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**Corporate taxes and high-quality  
entrepreneurship: Evidence from a tax reform**

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**Gabinete de Estratégia e Estudos**

## Corporate taxes and high-quality entrepreneurship: evidence from a tax reform<sup>\*</sup>

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### Abstract

We examine the impact of corporate taxation on entrepreneurship, using a quasi-natural experiment, which substantially reduced the corporate tax rate for start-ups located in inland municipalities in Portugal. Using a difference-in-differences approach and IV regression, we find that the tax reform increased firm entry by approximately 0.41% and birth job creation by 0.24% monthly, corresponding to an increase of 29,150 new firms, and 223,500 new jobs over a period of three years. We find that the entrepreneurs who took advantage of this tax reform are mostly male, relatively older and well-educated individuals. Their start-ups are relatively larger (up to 10 employees) and are on average more productive and more likely to survive their first three years. These findings suggest that corporate taxation is an imperative constraint for entrepreneurship, particularly for high-quality entrepreneurs. High-quality entrepreneurs can more easily overcome the hurdles of tax legislation and they have the required knowledge to tackle the opportunity created by a tax reform.

**JEL Classification:** H24; H26; J24; L26; M13; H25

**Keywords:** Firm entry; Job creation; Tax policy; Corporate taxes; High-quality entrepreneurship

**Note:** This article is sole responsibility of the authors and do not necessarily reflect the positions of GEE or the Portuguese Ministry of Economy.

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## 1. Introduction

The effect of taxes on entrepreneurial activity has enjoyed a recent resurgence in empirical literature (Block, 2016; Braunerhjelm and Eklund, 2014; Darnihamedani, Block, Hessels and Simonyan, 2018). Empirical evidence links higher corporate taxes with slower economic growth, and lower productivity, innovation, investment, firm creation and employment (Djankov et al., 2010; Da Rin et al., 2011; Bacher and Bruehlhart, 2013; Balamoune-Lutz and Garelo, 2015; Haufler et al., 2014; Belitski et al., 2016; Mukherjee et al. 2017; Gemmell et al. 2018). Thus, reducing taxes is perceived as an effective tool to spur firm creation and employment. However, despite the promise that tax reductions promote entrepreneurial activity and address economic growth, there is still ambiguity regarding the type of ventures and entrepreneurs that take advantage of such tax reforms.

In this paper, we evaluate the effect of corporate taxes on entrepreneurship. Like the previous studies, we investigate the impact of corporate taxes on firm formation and job creation. Unlike them, we take the additional step of exploring the characteristics of the founders and of the start-ups that take advantage of this reform. We add to the previous literature on entrepreneurship and taxation by (1) taking advantage of a Portuguese quasi-natural experiment, by looking at a reform which significantly reduced corporate taxes on some specific municipalities and (2) we analyse how this tax reform affected the characteristics of the entrepreneurs and start-ups.

Portugal provides an excellent context to evaluate the effect of taxes on entrepreneurship for several reasons. First, Portugal offers an opportunity to assess the role of taxes in firm formation in a “neutral” tax setting. The majority of studies are based on US data, a country where the tax structure privileges risk-taking and tax-driven entrepreneurship by making it particularly attractive to high-income earners to move to self-employment where they are taxed at lower rates (Cullen and Gordon, 2007). Portugal operates in a flat-rate corporate income tax system, and potential losses are generally deductible against future gains in the firm. Hence, tax progressivity is not a concern during the period of the study (Gentry and Hubbard, 2000). Second, we are able to evaluate a variation in tax rates at the municipality level. Before 2001, the corporate tax rate faced by start-ups in Portugal was 34%. In 2001, Portugal implemented the “Portuguese Tax Benefits to Inlandness” (Benefícios Fiscais à Interioridade) and taxes reduced to 25% for all start-ups located in inland regions. After 2004, the tax rate was reduced to 15%, and after 2007 it was further reduced to 10%. Third, we combine rich municipality level data with individual- and firm-level data for the period 1997 and 2011. We use a detailed mandatory survey covering virtually all the firms and employees in the Portuguese private sector and exploit the variation on tax burdens within municipalities and across time to analyse the impact of corporate taxation on firm formation and job creation.

Our results suggest that the Portuguese tax reform increased firm entry in the treated municipalities by approximately 0.41% and birth job creation by 0.24% monthly. At the country level, this effect is economically sizeable. Over three years, the reform could increase the number of new firms by 29,150, and birth job creation by approximately 223,500.

