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European Funds and Firm Dynamics: Estimating Spillovers from Increased Access[1]

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Abstract

We take advantage of a quasi-natural experiment to assess the impact of European funds on firm dynamics in regions that, while not having their status changed, saw their neighbours increased access to European funds. Causality is established in a difference-in-differences intention to treat setting, using a rich dataset that considers the universe of Portuguese mainland municipalities from 2003 to 2010, and controlling for socio-economic, political and demographic variables. Our findings suggest a causal impact of between 1 and 2 percent in private sector firms´ entry and net entry rates, while we find no impact on firm exit rates. We consider time and space placebos to assure the reliability of our estimates. Our findings suggest that EU regional funds have a greater impact in times of distress, such as the world economic crisis, as far as entry rates are concerned. The analysis of the cross-section of firm demonstrates it is domestic owned micro firms in the primary and tertiary sectors that are most impacted by regional funds.

JEL Classification: C21, R10

Keywords: *quasi-natural experiment, European funds, firm creation; municipalities*

1. Introduction

This paper develops a novel strategy to assess the effects on neighbouring regions business firms of a region´s increased access to European Union (EU) structural funding. We rely on a quasi-natural experiment, whereby the Lisbon area, which had reached income well above the 75 percent threshold, leading to decreased access to funds, was artificially split so that a number of municipalities regained privileged eligibility status. Such an administratively-mandated increase in regional access to funds is rare occurrence as, through regional income growth, regions tend to lose, not gain, access. Here it is the impact of increased access on firm dynamics in the neighbouring regions that is analyzed, in contrast to most empirical papers so far, which exploit decreases in access.2 Thus, this paper pursues an empirical strategy that is complementary to the existing literature in two ways: first, as explained above, our unique quasi-natural experiment allows us to identify the spillover effects of increased access; second, instead of examining the impact of European funding in targeted regions, targeted precisely because they exhibited lower income and possibly different growth patterns, we focus our attention on neighboring municipalities that did not change status and have remained in Objective 1/ Convergence throughout the period 2003-2010. Our identification then comes from spillover effects of neighbouring municipalities experiencing an increase in eligibility. We believe such identification strategy reduces endogeneity concerns as, from the point of view of the municipalities under analysis, changes in their neighbours' fund eligibility is completely exogenous.

As stated in the Treaty of Lisbon, the EU aims to pursue economic, social, and territorial cohesion amongst its members. An important element of such aims is facilitating regional convergence, which motivates the channeling of substantial funds from the EU´s central budget to regions with an income per capita below 75 percent of the EU average.3 The objectives of such policy are to boost income and employment growth, and facilitate business creation. However, the actual results of this policy are very hard to assess and researchers have documented mixed results. Barone et al. (2016) and Becker, Egger, and von Ehrlich (2010 and 2012) uncover positive growth effects of EU regional transfers. On the other hand, Becker, Egger, and von Ehrlich (2012) suggest that funds are not efficiently allocated, as their reallocation across regions would lead to faster convergence. Becker, Egger, and von Ehrlich (2013) show that the presence of sufficient human capital and well-functioning institutions do benefit the translation of financial transfers into faster growth. Basile, Castellani, and Zanfei (2008) find that Structural and Cohesion funds allocated by the EU to laggard regions have helped to attract subsidiaries of multinationals from both within and outside Europe. While Becker, Egger, and von Ehrlich (2010) find no evidence in favour of an employment effect, Giua (2017) uncovers a positive effect on employment in "convergence regions", without any displacement of economic activity in neighbouring regions.

[2] The exception is Becker, Egger, and von Ehrlich (2017) who compare the effects of gaining versus losing eligibility under the Objective 1 (or Convergence) objective. Their findings highlight that the effects of this status on economic growth are positive but not very long-lasting.

[3] While relative to national budgets the EU's common budget is small – accounting for close to 1 percent of the joint Union GDP – the Structural and Cohesion Funds are a major budget line, second only to agriculture-related transfers.

In our paper, firm entry, exit, and net entry, are computed as a fraction of the existing firms one period before. Our sample includes mostly medium and small firms, which comprise the overwhelming share of the total universe of firms in EU countries. As we conduct this exercise within a single country and cover the universe of mainland municipalities, subject to similar governance rules, economic and political context, we minimize heterogeneity as far as unobservables.[4] Our intention-to-treat estimates are obtained from a difference-in-differences (hereinafter, diff-in-diff) specification in which socio-economic and demographic variables are controlled for. We provide diff-in-diff estimates for the impact of increased access on private firm entry, net entry, and exit rates in the neighbouring municipalities of interest. Our robustness tests exploit both the time and the spatial dimensions, including placebo treatment dates and placebo treated municipalities.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature on the effect of regional funds, Section 3 presents the estimation methodology and the data, and Section 4 the results and robustness tests. Section 5 concludes.

2. European Funds and Firm Dynamics

Growth and convergence across European regions has been a political priority of the European Union for decades. It gained importance over time, as relatively prosperous countries in Southern and then Eastern Europe adhered to the EU. Hampered by several econometric issues, empirical evidence on the success of EU regional policy is mixed. The first contributions to the debate, such as Sala-i-Martin (1996), and Boldrin and Canova (2001), detected no statistically significant effects of EU regional policy on per-capita-income growth of recipient regions, conditional on standard drivers of economic growth. Positive effects on agglomeration and industry location issues are reported in Midelfart-Knarvik and Overman (2002). The ambiguity of results so far may stem from econometric issues that stand in the way of clear estimates. The first such issue is reverse causality, whereby regional characteristics condition access to EU funds. A second issue resides in how dynamics are considered in the estimation procedure. A third difficulty is the possibility of omitted variables, variables that affect economic performance but are not, or cannot be, explicitly considered. In addition, as with all specifications, the selection of appropriate control variables is an issue.

