and Rodden (2000) argue that the relationship between globalization and decentralization is ambiguous due to the fact that globalization and international trade increase risks, which might lead the voters to prefer higher centralization. It is pointed out in the empirical literature that globalization may not always cause separatism. Brancati (2014) asserts that since different regions do not benefit from economic integration equally, the demand for independence need not be increased in a region that is worse off. Zinn (2006) pointed that economic integration and separatism are statistically correlated, but there does not exist a causal relationship. Sambanis (2006) stated that the increased demand for independence might be offset by a federal or decentralist solution. For example, the British government offered Scotland higher autonomy and decentralization as an alternative to full independence prior to the independence referendum in September 2014.

Previous studies show how sensitive international trade is with respect to border effects and how country breakups might affect economic outcomes. Fidrmuc and Fidrmuc (2003) analyze the dissolution of Czechoslovakia and report that intra-Czechoslovakian trade was 43 times more than their trade with the rest of the world before the dissolution of Czechoslovakia, but decreased to 7 after the breakup. Djankov and Freund (2000) find that the trade between Russia and newly formed former Soviet

republics have decreased significantly especially due to new trade barriers and border effects. In addition to these studies, we can also see the changes of country breakup on trade costs using data on domestic production and trade flows over time. I inferred trade costs between Czech Republic and Slovakia and their other trade partners after the formation of Czech Republic and Slovakia in January 1st, 1993. Figure (1) shows that the trade costs τ_{in}[1] between Czech Republic and Slovakia increased upon the dissolution of their union whereas trade costs between Czech Republic and its other main trade partners had been decrasing in this period[2]. On the effect of border effects of trade, McCallum (1995) reported that Canadian province traded twenty times more with each other than with US states comparable to the Canadian provinces in size and distance. Anderson and van Wincoop (2003) use a more robust specification and find that borders reduce trade flows between countries by twenty to fifty percent. Comerford and Rodriguez-Mora (2014) measured the hypothetical losses that Catalan and Scottish independence would bring on these regions and find that independence would reduce GNI in Catalonia by 10.4% and in Scotland by %5.5.

We do not know the exact effect of country breakups and independence on trade costs and trade flows. Border effects matter and inter-regional trade costs between regions are shown to have increased after dissolution of country unions in the past. Several explanations have been provided in the literature such as the effects of currency unions, distribution and transportation networks, ethnic networks and language, preferences, home market effects or boycotts (See Anderson and van Wincoop 2004 for a survey).

Finally, I do not focus on the other potential effects of secession such as changes in domestic production costs, government expenditure, risk-sharing, tax policy, redistribution or social or identity issues. I control for variable that would possibly affect the decisions of individuals such as ethnicity or income, however I do not explicitly model

[1] I start with the demand equation from a standard Armington model, that is given by

$$x_{in} = \frac{(w_i t_{in})^{(1-\sigma)}}{P_n^{1-\sigma}} I_n$$

where x_{in} is the trade flows from i to n, w_i is the wage in country i, P_n is the price index of the composite good in country n and I_n is the aggregate income, or gross domestic product. The term t_{in} costs, referred as iceberg trade costs represent the frictions between countries that take into account tastes, geographic distance, economic and political policies such as tariffs or non tariff barriers and all other border effects.

This setup leads the trade costs to be inferred from data such that

$$\tau_{in} = \frac{t_{in} t_{ni}}{t_{ii} t_{nn}} = \left(\frac{x_{ii} x_{nn}}{x_{in} x_{ni}} \right)^{2(1-\sigma)}$$

[2] I do not have interregional trade data between Czech Republic and Slovakia prior to the dissolution of Czechoslovakia, therefore it is not possible to observe changes in trade costs between 1992 and 1993.

their effect and take these for given.

3 Model

The economy is represented by a Armington model of international trade with multiple sectors and 3 regions. Each region $i = 1, 2, 3$ is endowed with a fixed amount of labor supply in each sector $j = 1, ..., J$, represented as L_i^j, which is immobile across regions and sectors. Region 1 and 2 are two regions within a country or union, and region 3 is rest of the world. For the empirical setup, the region of interest Catalonia will be region 1, and region 2 will be rest of Spain.

3.1 Demand

Agents in each region $n = 1, 2, 3$ consume varieties of goods produced by regions $i = 1, 2, 3$ from sectors $j = 1, 2, .., J$. The utility of each agent in region n is given by a Cobb-Douglas aggregate of goods from each sector

$$U_n = \prod_{j=1}^{J} \left(C_n^j \right)^{\beta_j} \tag{1}$$

where C_n^j denotes the consumption of sector j good in region n, and β_j denotes the share of each sector in the utility function with $\sum_{j=1}^{J} \beta_j = 1$.

Each sector's final good C_n^j is given by a CES aggregate of domestic and foreign varieties that are produced by and shipped from each region $i = 1, 2, 3$,

$$C_n^j = \left[\sum_{i=1}^{3} \left(Q_{in}^j \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \tag{2}$$

where Q_{in}^j denotes the consumption of region n of good j produced in region i. The parameter $\sigma > 1$ is the elasticity of substitution across varieties originating from alternative destinations.

Cobb-Douglas utility implies that the demand for each variety is given by $P_n^j C_n^j = \beta_j I_n$, in other words expenditure final goods for each sector good j is a constant fraction of the total income I_n. The CES structure states that each variety Q_{in}^j of sector j good produced in i and sold in n that has a price p_{in}^j will have the following demand equation

$$X_{in}^j = p_{in}^j Q_{in}^j = \frac{(p_{in}^j)^{1-\sigma}}{(P_n^j)^{1-\sigma}} \beta_j I_n \tag{3}$$

where P_n^j is the price index of good j consumed in country n

$$P_n^j = \left[\sum_{k=1}^{J} (p_{kn}^j)^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \tag{4}$$

3.2 Production

Each good is produced using a linear and one to one production function $q_{in}^j = l_{in}^j$ that transforms each labor unit into one unit of output. Trade is subject to variable iceberg trade costs so that a shipment that arrives as Q_{in}^j from i to n requires $\tau_{in}^j Q_{in}^j$ units to be shipped, and the amount $(\tau_{in}^j - 1)Q_{in}^j$ is assumed to be lost during the journey, where $\tau_{in}^j \geq 1$. Since labor is immobile across sectors, each sector will have its own wage w_i^j, which will be a function of all of the model parameters and variables. The markets are assumed to be perfectly competitive and there are no costs of entry. As a result, profits will be zero and profit maximization leads to prices

$$p_{in}^j = w_i^j \tau_{in}^j \text{ for } j = 1, ..., J \tag{5}$$

The non-tradable sectors are not modeled as a separate sector in the model, however assuming that non-tradable sectors have infinite trade costs $\tau_{in}^j = \infty$ will result in zero trade flows for these sectors across regions. Assuming that productivity does not play any role in the production process does not pose a problem since, as will be explained shortly, I am interested in the percentage changes on wages in each sector after independence. The changes on wages will not be affected due to productivity since I will assume that the sole effect of independence is higher trade costs between region 1 and region 2.