One possible explanation for the increase in firm entry is that taxes represent recurring costs reducing the gains from entrepreneurial profit, discouraging risk-taking and high-quality entrepreneurs (Hansson, 2012; Gentry and Hubbard, 2000; Darnihamedani et al., 2018). Alternatively, corporate taxes reduce the amount of funding available for capital investments and skilled employees. Additionally, we argue that only individuals with higher ability will have the required knowledge to tackle the opportunity created by the reform and to understand the complexity of the tax systems. To investigate this concern, we take

advantage of a detailed individual-level database. We select start-ups established between 1997 and 2011. For each firm, we gather comprehensive information on entry year, location, industry, number of employees and founder characteristics. Then, we identify the founders and evaluate their socio-demographic characteristics. We find that start-ups established in municipalities that reduced the corporate tax rate are more likely to survive their first three years and are relatively larger, with a statistically significant result for firms up to 50 employees, yet more pronounced for firms with 3 to 10 employees. The positive effect of the tax reform on firm entry appears to materialise in the construction and trade (retail and wholesale) sectors. The entrepreneurs induced to the market are mostly male, well-educated and between 40 and 50 years old. Hence, they have the required skills to understand and take advantage of opportunities created by a tax reform.

The lessons learnt in this paper are likely to extend beyond the Portuguese context. Several countries continue to enact pro-entrepreneurship policies without understanding its effects on economic growth and new venture creation. The extent to which corporate taxes influence entrepreneurial activity and type of entrepreneurship requires further investigation to craft better policies. As governments thrive on collecting taxes to provide public goods, they also want to avoid the risk of deterring firm entry, particularly from high-quality entrepreneurs (Lee and Gordon, 2005). A small set of high-growth companies account for the majority of job creation and economic growth (Shane, 2009), which makes a thorough consideration of the effect of taxes on the type of entrepreneurship even more relevant. In addition, our research responds to a call for a better understanding of how successful the new ventures created due to tax reductions are (Darnihamedani et al., 2018). Moreover, understanding the factors involved in business location decision is a key issue for regional policy.

The remainder of this paper is structured as follows. In section 2, we briefly review the literature on the impact of taxes on entrepreneurship. Section 3 presents the main hypothesis of our study. Section 4 describes the Portuguese corporate tax reform and the institutional setting. In section 5, we describe the data, and section 6 presents the empirical strategy and results. Section 7 concludes.

## **2. Literature review**

The number of studies on the effects of taxation on entrepreneurship has grown significantly in recent years, mainly due to higher data availability. Previous research has focused mostly on the effects of personal income on self-employment and to a lesser extent on the effects of corporate income taxes on entrepreneurship. While personal income taxes are imposed on the income generated by unincorporated firms, wage workers or self-employed, the corporate tax applies to incorporated firms. Other studies define a more aggregate measure of taxes which, besides including the corporate tax rate, also includes VAT, personal taxes and other taxes (Djankov et al., 2009; Da Rin et al., 2011).

Time-series studies generally conclude that higher personal income or payroll tax rates cause higher rates of self-employment (Long, 1982a, b; Moore, 1983; Blau, 1987; Parker, 1996; Cowling and Michell, 1997; Robson, 1998; Parker and Robson, 2004). The explanation for this positive relationship rested on the idea that high tax rates drive workers out of paid employment into entrepreneurial ventures, where they can more easily avoid or evade taxes. However, recent studies do not show consensus. Some argue that taxes have a substantial adverse effect on entrepreneurship because the expected gains from risky business ventures are reduced (Briscoe et al., 2000; Fölster, 2002; Moore, 2003; Gentry and Hubbard,

2005; Djankov et al., 2010; Fossen and Steiner, 2009; Hansson, 2012). In contrast, others suggest that tax rate policies are an ineffective tool for generating meaningful changes in entrepreneurial activity (Bruce and Mohsin, 2006). Nevertheless, these studies pose several inference problems as they fail to address the autocorrelation and endogeneity problems (Bruce and Mohsin, 2006).

To overcome these limitations, other studies have examined longitudinal micro level data. Their results have also been inconclusive (Bruce, 2000, 2002; Gentry and Hubbard, 2000; Moore, 2003; Schuetze, 2000; Carroll et al., 2000). While some find that higher income tax rates have an ambiguous effect on self-employment rates, a growing consensus suggests a positive correlation between taxes and entrepreneurial entry (Schuetze, 2000; Bruce, 2000, 2002). Some studies even suggest a non-linear relation between taxes and entry rates, such that the effect is only at work below a tax level threshold (Da Rin et al., 2011).

In sum, previous literature has found that tax policies can be important determinants of entrepreneurial activity, but magnitudes, signs, and statistical significance levels have not been conclusive, warranting additional research.

### **3. Corporate Taxes and High-Quality Entrepreneurship**

Corporate taxes have a deterrent effect on firm entry as they influence the supply of potential entrepreneurs and the effort they exert in the economy.

Corporate taxes influence an individual's career decision by increasing the opportunity costs of entrepreneurship. The occupational choice model suggests that individuals compare their earning potential accruing from entrepreneurship with wages earned from employment (Lucas, 1978; Kihlstrom and Laffont, 1979). Individuals will then pursue the occupational option with the highest income. As entrepreneurial returns are squeezed by corporate taxes, the option of becoming an entrepreneur becomes less appealing when compared to working as a hired employee. Although entrepreneurs have more opportunities to avoid paying taxes than employees (Kamleitner et al., 2012), corporate taxes are seen as part of the entrepreneur's mental income and perceived as a recurring loss.