More sophisticated empirical approaches have been attempted, and some papers identify effects using techniques such as instrumental variable estimates - Dall'Erba and Le Gallo (2008), Ramajo et al. (2008); (dynamic) panel data techniques - Rodriguez-Pose and Fratesi (2004); a combination of the two - Esposti and Bussoletti (2008); Mohl and Hagen (2010), Bouayad-Agha, Turpin, and Védrine (2013); bayesian methods - Cuaresma, Doppelhofer, and Feldkircher (2012); or spatial growth models - Fiaschi, Lavezzi, and Parenti (2017). However, here the empirical evidence is mixed and remains controversial, as pointed out by Dall'erba and Fang (2015).

[4] A similar empirical strategy is in Cavalcanti and Vaz (2017), who study the effects of credit subsidies on Brazilian firms exploiting an exogenous variation in access. For a broad diagnostic of the level of institutional development in Portugal in the legal, corporate governance, and financial systems, as well as a comparative assessment of Portuguese with other European institutions, see Tavares (2004). See also Cavalcanti, Magalhães, and Tavares (2008) for an application to Brazil.

Becker, Egger, and von Ehrlich (2010) first exploited the fact that Objective 1 funding is based on a simple assignment rule, with a clear and simple threshold that affects a region´s eligibility: NUTS2 regions are eligible for funding if their GDP per capita is less than 75% of the EU average. These authors exploited a fuzzy regression discontinuity design (RDD), and use data from three programming periods (1989-1993, 1994-1999, and 2000-2006), to find that, on average, treated regions grow significantly faster than do regions just above the 75% threshold.5 No effects on employment growth were uncovered. Becker, Egger, and von Ehrlich (2012) have distinguished average and marginal effects, in which the former may be positive but the latter negative, implying that the optimal funding has been surpassed. Becker, Egger, and von Ehrlich (2013) have shown that regions with high levels of human capital and good institutions were able to use funds more efficiently, that is, deliver the most growth.

Three recent papers that are closely related to our methodology study the impacts for regions within a single country. Barone, David, and de Blasio (2016) focus on the post-expiry period to examine the persistence of the economic boost to "convergence" regions following termination of access to EU Regional Funds. Giua (2017) was the first to examine municipalities contiguous to the policy-change boundary and a measure of distance to identify the effects of EU Regional Policy in a panel of Italian regions. This study shows that the EU Regional Policy produced a positive impact on employment levels. Di Cataldo (2017) studies the impact of EU funds in Cornwell and South Yorkshire, two regions amongst the largest beneficiaries in the UK. Using synthetic control methods that enable constructing a counterfactual region, similar to them with the exception of not being eligible for Objective 1 policies, the results show that the income gap has diminished with EU funding and that labour market perspectives have improved.

3. Empirical approach

3.1. Identification strategy and econometric model

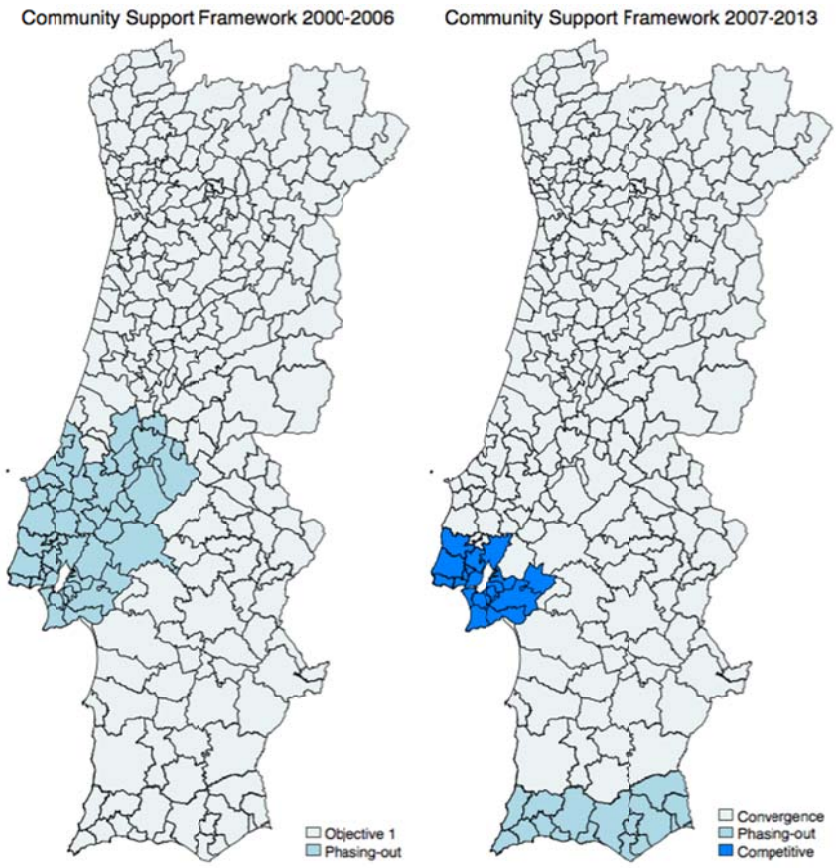
Portugal has received European funding associated with several Community Support Framework (CSF) phases. If a region´s per capita GDP is below the threshold of 75% of the European average, it is eligible for Objective 1 funding (before 2006) or Convergence region funding (after 2007). Differences in regional eligibility imply that more (less) developed regions have a lower (higher) likelihood of having a given project accepted, and thus receive less (more) resources from the EU cohesion and structural funds.