3.3 Market Clearing

Since labor is the only factor, and is fixed across sectors and regions, labor market clearing within each sector leads the sectoral income to be equal to total production and sales. In other words the following equality must hold for each $i = 1, 2, 3$ and $j = 1, ..., J$

$$w_i^j L_i^j = \sum_{n=1}^{3} X_{in}^j \tag{6}$$

This equality also insures that trade is balanced across regions

$$\sum_{j=1}^{J} \sum_{n=1}^{3} X_{in}^j = \sum_{j=1}^{J} \sum_{n=1}^{3} X_{ni}^j \tag{7}$$

Combining equation (6) with the demand equation (3), profit maximization condition (4) and the price index (5) leads to

$$w_i^j L_i^j = \sum_{n=1}^{3} X_{in}^j = \sum_{n=1}^{3} \frac{(w_i^j \tau_{in}^j)^{1-\sigma}}{(P_n^j)^{1-\sigma}} \beta_j I_n \tag{8}$$

where aggregate income I_n, and price index P_n^j are given by

$$I_n = \sum_{j=1}^{J} w_n^j L_n^j \tag{9}$$

$$(P_n^j)^{1-\sigma} = \sum_{k=1}^{J} (w_k^j \tau_{kn}^j)^{1-\sigma} \tag{10}$$

Equation (8) is a non-linear system of $3J$ equations and $3J$ unknowns. Equilibrium wages can be solved using this equation, and the equilibrium can be defined accordingly.

Definition 1. *Given L_n^j and τ_{in}^j, an equilibrium is a wage vector $\mathbf{w} = \{w_i^j\}_{j=1}^{J}{}_{i=1}^{3}$ that satisfies equation (8) where income and prices are given by equations (9) and (10) for $j = 1, ..., J$ and $i, n = 1, 2, 3$.*

Instead of solving the model, and then computing the effect of policy changes on model outcomes, I find the counterfactual effects of policy changes by focusing on percentage deviations around the equilibrium. After writing the model in deviations, they compute the counterfactual effects of tariff or trade cost changes on using data on exports, imports and production. This method has also been utilized in various studies such as Arkolakis et. al (2012), Costinot et. al (2010) and Caliendo and Parro (2014), and summarized in Costinot and Rodriguez-Clare (2013). I will follow the log-deviation method and compute the percentage changes of sectoral wages for each sector in country 1 after region 1 becomes independent.

As explained before, the sole effect of a breakup between regions 1 and 2 is the imposition of higher trade barriers between regions 1 and 2. In other words, the trade costs τ_{12}^j and τ_{21}^j will increase in each sector. I will assume that independence of region 1 will not significantly affect their relationship with the rest of the world, hence the trade costs with respect to the rest of the world will not change. Similarly, the trade costs of each region with respect to their domestic market, τ_{ii}^j will not change. For further simplicity, the trade cost changes in each sector between region 1 and 2 will be assumed to be identical. Each variable will be denoted by its log-deviation, or percentage change $\hat{x} = \frac{\Delta X}{X} = d \log X$ around the initial value X prior to the change. The structure of the changes in trade costs $\hat{\tau}_{in}^j$ is summarized as

Assumption 1. *Independence affects trade costs only between regions 1 and 2 :* $\hat{\tau}_{i3} = \hat{\tau}_{3i} = \hat{\tau}_{ii} = 0$ *for all* $i = 1, 2, 3$.

Assumption 2. *Percentage changes in trade costs is identical across all sectors and regions 1 and 2 :* $\hat{\tau}^j_{12} = \hat{\tau}^j_{21} = \hat{T}$ *for all* j*, for a scalar* $\hat{T}$.

Log differentiating equation (8) around the initial equilibrium results in

$$\sigma \hat{w}^j_i = \sum_{n=1}^{3} \theta^j_{in} \left[\hat{I}_n - (\sigma - 1)\hat{\tau}^j_{in} + (\sigma - 1)\hat{P}^j_n \right] \tag{11}$$

with $\theta^j_{in} = \frac{X^j_{in}}{\sum_{n=1}^{3} X^j_{in}}$ is the share of region i's sales of good j to region n in its total sales of j. Note that since L^j_i is assumed to be fixed, its deviations will be zero, $\hat{L}^j_i = 0$. The change of the price index, $\hat{P}^j_n$, and aggregate income $\hat{I}^j_n$ can be expressed in terms of the endogenous variables and other parameters

$$\hat{P}^j_n = -\frac{1}{\sigma - 1} \sum_{k=1}^{3} \phi^j_{kn} \left[-(\sigma - 1)(\hat{w}^j_k + \hat{\tau}^j_{kn}) \right] \tag{12}$$

$$\hat{I}^j_n = \sum_{j=1}^{J} \lambda^j_n \hat{w}^j_n \tag{13}$$

where $\phi^j_{kn} = \frac{X^j_{kn}}{\sum_{l=1}^{3} X^j_{ln}}$ is the share of region k's sales to region n in sector j in the total expenditure of region n of good j. Since aggregate income is given by $I_n = \sum w^j_n L^j_n$, the constants $\lambda^j_n = \frac{w^j_n L^j_n}{\sum_{g=1}^{J} w^g_n L^g_n}$ denotes the share of total income of sector j in the aggregate income of country n. Plugging equations (12) and (13) into equation (11) results in the following expression

$$\sigma \hat{w}^j_i = \sum_{n=1}^{3} \theta^j_{in} \left[\sum_{j=1}^{J} \lambda^j_n \hat{w}^j_n - (\sigma - 1)\hat{\tau}^j_{in} + (\sigma - 1) \sum_{k=1}^{3} \phi^j_{kn} (\hat{w}^j_k + \hat{\tau}^j_{kn}) \right] \tag{14}$$