Moreover, high corporate tax rates pose an entry barrier to entrepreneurs as they increase the costs of starting a business and consequently deter individuals who are unable to raise the required capital. Due to high agency costs, new ventures rely heavily on retained earnings (Henrekson and Sanandaji, 2011). High corporate tax rates take away part of these earnings and make it more difficult for entrepreneurs to acquire the required funding.

To sum up, corporate taxes lower entrepreneurial returns and increase entry barriers. Therefore, we expect:

Hypothesis 1: A reduction on corporate taxes will have a positive effect on firm entry.

Taxes also influence the type of entrepreneurial activity. Entrepreneurs' strategic decisions, such as their willingness to introduce new products and services (Darnihamedani et al., 2018), invest in corporate investments and capital formation (Djankov et al., 2010; Bhattarai et al., 2017), and hire new employees (Carroll et al., 2000) are tax-sensitive.

High-quality ventures usually require larger capital investments and skilled employees. Nonetheless, corporate taxes reduce the amount of funding available to invest in those resources, making it more difficult for entrepreneurs to finance their ideas.

On the other hand, tax-financed welfare systems are usually associated with extensive safety net programs such as generous unemployment benefits and universal health insurance (Baumol et al., 2007). These benefits generally point to a culture that does not reward risk-taking behaviour and entrepreneurial investments (Baumol et al., 2007). Therefore, high corporate taxes deter high-quality entrepreneurs by discouraging them from investing and engaging in risk-taking initiatives. In fact, previous literature finds that corporate taxes reduce the expected gains from risky business ventures (Briscoe et al., 2000; Folster, 2002; Gentry and Hubbard, 2000; Fossen and Steiner, 2009; Hansson, 2012). In contrast, a reduction in the corporate tax rate is expected to increase entrepreneurial investments and capital accumulation, while at the same time, higher-quality firm entry should emerge.

Complex rules, especially in taxes, are not easy to understand. Tax systems tend to grow increasingly complex and opaque over time. To give an example, Sull and Eisenhardt (2015) asked 45 tax professionals to compute one fictional family's tax bill and they came up with 45 different estimates, with differences ranging in the tens of thousands of dollars. To navigate the tax system, individuals need tacit knowledge to understand the meanders of taxation. Taxes at a firm-level have “an irreducible core of complexity” (Weisbach, 2006). Therefore, highly educated founders should have the required “absorptive capacity” to understand and take advantage of possible opportunities created by changes on tax laws (Balconi and Fontana, 2011). More educated founders can also search for specificities in the tax code (such as tax credits), which become useful for subsequent entrepreneurial spells and, eventually lead to a superior venture performance. Only individuals with high education will have the required knowledge to tackle the opportunity created by a tax reform.

To sum up, a reduction in corporate taxes encourages risk-taking and well educated entrepreneurs because they can more easily overcome the hurdles of tax legislations and raise the required capital. Therefore, we expect:

Hypothesis 2: A reduction on corporate taxes will have a positive effect on high quality entrepreneurship..

#### **4. Portuguese Tax Reform**

To better frame the empirical results, we briefly describe the Portuguese tax reform. Before 2001, all start-ups in mainland Portugal faced a tax rate of 34%. To enhance the economic activity in less-favoured regions and prevent human migrations, the 1998 National Budget suggested the inclusion of fiscal benefits towards micro and small firms located in inland regions. Leveraging on this suggestion, the main opposition party (PSD party) issued a bill which was approved in the commission with the votes of all opposition parties and abstention of the government party (PS party). Nevertheless, the bill passed with unanimity in the final vote. As a result, the Parliament introduced in 2001 the Law nr. 171/99 on “Tax Benefits to Inlandess” (Benefícios Fiscais à Interioridade) to promote firm formation and job creation in the inland regions.

Figure 1 compares the marginal tax rates faced by start-ups located in mainland Portugal before and after the tax reform. The 2001 reform allowed start-ups located in treated municipalities to face a tax rate of 25% for their first five years of activity, compared to 34% for start-ups located in control municipalities. Nevertheless, between 2002 and 2003, the gap in the tax rate between treated and control municipalities diminished and all start-ups faced the same tax rate of 25% in 2004. In 2005, the newly elected government supported by the PSD party decided to extend the tax benefits to inlandness to the following years. After several debates, the “Tax Benefits to Inlandness” law was included in the Portuguese Tax Benefits Code, and the tax rate for start-ups was further reduced to 15%, and those benefits were extended until 2007 (Law nr. 55-B/2004). In 2008, the tax rate for new firms located in inland municipalities was further reduced to 10%. In 2012, after the period of our analysis, the reduced tax rate was cancelled, and all start-ups in mainland Portugal faced a tax rate of 25%.

[Insert Figure 1 about here]

The reduced tax rate did not apply to ventures established in the agriculture, fishing, mining, manufacturing of coke (fuel products) and transportation sectors. Accordingly, it applied to start-ups whose headquarters and the majority of the payroll was located in eligible (inland) municipalities. We use this reform as a quasi-natural experiment to split the country into control (coastal) and treated (inland) municipalities. A map of mainland Portugal with the treated and control municipalities is portrayed in Figure 2. To make our analysis more comparable, we only consider municipalities on the border of the tax reform. A potential entrepreneur living in a control municipality may move to a nearby treated municipality to set up its start-up. Although this concern is plausible, Kulchina and Venâncio (2019) show that 90% of Portuguese entrepreneurs establish their ventures in the same municipality where they previously worked. Our data presents similar figure.