Mainland Portugal is now constituted of three distinct groups with regard to accessibility to EU funds. The first is composed by the North, Centre, and Alentejo regions and are part of the Convergence objective, with the most favourable conditions to access funding. The second is Algarve, part of the phasing out regime, with per capita GDP above the 75% income threshold, considering the 25 EU countries, but still below the 75% of average income for EU-15. Finally, the new smaller NUTS 2 Lisbon

[5] Pellegrini et al. (2013) largely confirm the results of Becker, Egger, and von Ehrlich (2010) using data from Eurostat. Cerqua and Pellegrini (2017) extend the regression discontinuity design to the case of continuous treatment. Their results, despite portraying an average positive effect on regional growth, advance that exceeding funds could have been allocated to other lagging regions without reducing growth effects.

region, the only area above the 75% average for EU-15, part of the Competitive objective.[6] These changes are portrayed in Figure 1.

Figure 1.
CSF III and CSF IV- Geographical dispersion



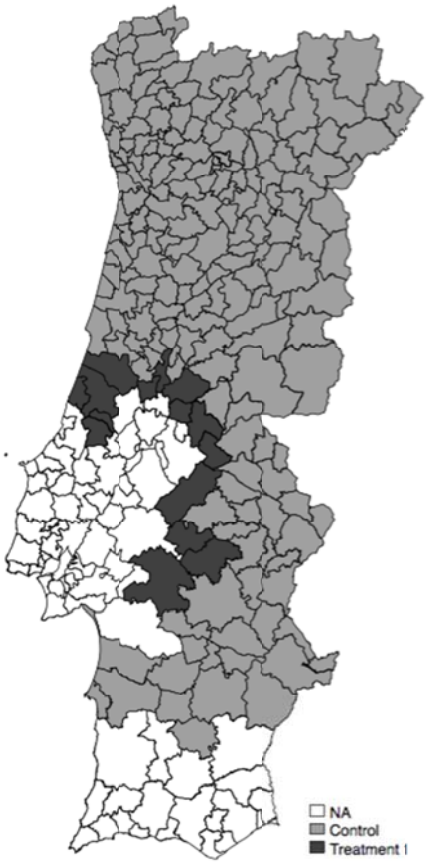
Access to European funds enlarged local governments' revenues, contributing to improvements in local infrastructures and an extension of municipalities' activities. In this paper we explore the spatial discontinuity in access to European funds occurring between 2006 and 2007 for a certain number of municipalities in the outer regions around Lisbon. These municipalities saw their access to funds increase between the pre-treatment period, 2003 to 2006, and the treatment period, from 2007 to 2010.[7] The treatment group is composed of the 14 municipalities bordering municipalities that gained greater access

[6] The period between 2003 and 2006 saw the region of Lisbon and the Tagus valley surpassing the threshold of 75% of EU average income per capita, and jumping to a transitory regime called phasing-out. In 2002, the area of this region was severely reduced with the incorporation of some NUTS 3 regions in NUTS 2 Centre and Alentejo. Oeste e Médio Tejo is now part of the new NUTS 2 Centre whereas Lezíria do Tejo is now part of the new NUTS 2 Alentejo.

[7] The first (1989-1993) and the second CSF (1994-1999) are not included in our analysis, and do not display similar discontinuities in access.

to funds due to redistricting (the administrative reorganization of the territory). Municipalities in the treatment group do not see their access to funds change – only those of neighbouring municipalities. From the point of view of the treated municipalities, the change in fund accessibility by their neighbours is an exogenous shock. The comparison group is composed of the 190 municipalities in less developed regions that experienced changes in neither their accessibility nor their neighbours´. The geographical distribution is presented in Figure 2.

Figure 2.
Geographical Distribution of the Treated and Control Municipalities



Our empirical design is inspired in recent contributions that compare contiguous municipalities on the two sides of the policy-change boundary (Jofre-Monseny (2014); Freedman (2015)). We run diff-in-diff regressions to understand the intention to treat effects as follows:

$$Y_{it} = \beta_0 + \gamma_t + \delta_1 \mathrm{QREN} \cdot \mathrm{dTreated}_i + \alpha_i + \beta_1 X_{it} + e_{it}$$

where α_i are municipality fixed effects (characteristics of municipalities that do not change over time), γ_t are year fixed effects, and e_{it} is an error term. Municipalities and time are indexed by i and t, respectively. We also include a vector of time-varying controls X_{it} to rule out that omitted variables induce any considerable bias.8 Clustered standard errors per municipality are corrected for heteroscedasticity and autocorrelation issues. 9 The main outcome of interest is δ_1, measuring the impact of increased neighbours´ access to funds.

3.2. Data

Dependent variable

Our dependent variables are calculated from Quadros de Pessoal, a longitudinal survey conducted by the Portuguese Ministry responsible for employment affairs which,10 due to its mandatory nature, covers virtually all firms with at least one wage earner in mainland Portugal.11 We compute three measures of entrepreneurial dynamics for the municipalities of interest. Our first indicator is the number of business units created divided by the existing firms, called Entry Rate (Dunne et al., 1988). Second, we compute the number of firms that exit the market, also relative to existing firms, named Exit Rate. Third, we compute a Net Entry Rate, subtracting the previous variables.

We also provide a more refined analysis, dividing our two dependent variables by sector of activity (primary, secondary, and tertiary), and by size of firms. In particular, we consider micro firms as those with one or two paid employees, small as those from three to ten, and medium and large enterprises those with more than eleven workers.

European Funds

We add two further controls related with EU funding. We include the amount of European funds attributed to a municipality in real terms per capita, and the number of spending categories that those European Funds cover. This last variable has been overlooked in the literature but there are important reasons to consider it. First, a more diversified municipality is better equipped to cope with shocks. Second, this variable is an indicator of institutional quality.