This equation indicates that given certain changes on trade costs $\hat{\tau}^j_{in}$, elasticity of substitution σ, and data $(\theta^j_{in}, \phi^j_{in}, \lambda^j_{in})$ for each i, n, j, the changes in wages $\hat{w}^j_n$ can be solved from a linear system of $3J$ equations and $3J$ unknowns. As a result, the only endogenous variables are the sectoral wage losses $\hat{w}^j_i$ for $i = 1, 2, 3$. In addition, since region 3 is very large compared to region 1 and 2, there are very small changes on w^j_3, therefore we can assume that $\hat{w}^j_3 = 0$ for all $j = 1, ..., J$ for simplicity. Since all region 3 wages are zero, any of w^j_3 can be designated as the numeraire good. After these assumptions, we will have two sets of endogenous variables $\hat{w}^j_1$ and $\hat{w}^j_2$ for $j = 1, ..., J$. The variable of interest of the model, the sectoral change in region 1, $\hat{w}^j_1$ can be thus

computed using data on θ_{in}^j, ϕ_{in}^j and λ_{in}^j. There will be $2J$ equations and $2J$ unknowns given by equation (14). Using the trade cost change structure, expressed in assumptions (1) and (2), the trade cost terms will be either zero or $\hat{T}$. Therefore, given the elasticity of substitution σ, change in trade costs $\hat{T}$, and parameters derived from data θ_{in}^j, ϕ_{in}^j and λ_i^j, the change in wages in region 1 and 2 can be expressed as

$$\hat{w}_1^j = a_1^j \hat{I}_1 + b_1^j \hat{I}_2 + c_1^j \hat{T} + d_1^j \hat{w}_2^j \tag{15}$$

$$\hat{w}_2^j = a_2^j \hat{I}_1 + b_2^j \hat{I}_2 + c_2^j \hat{T} + d_2^j \hat{w}_1^j \tag{16}$$

where the constants are given by[3]

$$a_1^j = \frac{\theta_{11}^j}{K_1^j}, \quad a_2^j = \frac{\theta_{21}^j}{K_2^j}, \quad b_1^j = \frac{\theta_{12}^j}{K_1^j}, \quad b_2^j = \frac{\theta_{22}^j}{K_2^j}$$

$$c_1^j = \frac{(\sigma-1)(\theta_{12}^j(\phi_{12}^j - 1) + \theta_{11}^j \phi_{21}^j)}{K_1^j}, \quad c_2^j = \frac{(\sigma-1)(\theta_{21}^j(\phi_{21}^j - 1) + \theta_{22}^j \phi_{12}^j)}{K_2^j}$$

$$d_1^j = \frac{(\sigma-1)(\theta_{11}^j \phi_{21}^j + \theta_{12}^j \phi_{22}^j + \theta_{13}^j \phi_{23}^j)}{K_1^j}, \quad d_2^j = \frac{(\sigma-1)(\theta_{21}^j \phi_{11}^j + \theta_{22}^j \phi_{12}^j + \theta_{23}^j \phi_{13}^j)}{K_2^j}$$

Solutions of system (15) and (16) give the following equality for wages in region 1.[4]

$$\hat{w}_1^j = \left(A^j E_1 + B^j E_2 + C^j\right)\hat{T} \tag{17}$$

The constants A^j and B^j indicate how much each sector is affected through changes in the reductions in the aggregate income of regions 1 and 2. When aggregate income falls in regions 1 and 2, their demands for all products decline, and if a sector j

[3] $K_1^j = \sigma - (\sigma-1)(\theta_{11}^j \phi_{11}^j + \theta_{12}^j \phi_{12}^j + \theta_{13}^j \phi_{13}^j)$ and $K_2^j = \sigma - (\sigma-1)(\theta_{21}^j \phi_{21}^j + \theta_{22}^j \phi_{22}^j + \theta_{23}^j \phi_{23}^j)$.

[4] Upper case constant $A_1, A_2, B_1, B_2, C_1, C_2, D$ (again superscripts will be j):

$$D^j = 1 - d_1^j d_2^j$$

$$A_1^j = \frac{a_1^j + d_1^j a_2^j}{D^j} \qquad A_2^j = \frac{a_2^j + d_2^j a_1^j}{D^j}$$

$$B_1^j = \frac{b_1^j + d_1^j b_2^j}{D^j} \qquad B_2^j = \frac{b_2^j + d_2^j b_1^j}{D^j}$$

$$C_1^j = \frac{c_1^j + d_1^j c_2^j}{D^j} \qquad C_2^j = \frac{c_2^j + d_2^j c_1^j}{D^j}$$

trades significantly with regions 1 and 2, the magnitudes of A^j and B^j will be higher accordingly, and sector j will face higher losses. On the other hand, the term C^j denotes the direct effect of trade cost increases on sectoral wage j, that is independent of the general equilibrium effects through the change in aggregate income of regions 1 and 2.

Overall, equation (17) expresses the change in sectoral wages in region 1, $\hat{w}_1^j$, after region 1 becomes independent, or in other words when trade costs of each sector between regions 1 and 2 increase by the same percentage. The disproportionate effects of trade cost changes on each sector are generated due to differences in sectoral characteristics, that are simply variations in θ_{in}^j, ϕ_{in}^j and λ_i^j. Therefore, the model and the data will result in variations in each sector will be proportional to the increases in trade costs $\hat{T}$, which I call as the counterfactual border effect between regions 1 and 2. We do not know the magnitude of $\hat{T}$ after the secession of region 1. Since I do not have potential estimates on $\hat{T}$ at this point, I will refer to the magnitudes of sectoral wage changes in terms of $\hat{T}$ from equation (17). Note that the border effect $\hat{T}$ might also be changing over time, and therefore different counterfactual trade cost changes will lead to different scaling effects on $\hat{w}_1^j$.