[Insert Figure 2 about here]

By the end of 2001, 38 municipalities reduced their corporate tax rate and 33 municipalities maintained their corporate tax rate. In total, we evaluate 71 municipalities (out of 278 municipalities in mainland Portugal). The treated and control municipalities are not spread throughout mainland Portugal. At first, the government defined several criteria to select the treated municipalities based on: population density, income level, purchasing power, and social, economic and cultural opportunities. Then, to comply with EU legislation, in 2001, the government identified the eligible municipalities.

Table 1 presents the summary statistics for the treated and control municipalities before the adoption of the reform. As expected, less favoured municipalities were explicitly targeted for the tax reform. The inland municipalities were smaller in terms of purchasing power and population density.

[Insert Table 1 about here]

Although the municipalities were not randomly selected to adopt the tax reform, discussions with municipality and tax officials suggested that the decision to select the inland municipalities was also driven by political issues. The reform targeted municipalities whose mayor belonged to the same party that



proposed the bill. About 47% of the treated municipalities were from the opposition party at the moment of the reform.

Two features of the Portuguese taxation regime deserve additional discussion. First, to reduce the informal sector, in 2001, the government created a simplified taxation regime for self-employed individuals with a tax rate of 20%. Second, personal taxes were also targeted for several reforms. Nonetheless, both reforms applied to all individuals and municipalities.

## 5. Data and Variables

To implement our empirical analysis, we use municipal and individual-level data. Our municipal-level data comes from a matched employer-employee dataset, Quadros de Pessoal (QP). QP is based on a mandatory survey submitted annually to the Portuguese Ministry of Employment and Social Security by firms with at least one employee. The dataset covers virtually all employees and firms in the Portuguese private sector. From QP, we select all start-ups established in eligible industries between January 1997 and December of 2011. New entries created by mergers, takeovers, breakups or changes in legal form or in the industry are not included. Accordingly, we also exclude all non-profit start-ups. Then, we aggregate this firm-level data to municipal-level data to study the impact of the tax reform on entry and birth job creation rates. Entry rate is measured by the number of entrants relative to the number of existing firms at the beginning of each year. We use a similar approach to compute birth job creation rates by computing the number of jobs created by start-ups relative to the workforce at the beginning of each year.

Figure 3 plots the evolution of the average entry rates separately for the treated (inland) and control (coastal) municipalities located in the borderline of the tax reform. Before the tax reform, the average yearly entry rate for inland and coastal municipalities was 2.30% and 2.22%, respectively. The difference in means statistics for the pre-period was 0.08% (p-value 0.188). However, after the reform, the difference in entry rates increases to 0.432% (p-value 0.00). The positive effect on entry rate prevails after the second (2005) and third revisions (2008) of the tax policy. Our graphical inspection does not seem to show an evolution capable of undermining the parallel trend's assumption. Nevertheless, this assumption will be explicitly tested with an event study.

[Insert Figure 3 about here]

We supplement these data with information from other sources. Municipality-level data on inhabitants, population density, and purchasing power are from the National Statistics Office. Municipality elections data come from the Portuguese National Elections Commission.

Table 2 presents the summary statistics on municipality characteristics. The sample contains 11,736 observations. The average entry rate per month is 0.431%, while birth job creation is 0.287%. Before 2001, the average monthly entry rate for the treated and control municipality was 0.358% and 0.398%, respectively. After 2001, these numbers were 0.441% and 0.453%, respectively.

[Insert Table 2 about here]

Our individual-level data also comes from QP. These data include a unique identifier cross-referencing individuals and firms, making it possible to match founders' with their start-ups' characteristics. For each individual, QP provides information on gender, age, date of hire, number of years of education, occupation, working hours, and earnings. For each start-up located in the borderline municipalities, we identify the founders and their background history. We restrict the sample to full-time entrepreneurs with age between 20 and 60, who transition to entrepreneurship until 2009. The entrepreneur's sample includes 20,023 founders, who established 14,578 new firms and a total of 141,459 entrepreneur-year observations. We use this sample to evaluate the impact of the tax reform on start-ups performance.

Panels A and B of Table 3 present the descriptive statistics for the entrepreneurs' sample. Two-thirds of founders are aged between 20 and 40, 70% are male, and 48% attended junior high school. In terms of experience, 22%, 13% and 12% of founders worked before in the same industry, in managerial occupations and previously started a venture, respectively.

[Insert Table 3 about here]

Next, we select all individuals working in the eligible industries in the borderline municipalities in mainland Portugal between 1997 and 2009, within the age range of 20-60 and with known work careers. To identify the founders, we merge the latter dataset with the entrepreneurs' sample. Panel C of Table 3 presents the descriptive statistics for the individuals' sample. In total, we ended up with 6,156,986 individuals, of whom 0.33% are entrepreneurs. This allows us to compare the characteristics of the founders that were more likely to take advantage of the reform.