These data were kindly provided by Agência para o Desenvolvimento e Coesão, the government agency responsible for European funds management and monitoring in Portugal.

Other Control Variables

The external validity of the findings depends on whether treated and non-treated municipalities are similar in everything except the treatment. We deal with this concern by including municipal fixed effects,

[8] Figueiredo et al. (2002) concluded that in Portugal investors tend to locate in close proximity of their residence area. Nevertheless, firm births seem randomly distributed through the territory when scaling firm creation, destruction, or net creation by incumbent firms, suggesting that other dynamics associated with the local context constrain entrepreneurial intensity.

[9] See Bertrand, Duflo, and Mullainathan (2004).

[10] In a given year, a plant is identified as Entry (Exit) if it was absent in the files for the two preceding (following) years (Mata and Portugal, 1994).

[11] Cases of self-employment are thereby excluded. In addition, organizations falling outside the partnership or sole proprietorship legal definitions were also omitted given their non-profit nature.

year fixed effects, and a vector of time-variant controls to rule out possible heterogeneity affecting our results. Toward that end, we draw on several data sources, described in detail in Table A1 in the Appendix.

Amongst the important determinants of new firm formation in regional economics are demographic variables and economic indicators, as in Audretsch, Dohse, and Niebuhr (2015). Here we introduce ln Population and the age structure, given by the Dependency ratio12, as well as the percentage of Tertiary Education Share. 13 These variables take into account demographic controls, including the size and characteristics of the population, as they affect the context for the emergence and dynamics of firms. Unfortunately, there are no GDP data at the local level. Hence, we use the Mean value of real estate and the Electricity consumption per capita as proxies of municipal wealth and income.

In addition to the standard controls, we have collected data on and controlled for political and fiscal indicators at the municipal level. These are important, as fiscal and political context is also likely to affect business firm development. For ideology we consider the percentage of legislative mandates in the municipality that are associated with Leftist parties. As mayors often have an important role in shaping policy, especially as they gain experience and tenure, we compute the number of consecutive years the mayor has been in office, Mayor tenure, as well as the binary variable Majority, coded one if the mayor commands a majority in the municipal council. In addition, and given the absence of regional governments in mainland Portugal, the central government has a fundamental role in determining the distribution of funds to municipalities. We thus include a dummy indicator that takes the value 1 if the local mayor and the prime minister belong to the Same political party.14 Furthermore, we use total expenditures net of interest payments per capita - Primary expenditure PC – which proxies for the degree of municipal spending, with its likely impact on business conditions. The different taxing choices may also affect location choices, and as a result we include Property and Business tax rates decided at the municipal level. The existence of an Industrial area (i.e., industrial parks, science and technology incubators) is also contemplated as it may impact local entrepreneurship through the synergies of exploring an integrated location with informational spillovers.

As to non-political institutions, we consider the possible differential access to justice, taking into account whether a 1st Instance Court is present. As to infrastructure, Highway codes whether a motorway runs through the municipality, which may increase the relative attractiveness of specific locations.15 Table 1 displays the descriptive statistics for the variables used in the analysis.

[12] That is, the number of people above 65 and below 15 divided by the active population.
[13] Becker, Egger, and von Ehrlich (2013) showed that the absorptive capacity of regions depends on their human capital provision. Baptista and Mendonça (2010) found that regional access to knowledge and an educated workforce significantly influence Portuguese firm location in specific sectors.
[14] Veiga (2012) defends that political motivations are related to grant funding being skewed to Portuguese municipalities where the ruling national party had been supported by voters.
[15] Holl (2004) and Audretsch, Dohse, and Santos (2017) highlight the importance of highways for regional development in Portugal.

Table 1

Descriptive Statistics

	Obs	Mean	St Dev	Min	Max
Independent Variables					
Entry Rate	2 224	0.111	0.038	0.017	0.395
Exit Rate	2 224	0.111	0.042	0	0.506
Net Entry Rate	2 224	0.000	0.061	-0.459	0.261
European Funds					
European Funds PC	2 224	0.107	0.15	0	1.526
Spending items	2224	1.822	1.355	0	8
Other Control Variables					
ln Population	2 224	9.816	1.094	7.515	13.236
Dependency Ratio	2 224	58.897	12.188	38.614	108.789
Tertiary Education Share	2224	0.062	0.032	0.009	0.293
Mean Value of Real Estate	2 224	5.807	4.742	0.172	63.741
Electric Consumption PC	2 224	4237.918	4672.345	1243.923	66560.670
1st Instance Court dummy	2 224	0.751	0.432	0	1
Highways dummy	2 224	0.532	0.499	0	1
Primary Expenditure PC	2 224	0.062	0.032	0.009	0.293
Municipal Business Tax Rate	2 224	0.029	0.040	0	0.100
Municipal Property Tax Rate	2224	0.689	0.109	0.400	0.800
Same Political Party dummy	2 224	0.407	0.491	0	1
Majority dummy	2224	0.894	0.308	0	1
Leftist Mandates Share	2224	0.547	0.253	0	1
Mayor Tenure	2224	9.597	6.967	1	34
Industrial Area Share	2224	0.014	0.023	0	0.150

Note: For more information on these variables as well as specific data sources see Table A1. PC stands for per capita.

To appraise whether both sets of municipalities are similar, we compare their observable characteristics in the year before the treatment, i.e. 2006. Table 2 reports no statistically significant mean differences between the two groups. Hence, municipal characteristics are balanced between treatment and comparison group, allowing for credible use of the diff-in-diff methodology.