For now, I will assume that the border effects are and unknown number $\hat{T}$ and

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Greek letter constants: $\alpha_i, \beta_i, \gamma_i$: summed over all sectors $j = 1, ..., J$:

$$\alpha_1 = \sum_{j=1}^{J} \lambda_1^j A_1^j \qquad \alpha_2 = \sum_{j=1}^{J} \lambda_2^j A_2^j$$

$$\beta_1 = \sum_{j=1}^{J} \lambda_1^j B_1^j \qquad \beta_2 = \sum_{j=1}^{J} \lambda_2^j B_2^j$$

$$\gamma_1 = \sum_{j=1}^{J} \lambda_1^j C_1^j \qquad \gamma_2 = \sum_{j=1}^{J} \lambda_2^j C_2^j$$

Change in I_1 and I_2 (aggregate income) :

$$E_1 = \frac{\beta_1\gamma_2 - \beta_2\gamma_1 + \gamma_1}{1 - \alpha_1 - \beta_2 + \alpha_1\beta_2 - \alpha_2\beta_1}$$

$$E_2 = \frac{\beta_2\gamma_1 - \beta_1\gamma_2 + \gamma_2}{1 - \alpha_2 - \beta_1 + \alpha_2\beta_1 - \alpha_1\beta_2}$$

$$\hat{I_1} = E_1\hat{T}$$

$$\hat{I_2} = E_2\hat{T}$$

Sectoral output loss:

$$\hat{w}_1^j = \left(A_1^j E_1 + B_1^j E_2 + C_1^j\right)\hat{T}$$

$$\hat{w}_2^j = \left(A_2^j E_1 + B_2^j E_2 + C_2^j\right)\hat{T}$$

time in-varying. The following proposition summarizes the effect of independence on sectoral wages in region 1.

Proposition 1. *Given assumptions (1) and (2), if trade costs increase by $\hat{T}$ percent in each sector due to breakup of region 1 from region 2, percentage changes wages in each sector j in region 1 $\hat{w}_1$ percent are given by*

$$\hat{w}_1^j = \left(A^j E_1 + B^j E_2 + C^j\right)\hat{T}$$

where the constants A^j, B^j, C^j, E_1 and E_2 are constants with model parameters.

3.4 Political Problem

The region of interest is region 1 in this paper. As a result, I will remove the country subscripts as the remaining analysis will be only focusing on developments in region 1 except for the effects of independence on sectoral wages, $\hat{w}_1^j$, which will be denoted as $\hat{w}^j$ from now on. Region 1 is divided to M municipalities indexed by $m = 1, ..., M$. Each municipality m will be populated by L_m workers, and L_m^j of those work in sector j. An agent i who lives in m will have a type $\sigma^i = (\sigma_0^i, \sigma_1^i)$, which represents the biases of that agent for union σ_0^i and independence σ_1^i. An agent i will receive utility from wages of the sector in which she is working, and from her bias for independence and union for each state. Specifically the utilities under independence and union will be given by

$$W_i^j(1) = w_1^j \sigma_1^i \tag{18}$$

$$W_i^j(0) = w_0^j \sigma_0^i \tag{19}$$

where $W_i^j(s)$ denotes the welfare under state $s = 0$ (union) and $s = 1$ (independence). An agent i who works in sector j will be inclined towards independence if $W_i^j(1) > W_i^j(0)$. The bias term σ^i will be the effect of other factors that affect an agent's opinions on independence. Such factors are ethnicity, political ideology, income level of the individual other than the average sector level wage, education, age and various other variables. Given this configuration, the probability that an agent who works in sector j will support independence will be given by

$$\begin{aligned} p^j =& prob\left(W_i^j(1) > W_i^j(0)\right) \\ =& prob\left(\log W_i^j(1) - \log W_i^j(0) > 0\right) \\ =& prob(\hat{w}^j > -\hat{\sigma}^i) \end{aligned}$$

where $\hat{w}^j$ denotes the percentage change in the sectoral wage of sector j, that is computed with the economic model, and given by Proposition (1). This number $\hat{w}^j$ will have a negative value if sector j loses from independence, and positive if the sector gains from independence. Therefore, an agent will have a higher probability of voting for independence holding other variables constant if her sector loses less, or gains more, that is $\frac{\partial p^j}{\partial \hat{w}^j} > 0$. I will assume that the percentage differential between the bias of agent between the union state and independence state, $\hat{\sigma}^i$ will follow a probability distribution $F(\cdot)$ where each agent is independently and identically distributed.

The decision rule can be expressed with the observable characteristics of the agent with the equation

$$p_i = \alpha + \beta \hat{w}^{j(i)} + \gamma \mathbf{x}_i + \nu_i \tag{20}$$

where p_i denotes the probability that an agent will be inclined towards independence, $\mathbf{x}_i$ is the observable characteristics, and ν_i is an error term that represents the variation for agent i given the sectoral wage loss from independence and observable characteristics.

Unfortunately a dataset that provides statistics on political opinions and industry of employment at the individual level at the same time is not available. However, election results and employment distribution is available at local geographic levels in many countries. Hence, I can use an aggregated version of equation (20) by using political, economic and demographic statistics of municipalities. I will work with average and aggregate statistics for independence opinions, economic outcomes, namely $\hat{w}_i$, and other economic and demographic characteristics. The main empirical equation will transform into

$$Indep_{mt} = \alpha_t + \beta exposure_{mt} + \gamma \mathbf{X}_{mt} + \mu_m + \varepsilon_{mt} \tag{21}$$

where dependent variable is the independence proxy $Indep_{mt}$, which will be the average pro-independence opinions in municipality m at date t. The main explanatory variable is $exposure_{mt}$, which is the average change in sectoral wage in municipality m at time t that is constructed as a weighted sum using the labor distribution of municipality m at time t and potential losses of sectors from independence, $\hat{w}^j$.

$$exposure_{mt} = \sum_{j=1}^{J} \left(\frac{L_{mt}^j}{L_{mt}} \right) \hat{w}_t^j \tag{22}$$

L_{mt}^j is the employment of municipality of m at time t in sector j, and L_{mt} is the total labor force of municipality m at date t. $\mathbf{X}_{mt}$ is the vector of other explanatory variables such as average wage of municipality, percentage born outside of Catalonia, percentage of residents of m who speak Catalan, average education level and average age. The fixed effects that affect independence opinions in a municipality is given by μ_m, and

ε_{mt} is the residual term.