Appendix A1 provides additional details on the database and variable construction.

## 6. Methodology and Results

### 6.1 Municipal-level Analyses: Firm Entry and Job Creation

To estimate the effect of the tax reform on entrepreneurial outcomes – firm entry and job creation – we estimate the following difference-in-differences specification for municipality  $i$ , year  $t$  and month  $m$ , for the period between 1997 and 2011:

$$y_{imt} = \theta_i + \alpha_m + \delta(t) + \lambda \text{Treated}_i \times [\text{Post Period}]_{it} + [X']_{it} \beta + \varepsilon_{imt} \quad (1)$$

The dependent variables are the outcome variables entry rate and birth job creation, previously defined. Treated is a binary variable equalling one if the municipality reduced the corporate tax rate and zero otherwise. Post Period is an indicator variable equalling one for the period between 2001 and 2011.  $X$  is a vector of socio-demographic factors: purchasing power to control for economic activity at the municipality level, and population density to control for population factors.  $\alpha_m$  are monthly dummy variables to control for seasonal effects,  $\theta_i$  are municipality fixed effects and  $\delta(t)$  is a polynomial-time trend. The standard errors for this and all subsequent estimations are clustered at the municipality level (Bertrand et al., 2004). The coefficient of interest in equation (1) is  $\lambda$ , which measures the difference in firm formation and job creation between the treated and control municipalities.

There are three main challenges when assessing the causal impact of taxes on entrepreneurship. First, entrepreneurs choose among a large number of heterogeneous locations to establish their ventures. Many of the characteristics of those locations are unobserved. To mitigate this issue, we control for the municipal-level characteristics and evaluate municipalities in the borderline. In principle, those control municipalities are more similar to the treated ones. Second, unique features of the tax system may be endogenous to firm entry, which may lead to reverse causality. We circumvent these concerns by taking advantage of a quasi-natural experiment and an instrumental variable approach. Finally, to measure the impact of the tax reform, we need a counterfactual of what firm entry and job creation would have been in the treated municipalities if the tax reform had not occurred. For that purpose, we select a set of control municipalities that we expect would mimic the performance of the treated municipalities in the absence of the tax reform. More specifically, we assume that the tax reform was not introduced in a way that correlates with unobserved trends in the dependent variable. To investigate this concern, we analyse the determinants of the tax reform adoption.

Table 4 presents the probit results for the period 1997-1999 (before the tax reform). As independent variables, we include municipality mayor dummies (PS and PSD) to account for the fact that the tax reform was implemented after the municipal elections of 1997 and that the tax reform bill was proposed by the main opposition party (PSD party). As time-varying economic variables, we include population density and purchasing power.

[Insert Table 4 about here]

Municipalities whose mayors belonged to the party that proposed the bill (PSD party) were significantly more likely to be eligible for the tax reform. This suggests that the mayors might have recommended the party to propose the tax reform bill in the parliament. As expected, the economic time-varying covariates are significant and are relevant economically. Lower levels of both purchasing power and population density are positively associated with municipality eligibility for the tax reform. To check if the political dummies were not correlated with firm entry and job creation, we regress them on firm entry and birth job creation. The results are presented in Appendix C, Table C. 1. We find that the political dummies were not correlated with trends in firm and job creation before the tax reform. Overall, these analyses give us confidence that trends in firm formation were not correlated with the reform adoption, supporting our identification strategy.

Column (1) of Panel A of Table 5 presents the estimated coefficient for firm entry using OLS estimation for equation (1). To account for possible endogeneity issues, Column (2) presents the results using the instrumental variables (IV) estimation. We instrument the Treated variable using a dummy variable equalling one if the mayor belonged to PSD party. The estimates for  $\lambda$  are positive and statistically significant at the 5% level. The effect reported is of sizeable magnitude. Using the point estimates of Column (2), we find that municipalities that reduced the corporate tax exhibited a 0.411% increase on firm entry. Considering that, before the reform, the average monthly entry rate in treated municipalities was 0.358% (Table 1), our point estimates correspond to a substantial increase in firm entry. Back-of-the-envelope calculations suggest that over the first three years, the impact at national level would be approximately 29,150 new firms. The weak identification test is rejected with Kleibergen-Paap F-statistics above the cut-off level of 10% in all estimations. Appendix C, Table C. 2, presents the reduced form.

[Insert Table 5 about here]

Column (3) evaluates the different revisions of the tax reform. We substitute the Post Period variable with three binary variables for different time periods: T1, for the period 2001-2004; T2 for 2005-2007 and T3 for 2008-2011. In the first, second and third periods, the entry rate increased by 0.38, 0.22, and 0.32 percentage points, respectively. The effect is larger and only significant in the first period.