Table 2

Mean Differences Between Treatment and Control

	Treated	Control	Difference
ln Population	9.519	9.685	-0.166
Dependency ratio	68.009	59.551	8.458
Tertiary Education Share	0.056	0.056	-0.001
Mean Value of Real Estate	4.485	4.903	-0.418
Electric Consumption PC	4050.701	3898.448	152.253
1st Instance Court dummy	0.714	0.784	-0.070
Highways dummy	0.500	0.463	0.037
Primary Expenditure PC	0.956	0.877	0.079
Municipal Business Tax Rate	0.041	0.043	-0.002
Municipal Property Tax Rate	0.713	0.691	0.022
Same Political Party dummy	-0.070	0.358	0.288
Majority dummy	0.857	0.911	-0.053
Leftist Mandates Share	0.491	0.504	-0.012
Mayor Tenure	10.571	10.337	0.235
Industrial Area Share	0.009	0.013	-0.005

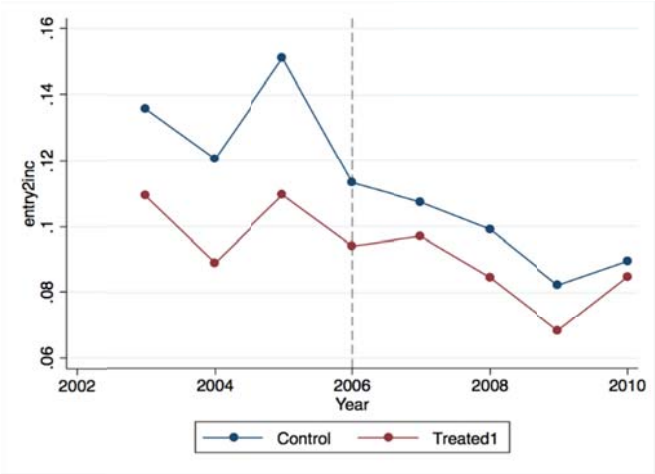
Note: Standard errors are clustered at the municipal level. For more information on these variables as well as specific data sources see Table A1. PC stands for per capita. Stars indicate significance levels of 10% (*), 5% (**), and 1% (***).

Internal validity considerations

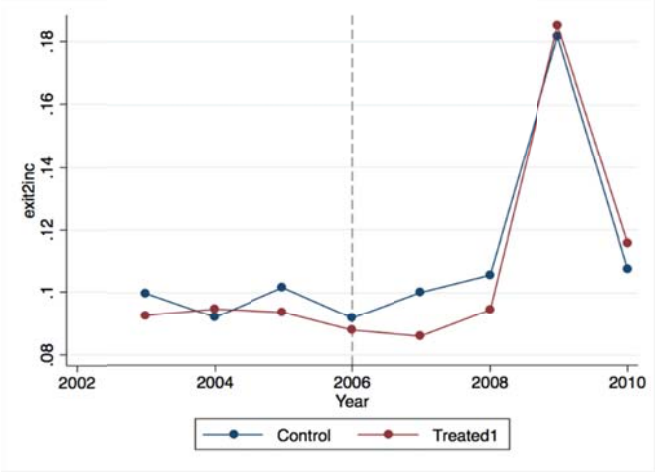
Internal validity of a diff-in-diff framework relies on the parallel trends assumption, i.e. that the trend in each of the dependent variables is the same for all municipalities before treatment. One common way to test this requirement is to compare the evolution of the different outcome variables in treated and control units during the pre-treatment period: between 2007 and 2011 in our case.[16] Figure 3 shows the pre-treatment evolution for all our dependent variables. A graphical inspection does not provide substantive evidence of distinct trends between treatment and control regions capable of undermining the empirical strategy, so that diff-in-diff coefficient estimates can be assumed to depict causal treatment effects for Firm Entry Rate and Firm Net Entry Rate. In contrast, the results for Firm Exit Rate should be interpreted with some caution.

[16] See Angrist and Pischke (2009, p. 231).

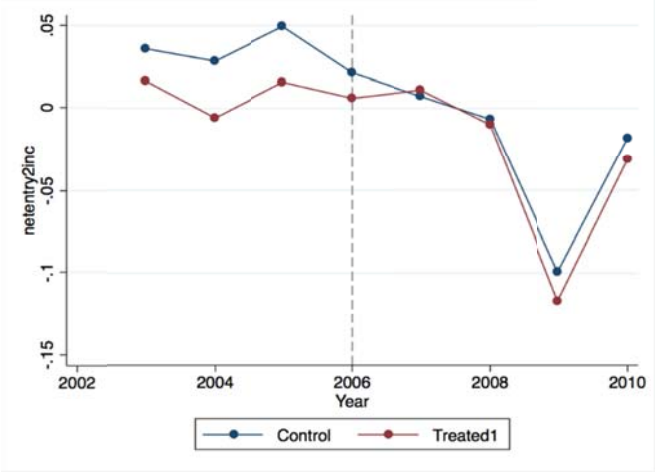
Figure 3: Parallel Trends



3.1 Firm Entry Rate



3.2 Firm Exit Rate



3.3 Net Firm Entry Rate

4. Results

4.1. Baseline Results

For each dependent variable, the column (1) presents the simplest diff-in-diff model, with municipal and year fixed effects and no additional controls. We then include the vector of time-varying controls explained in the previous section in column (2). Column (3) adds two European funding related controls as described in Section 3.

Tables 5, 6, and 7 present our baseline results, for the period 2003 to 2010 for Entry, Exit, and Net Entry rates, respectively. We find that being close to a municipality that was granted greater access leads to a 1.8 percent increase in entry rates, no greater exit rates, and a 1.8-1.9 percent increase in net firm creation. Controlling for the socio-economic context or own European funding does not decrease these estimates. Since most of the action seems to be happening for entry rates, we will restrict our analysis, in the remainder of this paper, to this dependent variable.