4 Data Description and Econometric Specification

4.1 Data Description

In order to perform the empirical tests, I collected data from various sources. I used input-output tables from Catalonia and Spain to compute the sectoral wage losses $\hat{w}^j$ due to independence. Employment and demographic data at the municipal level is available from population surveys. The independence opinions at the municipal level are constructed using election results and political opinion surveys. International trade flow data, and sectoral production data is used for exogenous sectoral changes and developments in other countries. Here is the detailed description for each of these sources and how they are used to construct the variables.

Input-Output Tables: I used regional Catalan input-output tables, and Spanish national input-output tables, which provide information for retrieving all the parameters $(\theta^j_{in}, \phi^j_{in}, \lambda^j_i)$ of the model. The National Institute of Statistics of Spain (INE) has constructed input-output tables for Spain for years 1985-2011, however the Catalan Statistical institute (IDESCAT) prepared the Catalan input-output tables only for years 1987, 2001, 2005 and 2011. Therefore I was able to construct the sectoral loss $\hat{w}^j_t$ only for years the Catalan input-output tables are available. Since these tables are constructed by different sources and at different years, various industry classifications for each of the tables have been used. For each of the years I use the necessary concordance tables and work with the same industry classifications.

Once both Catalan and Spanish input-output tables report the statistics for the same industry classifications, information on trade flows between regions 1,2 and 3, and total production are necessary to compute the model parameters. The regional trade flows between two Catalonia (region 1) and rest of Spain (region 2), X^j_{12} and X^j_{21} for each $j = 1, ..., J$ are derived from Catalan input output tables as they report imports from rest of Spain and exports to rest of Spain for each sector. The Catalan exports to the rest of the world, and imports of Catalonia from the rest of the world are also reported, and hence I derive X^j_{13} and X^j_{31} for each sector. In addition, total production values in each sector are available, which will be denoted as $Y^j_1 = w^j_1 L^j_1$, and the domestic trade flows from Catalonia to Catalonia will be production net of total exports, $X^j_{11} = Y^j_1 - X^j_{12} - X^j_{13}$. I derive the exports and imports of the rest of Spain with respect to the rest of the world by substracting Catalan exports and imports from total Spanish imports and exports, and hence find X^j_{23} and X^j_{32}. Accordingly, production of each sector for the rest of Spain will be total Spanish production net of total Catalan production within

a sector, which is given by $w_2^j L_2^j$. Accordingly, the domestic tradeflows from rest of Spain to itself will be production net of total exports to Catalonia and the rest of the world, $X_{22}^j = Y_2^j - X_{21}^j - X_{23}^j$. With this information, I compute the export shares θ_{in}^j for $in \in \{11, 12, 13, 21, 22, 23\}$, ϕ_{in}^j for $in \in \{11, 21, 31, 21, 22, 23\}$, shares of each sector in production λ_i^j for $i = 1, 2$ for each sector $j = 1, ..., J$. The remaining variables for the rest of the world such as total production in each sector, $Y_3^j = w_3^j L_3^j$ or the total trade flows from the rest of the world to itself will not be used, since the changes to the rest of the world are assumed to be negligible, and hence $\hat{w}_3^j = 0$, and the import share of the rest of the world from Catalonia and Spain will also very small and will be assumed as zero, i.e. $\phi_{13}^j = \phi_{23}^j = 0$ for all $j = 1, ..., J$. λ_1^j and λ_2^j are calculated using $Y_!^j$ and Y_2^j according to the definition in the previous section.

Population Census: I used the population census Catalonian municipalities for the necessary employment, occupation and demographic variables. The National Statistical Institute of Spain (INE) has conducted population censuses in 1991, 2001 and 2011, and the Catalonian Statistical Institute (IDESCAT) has conducted its own population censuses in 1986, 1991 and 1996. These censuses contain information on employment by sector, employment by occupation, age distribution, education levels by categories, knowledge of Catalan, region of birth, and other characteristics. The employment statistics in each census years are prepared with different classifications. 1991 Census has its own 26 sector classification that is an aggregated version of CNAE-74 classification. The 2001 census provides employment in industries at the 3 digit NACE Rev. 1 level, and 2011 census provides employment in industries at the 3 digit NACE Rev. 2 level. The sectors are aggregated up to the sectoral classification used in the corresponding input-output tables. Occupation in each sector is provided using CNO-74 in 1991, CNO-94 in 2001 and CNO-2011 in 2011. Income level of municipalities are not avaiable, however we can construct and average wage variable using the occupation distribution in a municipality and the average earnings of each occupation in Spain for that year. Specifically, the $AverageWage_{mt}$ is given by

$$AverageWage_{mt} = \sum_{k=1} \frac{l_{mt}^k}{L_{mt}} e_t^k \tag{23}$$

where e_t^k denotes the mean earnings of occupation k in Spain at date t and l_{mt}^k represents the number of residents of m at date t who hold the occupation k. The average earnings in each year t is retrieved from INE's 4 yearly survey employment. The dates available are 1995, 2001 and 2012 and if the wage in the occupation for a year is not available, the year that is closest is used. The variables that control ethnicity are named as $BornOutside_{mt}$ and $SpeakCatalan_{mt}$, which are respectively the fraction of the residents of m at date t who are born outside of Catalonia, and the fraction who

speak Catalan.

Political Data: In order to construct the proxy for independence, I work with Spanish general and Catalan regional election results for party strength in each municipality, and opinion surveys to find stances of each parties' supporters on independence of Catalonia. There are various political parties in Spain and Catalonia that participate in these elections. The election data is retrieved from the Interior Ministry of Spain[5]. These political parties occasionally form alliances, change names or join other parties. However the main parties that have had strong support from the public, and kept their core party structure are CiU (Convergence and Union), ERC (Rebuplican Left of Catalonia), ICV (Initiative for Catalonia Greens), PSC (Socialists' Party of Catalonia) and PP (Popular Party). ERC has always supported full-independence whereas CiU, which is a right-center nationalist political party, and ICV-Greens had supported higher autonomy for Catalonia historically, however they shifted their stance towards full-independence gradually. PSC is the Catalan branch of PSOE (Spanish Socialist Workers' Party), which had a strong popularity in Catalonia as a major left-wing political party, adopted an anti-independence federalist position, and lost its popularity in the recent years. As for the other parties, Popular Party of Catalinia, which is the Catalan branch of the Spanish-wide conservative Popular Party, and the newly formed C's (Party of the Citizenry) have a very clear anti-independence position. Finally, newly formed anti-establishment PODEMOS party in Spain supports self-determination of the Catalans, and want to hold a referendum for independence, but prefers to keep Spain united.