The identification strategy of our baseline results relies on two assumptions: the municipality characteristics must be balanced in the treatment and control groups, and the municipalities must show similar parallel trends in the pre-treatment period. With respect to the first requirement, we tackle it by using an IV approach and including several municipality socioeconomic variables. Regarding the second assumption, we performed three exercises. First, we compare the evolution of firm entry in treated and control municipalities during the pre-treatment and treatment periods (Angrist and Pischke, 2009). Figure 3 does not provide evidence of distinct pre-treatment trends between treatment and control municipalities capable of undermining our identification strategy. Second, we implement an event study design in Figure 4. Only from 2001 onwards, the interaction terms become significantly positive. The results imply that in the first year after the corporate taxes reduction, there is a statistically significant difference in entry rates between treated and control municipalities. Finally, we perform a falsification (placebo) test by restricting the period to 1994-1999. The treatment and control groups remain the same, but the Post Period variable equals one for the period between 1997 and 1999. The results are presented in Column (4) of Table 5. This exercise displays no statistically significant effects. Therefore, all these tests strengthen the interpretation of the results as being caused by specific timing and scope of the tax reform.

[Insert Figure 4 about here]

In 2012, the tax benefits were abolished. Column (5) presents the IV results considering the period between 2001 and 2012 and the Post Period variable is set to one for the year 2012, as opposed to Column (2) where the variable equalled one for the period between 2001 and 2011. The negative and statistically significant coefficient confirms our previous understanding that a reduction in corporate taxes increases firm entry in eligible municipalities.

In Panel B of Table 5, we run the same specifications to examine the impact of the tax reform on birth job creation. After controlling for potential endogeneity, the coefficients in Column (2) suggests that municipalities that reduced their corporate tax rate exhibited 0.24 percentage point increase in birth job creation per month, corresponding to 223,500 jobs created by start-ups over the first years of activity.

We expect that the effect of the tax reform on firm entry should be found in high-quality firms, more specifically in slightly larger and more-productive ventures. So, we estimate our baseline equation (1) for entry rate but categorized by start-up's initial size. Columns (1) to (4) of Panel A Table 6 report the coefficients using IV estimations, for the entry rate of start-ups with one to two, three to ten, eleven to fifty, and more than fifty employees. Our estimates indicate a statistically significant increase in the entry rate of start-ups with one to two employees, three to ten employees and 11 to 50 employees.

[Insert Table 6 about here]

Next, the entry rate is broken down into five sectors: manufacturing, construction, wholesale and retail trade, services and other industries. Panel B of Table 6 presents the results of this analysis, again using Equation (1). The estimated positive impact of the tax reform operates in the construction and trade sectors.

### 6.2. Entrepreneurs-Level Analysis: Survival and Productivity

Using the entrepreneur's sample, we evaluate the performance of the start-ups that took advantage of the tax reform by estimating:

$$y_{jimt} = \theta_i + \alpha_m + \delta(t) + \lambda Treated_i \times Post Period_{it} + X'_{it}\beta + W'_j\vartheta + \epsilon_{jimt} \quad (2)$$

where  $j$  denotes the founder.

The dependent variables are start-ups' survival and productivity. Survival is an indicator variable that equals one for start-ups that survived the first three years and zero otherwise. Productivity is measured as the logarithm of initial sales divided by the initial number of employees (with sales expressed in 2011 values, in Euros). Again, our variable of interest is  $\lambda$  and we include municipality ( $\theta_i$ ) and month ( $\alpha_m$ ) fixed effects, the quadratic time trend ( $\delta(t)$ ) and additional control variables ( $X_{it}$ ). We also include a vector of founder characteristics ( $W_j$ ): gender; four indicator variables for the founder's age, partitioned at 20, 30, 40, and 50; an "industry experience" variable; "managerial experience"; foreign founders; an "entrepreneurial experience" variable; and education (see Table B. 1 in Appendix B). In reporting the estimated coefficients, our omitted categories are founders aged 20-29 and with "very low education".

Columns (1) and (2) of Table 7 present the estimates for a three-year survival using the IV estimation. In the first column, we include our control variables. In line with previous studies on survival, the control variables are in the same direction as expected by the previous literature. Survival is higher for larger firms founded by well-educated, male and relatively older individuals with experience in the industry. Column (2) adds the interaction variable of interest:  $Treated_i \times Post Period_{it}$ . The positive coefficient indicates that start-ups formed after the tax reform are approximately 37 percentage points more likely to survive. Appendix C, Table C. 2, presents the reduced form.

Columns (3) and (4) of Table 7 present the results for sales per worker. Our results suggest that the introduction of the tax reform is associated with an increase in sales per employee. Similar to the survival analysis, male, well-educated individuals with industry experience are associated with higher levels of productivity. Conversely, entrepreneurial experience appears to be a disadvantage when it regards productivity.

[Insert Table 7 about here]

### 6.3. Individual-level Analysis: Entrepreneurs Characteristics

Next, using the individual sample, we examine the demographic characteristics of the founders that were induced to the market because of the tax reform by estimating:

$$E_{jit} = \theta_i + \delta(t) + \lambda Treated_i \times Post\ Period_{it} + X'_{it}\beta + W'_j\vartheta + \epsilon_{imt} \quad (3)$$

where  $j$  is the individual.