Table 3

Baseline Results (2003-2010)

Entry Rates

	Entry Rate		
	(1)	(2)	(3)
Treated*QREN	0.018***	0.018***	0.018***
	(0.004)	(0.004)	(0.004)
Controls	No	Yes	Yes
European Funds	No	No	Yes
Municipal Fixed Effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Number of observations	1 632	1 632	1 632
Adjusted R^2	0.368	0.379	0.379

Note: Standard errors in brackets are clustered at the municipal level and robust to heteroscedasticity. Results without the set of time-varying controls are very similar and are available from the authors upon request. The set of time-varying municipal controls includes ln Population, Dependency ratio, Tertiary Education Share, Mean Value of Real Estate, Electric Consumption PC, 1st Instance Court dummy, Highways dummy, Primary Expenditure PC, Municipal Business Tax Rate, Municipal Property Tax Rate, Same Political Party dummy, Majority dummy, Leftist Mandates Share, Mayor Tenure, Industrial Area Share. The vector of European Funds includes the amount per capita and the number of spending items. Stars indicate significance levels of 10% (*), 5% (**), and 1% (***).

Table 4

Baseline Results (2003-2010)

Exit Rates

	Exit Rate		
	(1)	(2)	(3)
Treated*QREN	0.001	-0.000	-0.000
	(0.005)	(0.006)	(0.006)
Controls	No	Yes	Yes
European Funds	No	No	Yes
Municipal Fixed Effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Number of observations	1.632	1.632	1.632
Adjusted R^2	0.504	0.506	0.507

Note: Standard errors in brackets are clustered at the municipal level and robust to heteroscedasticity. Results without the set of time-varying controls are very similar and are available from the authors upon request. The set of time-varying municipal controls includes ln Population, Dependency ratio, Tertiary Education Share, Mean Value of Real Estate, Electric Consumption PC, 1st Instance Court dummy, Highways dummy, Primary Expenditure PC, Municipal Business Tax Rate, Municipal Property Tax Rate, Same Political Party dummy, Majority dummy, Leftist Mandates Share, Mayor Tenure, Industrial Area Share. The vector of European Funds includes the amount per capita and the number of spending items. Stars indicate significance levels of 10% (*), 5% (**), and 1% (***).

Table 5

Baseline Results (2003-2010)

Net Entry Rates

	Net Entry Rate		
	(1)	(2)	(3)
Treated*QREN	0.018***	0.018**	0.019**
	(0.006)	(0.007)	(0.008)
Controls	No	Yes	Yes
European Funds	No	No	Yes
Municipal Fixed Effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Number of observations	1.632	1.632	1.632
Adjusted R^2	0.553	0.558	0.558

Note: Standard errors in brackets are clustered at the municipal level and robust to heteroscedasticity. Results without the set of time-varying controls are very similar and are available from the authors upon request. The set of time-varying municipal controls includes ln Population, Dependency ratio, Tertiary Education Share, Mean Value of Real Estate, Electric Consumption PC, 1st Instance Court dummy, Highways dummy, Primary Expenditure PC, Municipal Business Tax Rate, Municipal Property Tax Rate, Same Political Party dummy, Majority dummy, Leftist Mandates Share, Mayor Tenure, Industrial Area Share. The vector of European Funds includes the amount per capita and the number of spending items. Stars indicate significance levels of 10% (*), 5% (**), and 1% (***).

4.2. Heterogeneity across sector, size, and origin of capital

This subsection divides our main sample along three axes: i) the sector of activity; ii) firm size, measured by the number of workers, and iii) origin of capital.

Table 6 presents the estimation results. A careful examination shows interesting heterogeneity effects. Our findings suggest that it is domestic owned micro firms (i.e., that start with only one or two paid employees in the first year), especially in the tertiary (service) sector, that are most affected.

Table 6

Heterogeneity Results (2003-2010)

Entry Rates Across Sectors, Firm Size, and Origin of Capital

	Sector of Activity			Firm Size (Number of Workers)			Capital		
	Primary	Secondary	Tertiary	1 and 2	3 to 10	11 or more	Domestic	Mixed	Foreign
Treated*QREN	0.005***	0.005*	0.008***	0.014***	0.004*	0.000	0.020***	-0.000	-0.001
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.000)	(0.004)	(0.000)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
European Funds	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1 632	1 632	1 632	1 632	1 632	1 632	1 632	1 632	1 632
Adjusted R2	0.112	0.283	0.238	0.277	0.258	0.047	0.473	0.011	0.013

Note: Standard errors in brackets are clustered at the municipal level and robust to heteroscedasticity. Results without the set of time-varying controls are very similar and are available from the authors upon request. The set of time-varying municipal controls includes ln Population, Dependency ratio, Tertiary Education Share, Mean Value of Real Estate, Electric Consumption PC, 1st Instance Court dummy, Highways dummy, Primary Expenditure PC, Municipal Business Tax Rate, Municipal Property Tax Rate, Same Political Party dummy, Majority dummy, Leftist Mandates Share, Mayor Tenure, Industrial Area Share. The vector of European Funds includes the amount per capita and the number of spending items. Stars indicate significance levels of 10% (*), 5% (**), and 1% (***).

4.3. Robustness Checks: in time and space

This subsection presents numerous checks performed to validate the robustness of our baseline results.