In order to gauge the stance of each political party for independence over time. I utilize opinion surveys by matching pro-independence opinions of voters of each party. ICPS (Institut de Ciencies Politiques y Social) in the Autonomous University of Barcelona has conducted a political opinion survey in 1991-2013 in Catalonia where respondents were asked about their characteristics and opinions on political outcomes, such as their demographic and economic characteristics, ideology, ethnicity and stances on certain issues. They were also asked for which party they have voted in the recent general and regional elections. I use the information on the parties for which the respondents have voted and their positions on independence to find an average score for each party's supporters' stance on independence.

In order to estimate the average pro-independence stance of voters of each party, I implemented a probit regression at each survey date t of independence opinion D_{it} on the party choice of the respondent, d_{ikt}. D_{it} is a dummy variable that takes the value 1 if the respondent has indicated that she supports independence and 0 otherwise. The

[5]Informacion Electoral - Ministerio del Interior, http://www.interior.gob.es/web/interior/informacion-electoral

variable d_{ikt} is also a dummy variable that takes the value 1 if respondent i voted for party k in the most recent elections prior to the time of the survey t. Since the survey data does not follow individuals over time, I estimated the coefficients at each date separately, and ran regressions for each of the years $t = 1991, ..., 2013$.

$$prob(D_{it} = 1) = \gamma_t + \sum_{k=1}^{K} \delta_{kt} d_{ikt} + \epsilon_{it} \tag{24}$$

The predicted $\hat{\gamma}_t + \hat{\delta}_{kt}$ will give the probability that a voter of party k has pro-independence position at date t. Using these predicted probabilities and vote shares of each party at date t, I predict the average pro-independence opinion in a municipality m

$$Indep_{mt} = \hat{\gamma}_t + \sum_{k=1}^{K} \hat{\delta}_{kt} v_{kmt} \tag{25}$$

where v_{kmt} is the vote share of party k in municipality m at date t. There are two types of elections, Catalan regional and Spanish general elections. I followed this strategy for both election types and found two independence proxies, one for Catalan regional elections and the other for Spanish general elections.

I did not simply add the vote shares of pro-independence and nationalist parties due to three reasons. First the average pro-independence position of voters of each party are different even if the party clearly expresses a pro-independence or anti-independence opinion. Second, some parties such as PSC may not have a very clear position consistently on autonomy and independence of Catalonia. And Third, the party stances and positions, or voters' perception of parties' positions might change over time. Having a score on average pro-independence opinion for each party at each date better allows to quantify independence opinions and compare over time.

4.2 Empirical strategy

After constructing the necessary variables, I move on to the estimation of equation (21). The estimation of equation (21) will face two serious problems, the fixed effects within a municipality, and endogeneity or measurement errors in the main regressor $exposure_{mt}$. In order to control for the fixed effects, I use a first-differencing approach by using the changes of each variable over time and rewrite the regression equation as

$$\Delta Indep_m = \Delta\alpha + \beta \Delta exposure_m + \Delta\gamma \mathbf{X}_m + \Delta\varepsilon_m \tag{26}$$

where Δx_m denotes the changes in x from initial period to the second period. I use census dates 1991 and 2011 for time $t = 1$ and $t = 2$ where the right-hand side variables

$exposure_{mt}$ and $\mathbf{X}_{mt}$ will have their municipality values from the Spanish Census of 1991 and 2011. The industry statistics that I will use for these dates will be the IO tables for 1987 for date $t = 1$ and IO Tables in 2011 for date $t = 2$. I do not use the census year 2001 and the input-output tables in 2001 for two reasons. First, there are small changes in terms of independence opinions between early 1990's early 2000's. As a result, first differencing approach does not lead to consistent estimates. Second, it is not be possible to address the possible endogeneity in $exposure_{mt}$ through an instrument that could be valid and strong at all dates, both from 1991 to 2001, and from 2001 to 2011.

In order to form a causal relationship between $exposure_{mt}$ and $Indep_{mt}$, we need to be sure that the estimation will not be biased due to endogeneity of the regressors or measurement errors. First, there might be unobservable omitted variables that affect the independent and dependent variables jointly, which could lead to biased estimates. One source of a possible omitted variable is the omission of factors that affect the initial distribution of employment and sectors across Catalonia. I do not have an explanation on the distribution of employment for each sectors across municipalities. For instance if ethnically Spanish population for any reason work more in sectors that trade more with Spain, there will be a positive correlation between a negative and large $exposure_{mt}$ and low independence opinions $Indep_{mt}$. In addition, if workers from the rest of Spain move to a municipality because it is close to a Spanish-owned factory that trades more with Spain, and since people from rest of Spain are against Catalonian independence, we will also see a positive correlation between independence opinions and exposure to independence. Another source of endogeneity might arise if the Catalan regional government has a role in shaping industry and trade reorientation towards more economic exchange with the rest of the world as a party of their political agenda. Meadwell and Martin (1996) argue that international trade increases economic viability of a region, which increases supports for independence. Therefore, if this is the case, municipalities in which there is more Catalan government influence or support would be more likely to increase their trade with the rest of the world, and also have higher support for independence. Finally, the estimation could face problems from measurement errors in the independent variable. Since I work with use municipal level data and the variable $exposure_{mt}$ is an average score that does not take into account the variation within a municipality, there is a serious concern about measurement errors for average exposure, and the variation of exposure within a municipality. The estimation does not take into account how conflicting interests that come from sectoral distribution within a municipality will result on the independence opinions.