The dependent variable is an indicator variable that equals 1 if an individual  $j$  transitions to entrepreneurship and establishes a start-up in municipality  $i$  and year  $t$ , and 0 if that individual does not become an entrepreneur. Again, we include municipality fixed effects ( $\theta_i$ ), the quadratic time trend, a vector of control variables  $X_{it}$  and a vector of individual characteristics  $W_j$ . The estimates for this specification are presented in Table 8.

[Insert Table 8 about here]

Not surprisingly, we show that the tax reform is associated with an increase in the probability an individual becomes an entrepreneur. Note, however, that only a small fraction of the individuals become entrepreneurs. On more than six million individuals, only fewer than 19,000 transition into entrepreneurship (approximately 0.3 percent). Therefore, the tax reform is associated with a large increase on the decision to become an entrepreneur. As for the demographic and education variables, we can infer that male, older, and well-educated individuals are relatively more likely to transition into entrepreneurship.

To evaluate which type of individual is more likely to take advantage of the tax reform, we estimate Equation (3) in several subsamples, such as male and female, type of education, age brackets and foreign or Portuguese. The estimates are reported in Table 9. Overall, founders are more likely to be male, between 40-50 years old, more educated and of Portuguese citizenship.

[Insert Table 9 about here]

A potential concern is that the tax reform might have led existing active firms in the unregistered/informal sector to become formal. Following up on this observation, we estimated the impact of the tax reform on novice entrepreneurs, individuals who worked as paid employees before the transition to entrepreneurship. Results are presented in Appendix C, Table C. 4. We find that half of the new firms created were established by these “novice entrepreneurs”. Nonetheless, some of them might also be existing firms operating in the informal sector.

Additionally, we might be concerned that the tax reform might have led incumbent firms to close their operations in coastal municipalities and open a new firm in the inland municipalities. To address this concern, we evaluate the effect of the reform on the exit rate of established firms. Results are presented in Appendix C, Table C. 5. The coefficient is not statistical significant. Therefore, our exercise provides evidence that the positive impact of the tax reform is not due to firm migration.

#### 6.4. Robustness Check

Our first robustness exercise runs Equation (1) for the full sample of Portuguese mainland municipalities (Appendix C, Table C. 6). This specification includes the 161 municipalities which reduced their corporate taxes rates in 2001, and 98 non-eligible municipalities. The results remain similar to the baseline.

Furthermore, we compute three additional exercises in Appendix C, Table C. 7. First, we include the year 2000, the year when the reform was firstly announced, though it only entered into effect in the year 2001. Second, we include the year 2000 and change the Post Period variable to equalling one for the years after 2000. Third, we remove the most severe crisis year from our sample (i.e., 2011) when Portugal requested an assistance program. These findings further support our baseline specifications.

Our results are still robust if we use a different time trend (linear and cubic) or if we apply different estimation models (probit or logit model) or when we include other control variables such as corruption perception index; country's trade openness ratio tax evasion ratio or the "one-stop-shop" reform (Branstetter, Lima, Taylor and Venâncio, 2014). Lastly, we used an alternative measure of performance - average wages. The coefficient associated with the reform adoption is positive but not statistically significant.

## 7. Discussion and conclusions

Policymakers around the world reduce corporate tax rates to promote firm formation and job creation. The literature also points out that reducing taxes is perceived as an effective tool to spur firm creation and employment. Nevertheless, there is still ambiguity regarding the type of ventures and entrepreneurs that take advantage of such tax reductions.

This study uses micro-level data for the period between 1997 and 2011 to analyse the effects of a Portuguese tax reform on entrepreneurial activity. Portugal's tax policy went through a reform in 2001, to favour firm creation and job formation in specific less developed regions. This reform reduced taxes to 25% for start-ups established in inland municipalities, while coastal municipality start-ups faced a rate of 32%. Like the previous studies, we investigate the impact of corporate taxes on firm formation and job creation. Unlike them, we take the additional step of exploring the characteristics of the founders and of the start-ups that take advantage of this reform.

We find evidence that reducing taxes can lead to increased firm formation and job creation. Our results suggest that in the regions targeted by the tax policy, the Portuguese tax reform increased firm entry by approximately 0.41% and birth job creation by 0.24% monthly. Importantly, we also find that the start-ups created in response to the reform are relatively larger (up to 10 employees), headed by well-educated individuals, on average more likely to survive their first three years, and more productive. Moreover, our results are consistent with a plethora of robustness exercises and falsification tests.

These findings suggest that corporate taxation is an imperative constraint for entrepreneurship. In particular for high-quality entrepreneurs, as they can more easily overcome the hurdles of tax legislation and raise the required capital to start their ventures, and consequently perform better.

Our conclusions come with some caveats. Our study only evaluates the short-term impact of the tax reform, but of course, we also have to account for possible long-run effects. Second, we do not account for changes on taxes at the personal level. Although they reduced over time, their reduction was less significant than the one that affected taxes at the firm level. Therefore, our results underestimate the real impact of the reform and are just the lower bound of the effect of the tax reform.