The years 2009 and 2010 were contemporaneous with one of the greatest recessions in economic history, in the wake of the world´s financial crisis. In this regard, Becker, Egger, and von Ehrlich (2017) show that eligibility effects are weaker during the Crisis (until 2013) than before. Nevertheless, to investigate whether it is this event that is driving our results, we exclude the years of 2009 and 2010, and re-estimate the treatment effect. We find that our results remain strongly significant. We then run time placebo tests in which the treatment and comparison groups remain fixed but the treatment is set in a period (2005-2006) during which no redistricting was undertaken. We contrast these results in Table 8. The coefficient of interest is significant when we exclude the crisis period (Columns (1) and (2)) but it is not statistically different from zero for our falsification test (Columns (3) and (4)), corroborating our hypothesis that the results are driven by the specific quasi-natural experiment we are studying.

Table 7

Robustness Results

Tests Across Time

	Entry Rate			
	No Crisis Period		Falsification Test	
	(1)	(2)	(3)	(4)
Treated*QREN	0.017***	0.018***	-0.002	-0.002
	(0.005)	(0.005)	(0.005)	(0.005)
Controls	Yes	Yes	Yes	Yes
European Funds	No	Yes	No	Yes
Municipal Fixed Effects	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Number of observations	816	816	816	816
Adjusted R^2	0.203	0.203	0.203	0.203

Note: Standard errors in brackets are clustered at the municipal level and robust to heteroscedasticity. Results without the set of time-varying controls are very similar and are available from the authors upon request. The set of time-varying municipal controls includes ln Population, Dependency ratio, Tertiary Education Share, Mean Value of Real Estate, Electric Consumption PC, 1st Instance Court dummy, Highways dummy, Primary Expenditure PC, Municipal Business Tax Rate, Municipal Property Tax Rate, Same Political Party dummy, Majority dummy, Leftist Mandates Share, Mayor Tenure, Industrial Area Share. The vector of European Funds includes the amount per capita and the number of spending items. Stars indicate significance levels of 10% (*), 5% (**), and 1% (***)

In addition, we consider three further robustness checks in Table 9: i) excluding the Oporto Metropolitan Area, ii) excluding the entire North NUTS 2 Region, and iii) focusing only on the Centre NUTS 2 Region. We show, for the first two cases, that if we exclude more distant areas in the comparison group that may be more urban or more geographically apart from the treated group, our results remain unchanged. The same holds if we consider an even more homogenous group of municipalities in the same NUTS 2 region as in columns (5) and (6). In this case, the point estimates are slightly smaller but still highly statistically significant.

Table 8

Robustness Results (2003-2010)

Restricted Comparison and Treatment Groups

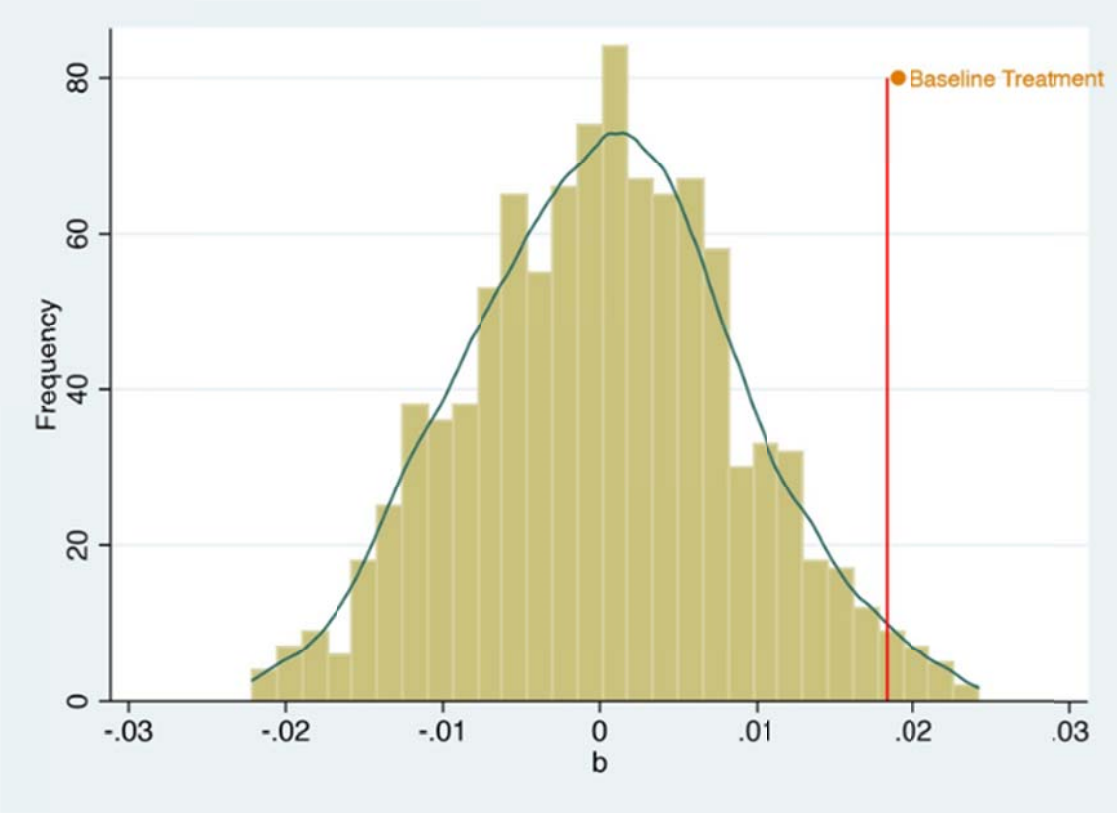
	Entry Rate					
	No Oporto Metropolitan Area		No North Region		Only Centre Region	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated*QREN	0.019***	0.019***	0.014***	0.013***	0.011***	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
European Funds	No	Yes	No	Yes	No	Yes
Municipal Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1 504	1 504	944	944	624	624
Adjusted R^2	0.373	0.374	0.310	0.310	0.346	0.346

Note: Standard errors in brackets are clustered at the municipal level and robust to heteroscedasticity. Results without the set of time-varying controls are very similar and are available from the authors upon request. The set of time-varying municipal controls includes ln Population, Dependency ratio, Tertiary Education Share, Mean Value of Real Estate, Electric Consumption PC, 1st Instance Court dummy, Highways dummy, Primary Expenditure PC, Municipal Business Tax Rate, Municipal Property Tax Rate, Same Political Party dummy, Majority dummy, Leftist Mandates Share, Mayor Tenure, Industrial Area Share. The vector of European Funds includes the amount per capita and the number of spending items. Stars indicate significance levels of 10% (*), 5% (**), and 1% (***).