In order to control for these problems, I provide an instrument Z_m, which is the exposure of each municipality to trade cost changes of sectors in various Western Euro-

pean countries that have data excluding Spain[6]. In order to construct this instrument, I first use the inferred bilateral trade costs between each country in the sample.

$$\tau_{int}^{j} = \left(\frac{x_{iit}^{j} x_{nnt}^{j}}{x_{int}^{j} x_{nit}^{j}} \right)^{\frac{1}{2(\sigma-1)}} \tag{27}$$

where x_{int}^{j} and τ_{int}^{j} are respectively trade flows and trade costs from i to n in sector j at date t[7]. The trade flow data x_{int}^{j} is taken from United Nations Commodity Trade Database, and the sectoral production data in each country x_{iit}^{j} is retrieved from the OECD-STAN Database for Structural Analysis. I used to 2 digit ISIC Rev.3 aggregation, and computed the trade costs for only traded commodities. After inferring the trade costs from data, I averaged trade costs of each sector j at each t across country pairs, and find T_t^j, that is the average trade costs of sector j good at date t. Since I am interested in the change of these trade costs over time, I grouped dates 1992, 1993 and 1994 for the early period, and 2005, 2006 and 2007 for the later period. Then, I find the the percentage change of trade costs in each sector between these dates, which I denote by g_τ^j

$$g_\tau^j = \frac{\tau_{laterperiod}^{j} - \tau_{earlyperiod}^{j}}{\tau_{earlyperiod}^{j}} \tag{28}$$

For relating this variable to the employment variation in each municipality, I use the earliest employment distribution as possible, which is provided in 1986 population census by IDESCAT. Then, I calculate an aggregate sum for the average exposure to the change in trade costs in each sector, that is given by

$$Z_m = \sum_{j=1}^{J} \frac{L_{m1986}^{j}}{L_{m1986}} g_\tau^j \tag{29}$$

Note that, non-tradable sectors will receive a value of 0 for g_τ^j. Positive and high values of Z_m indicate that trade costs have increased on average for the sectors that are more pervasive in m. The theoretical model states that these sectors should have traded less with these European countries, and should have lower and possibly negative values $\Delta exposure_{mt}$. Equivalently, a negative and large value of Z_m predict that the sectors within m should have reorientated their sales towards Europe due to European economic integration and lower trade costs. As a result, a municipality with a negative and large value of Z_m should have faced increases in $exposure_{mt}$.

The first stage results show that this intuition is valid. As shown in table (1), there

[6] Austria, Germany, Denmark, Finland, Italy, Netherlands, Sweden, United Kingdom

[7] We need to assume that the bilateral trade costs are symmetric betweeen two destinations

is a negative and significant relationship between Z_m and $\Delta exposure_{mt}$.

5 Empirical Results

Table (2) displays the results of equation (26). Columns (1) and (2) show the OLS results without using the instrument Z_m. All standard errors are clustered around local labor market areas (Els mercats de treball) in Catalonia that are prepared by the geographical planning directorate of the regional government of Catalonia according to the commuting data in 1991 (Generalitat de Catalunya, 1995). The coefficient of interest, β is around 0.2 in both specifications, which indicate that moving from the 25th percentile to 75th percentile for the variable $exposure_{mt}$, increases pro-independence opinions by 1.2 percentage points. Columns (3)-(6) report the two stage least squares results when $\Delta exposure_{mt}$ is instrumented by Z_m. The results show that the coefficient β increases substantially to 1.67 in the full specification. In particular, moving from the 25th percentile to 75th percentile for $exposure_{mt}$ independence opinions increase by 9.2%.

We also note that the effect of having a higher average income level results in increases in independence opinions, specifically, having 10,000 euros higher average income results in an increase of 7.56 percentage points for independence opinions. However, we see that neither the knowledge of Catalan language nor being from outside of Catalonia results in the desired direction, nor are significant. The first differencing method leads the fixed effects to be removed, which is highly indicative of the ethnic distribution within a municipality. One alternative explanation is that places that were subject to migration from the rest of Spain induced the local Catalans to increase their turnout in the elections and vote more for nationalist parties to counter the Spanish influence.

The huge difference in the coefficients of the main explanatory variable might be because the instrumental variable approach is correcting the measurement errors in the explanatory variable, which biases the coefficient towards zero in the OLS estimation. Another reason could be because historically there might be a correlation between locations and sectors that have higher independence opinions and lower exposure, and the change in exposure does not reflect much increases in independence opinions. However once we use the instrument Z_m, which shows the potential effects of the effect of European integration on sectors exogenously, we might be correcting for this bias. However, the substantial difference between the OLS and 2SLS results might be due to measurement errors in the instrument, or problems with the specification, for which additional robustness checks are needed with additional variables. So far the only control variable I have used are income and ethnicity since the fixed effects absorb for

all variable that do not change over time within a municipality.

Despite the potential errors in the specification, the results show that the variation in terms of potential losses that independence would incur on the municipalities in Catalonia are correlated with independence opinions in Catalonia in both OLS and 2SLS specifications. The 2SLS results indicate that there is a causal relationship of the exposure to potential losses of independence on independence opinions.

6 Conclusion

In this paper I test whether potential economic effects due to independence of a region from a country can affect political opinions on independence. Specifically, I find the effect on Catalan sectors due to increases in trade costs between Catalonia and Spain upon independence of Catalonia. Using employment data over the sectors in each Catalan municipality, I find the average exposure of each municipality and test the relationship between this potential exposure to independence and pro-independence opinions in municipalities.

The results show that controlling for fixed effects and endogeneity by using a first-difference and instrumental variable approach, independence opinions differ increase about 9.2% when moving from a more exposed municipality (25th percentile) to a less exposed municipality (75th percentile). The results might be subject to measurement or aggregation errors due to the fact that the data is only available at the municipal and sectoral level, and the variation within municipalities or sectors are not taken into consideration.

However, by using economic and political data at the local geographic levels, I improve the earlier literature that solely focused on cross-country studies that has failed to even account for regional differences in terms of economic and political characteristics. In addition, I have contributed to the literature that studies local effects of international trade by providing how a potential "de-liberalization" can affect sub-regions differently, and how different exposures to trade can influence political opinions.

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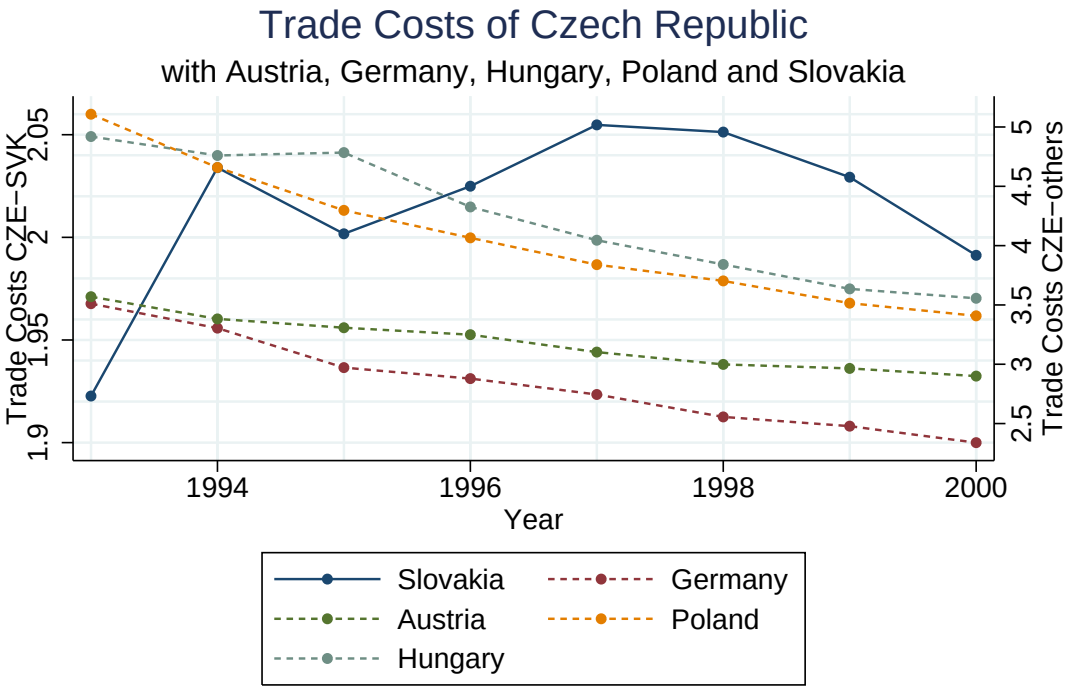
Figure 1: Trade Costs between Czech Republic and Slovakia upon independence



Source: World Trade Flows Database, UN National Accounts, own calculations

Left axis reports Czech Rep.−Slovakia, and right axis reports Czech Rep.−others

Figure 2: Independence and Trade Costs

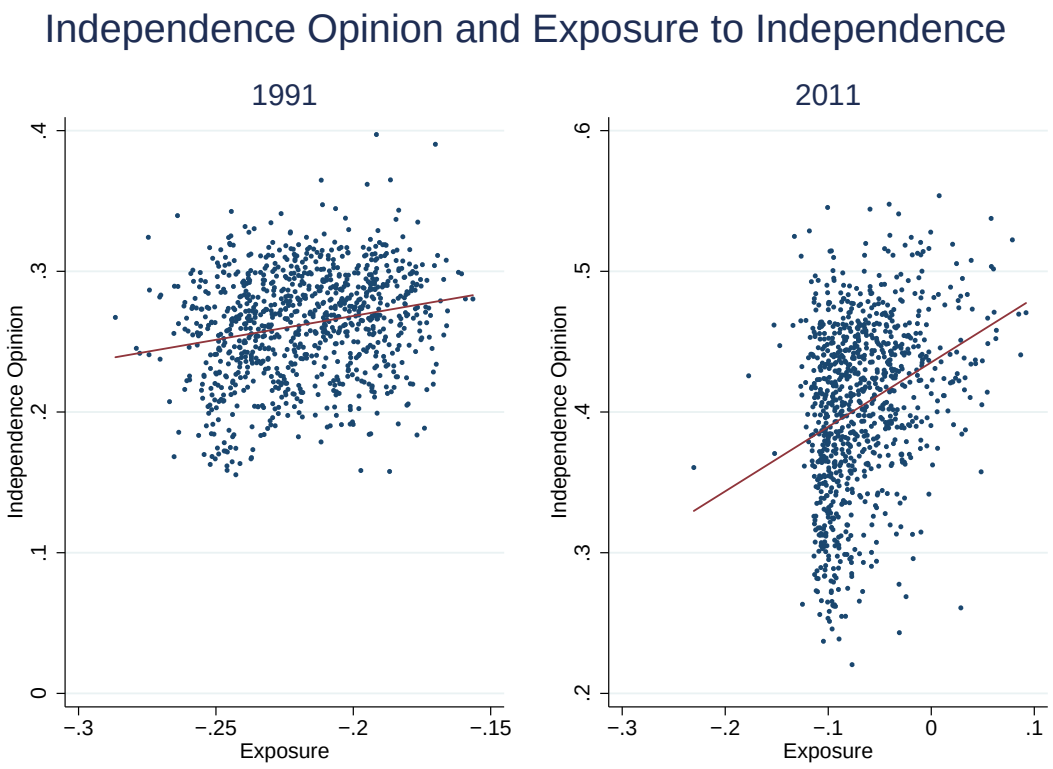


Table 1: First Stage Results

	(1) $\Delta exposure$	(2) $\Delta exposure$	(3) $\Delta exposure$	(4) $\Delta exposure$
Z	-0.0749***	-0.0727**	-0.0978***	-0.0978***
	(0.022)	(0.023)	(0.022)	(0.022)
$\Delta AverageWage$	-0.0295***	-0.0295***	-0.0438***	-0.0438***
	(0.004)	(0.004)	(0.004)	(0.004)
$\Delta BornAbroad$		0.00446	0.0127	0.0127
		(0.011)	(0.012)	(0.012)
$\Delta SpeakCatalan$			0.0283*	0.0283*
			(0.012)	(0.012)
Constant	0.160***	0.160***	0.166***	0.166***
	(0.003)	(0.003)	(0.003)	(0.003)
Observations	938	938	929	929
R^2	0.068	0.068	0.109	0.109

Robust standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Estimation Results

	(1) OLS	(2) OLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
$\Delta exposure$	0.212***	0.232***	2.791*	2.146*	2.605	1.670**
	(0.053)	(0.055)	(1.126)	(0.939)	(1.455)	(0.569)
$\Delta AverageWage$		0.0170**	0.0841**	0.0651**		0.0756**
		(0.006)	(0.029)	(0.023)		(0.024)
$\Delta BornAbroad$		0.136***		0.0960***	0.101*	0.0986***
		(0.019)		(0.025)	(0.041)	(0.025)
$\Delta SpeakCatalan$		0.0261			0.0113	-0.0157
		(0.017)			(0.052)	(0.033)
Constant	0.111***	0.104***	-0.322	-0.211	-0.247	-0.145
	(0.010)	(0.010)	(0.181)	(0.151)	(0.221)	(0.099)
Observations	941	932	938	938	929	929

Robust standard errors clustered at the local labor market level in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$