Finally, we run spatial placebo tests, that is, we select 15 municipalities at random from the control group and estimate the "treatment" effect as we have done above for the municipalities close to those that gained access. We repeat this exercise 1000 times and plot the estimated treatment effects distribution in a histogram, and compare these results with our results in Table 3 (Baseline Treatment line). Figure 4 presents our results, where we see that Firm Entry Rates are very unlikely to occur in our spatial placebo tests, suggesting that we are indeed measuring the impact of increased access by neighbouring municipalities.

Figure 4

Placebo Distributions Entry Rate



Note: Author's own construction.

5. Concluding Remarks

The European Union set up regional policy initiatives that are responsible for large public transfers to lower income regions across the continent. The efficacy of these funds in delivering growth needs to be carefully monitored. Our paper exploits a unique quasi-natural experiment in which a split in a "non-convergence" region administratively and artificially increased access of several municipalities to EU regional funds. We examine the impact of such administrative increase in access on neighbouring regions, that is we assess how business entry, exit, and net entry rates on contiguous municipalities, whose status remained unaffected. The estimated impact of increased EU funds eligibility on entry and net entry rates of neighbouring municipalities is estimated as an increase ranging from 1% to 2% per year. Time and spatial placebos show how our results derive from increased access to EU funds and not other, unidentified causes. Most of the impact of increased access on neighbouring municipalities´ firm dynamics is associated with creation of domestically owned, micro enterprises, in the service sector, but small firms and the agricultural and industrial sectors also register significant, though lower, increases in firm creation. We interpret the uncovered neighbourhood spillover effect as far as firm creation as stemming from three

orders of factors: a spillover from the quantitative increase in firm creation in the region with improved access to funds; second, a spillover deriving from a qualitative change in the firms in the region experiencing improved access; and third, a spillover from the improved institutional context in the higher eligibility region, including changes such in the quality of governance, improvements in the fiscal balance, and higher infrastructure investment.

Our results suggest the importance of European institutions and policy-makers conducting rigorous and specific examinations of the impact of European funds on private business firms, and the concomitant impact on economic growth. By exploiting specific policy episodes and neighbourhood effects, more can be learned of the nature, quantitative importance, and causal mechanisms concerning the effects of European funds. In particular, our results suggest neighbourhood effects are important, and their breakdown across firm types diverse and significant.

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Appendix

Table A1

Variable Description

Variable	Operational Description	Data source
Firm Entry Rate	Number of new firms attracted to each municipality divided by the number of firms functioning in the same area	*Quadros de Pessoal*
Firm Exit Rate	Number of firms leaving the municipality divided by the number of firms still functioning in the same area	*Quadros de Pessoal*
Firm Net Entry Rate	*Firm Entry Rate* minus *Firm Exit Rate*	*Quadros de Pessoal*
Ln Population	Total number of citizens inhabiting a given municipality	*INE*
Age Dependency Ratio	Ratio of individuals typically not in the labour force (aged 0-14 and 65+) and active population (aged 15-64)	*INE*
Tertiary Education Share	Share of individuals with tertiary education in municipal labour force	*Quadros de Pessoal*
Primary Expenditure PC	Total annual expenditure of municipalities minus annual interest payments divided by the number of inhabitants	*DGAL*
Same Political Party dummy	Indicator variable that takes value of one if there is a coincidence between the prime minister and mayor's political party	*DGAL*
Mean value of real estate	Value of real estates traded (rural, urban, and mixed buildings and constructions)	*INE*
Electricity consumption PC	Total electricity consumption (including households, firms, and the state)	*INE*
Majority	Indicator variable that takes value of one if the local mayor has an absolute majority	*DGAL*
Mayor Tenure	Number of consecutive years that a local mayor held office	*DGAL*
Leftist Mandates Share	Percentage of mandates in the municipal local authority assigned to parties or coalitions ideologically leftist (PS, CDU and BE)	*INE*
Property Tax Rate	Tax rate on Property Tax (IMI- *Imposto Municipal sobre Imóveis*) that was set in the previous budget	*INE*
Business Tax Rate	Tax rate on Business Tax (*Derrama*) that was set in the previous budget	*INE*
Industrial Area	Percentage of municipal area allocated for industrial usage according to the official PMOT: Municipal Spatial and Land use Plan	*INE*
1st Instance Court dummy	Indicator variable that takes value of one if there exists at least one court of first instance in the municipality	*ANSR*
Highways dummy	Binary variable that takes the value one if there is at least one highway crossing a given municipality	

Note: INE (*Statistics Portugal*); DGAL (*Direção Geral das Autarquias Locais*) - government body for local institutions; ANSR (*Autoridade Nacional de Segurança Rodoviária*) - government body for road security. *Quadros de Pessoal* is a linked employer-employee covering private work in Portugal, collected by the Ministry of Employment and Social Security. PC stands for per capita.