The results of our study are in line with Darnihamedani et al. (2018). They find a negative relationship between corporate taxes and innovative entrepreneurship. However, we add a better understanding of how successful the new ventures created due to tax reductions are and explore the characteristics of the

founders and of the start-ups that take advantage of tax reforms. Our findings are not restricted to the Portuguese context. Governments are still enacting policies to trigger entrepreneurial activity without a complete understanding of its effects on economic growth and firm creation. Thus, for governments to craft better policies, more research must be conducted on the extent to which corporate taxes influence entrepreneurial activity.

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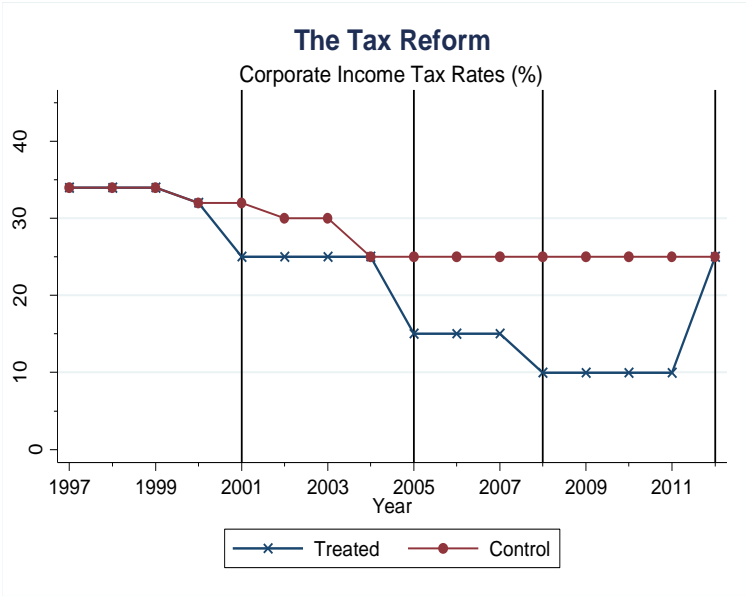
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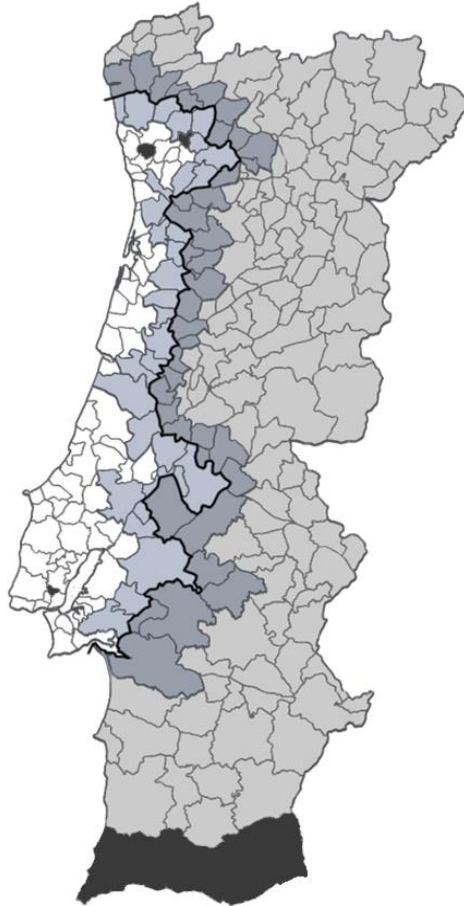
Figures

Figure 1. Corporate Income Tax Rates.



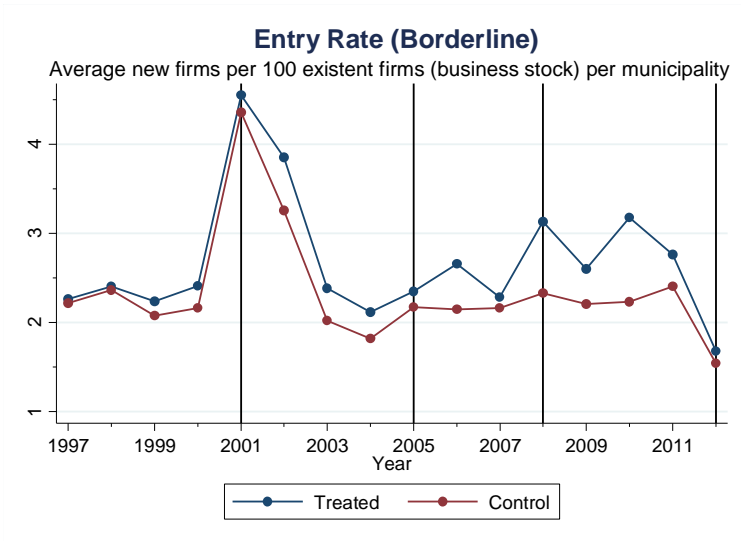
Notes: The figure plots the corporate income tax rates applicable to all municipalities in mainland Portugal for the period 2001-2011 separately for treated and control municipalities. These rates do not apply to Madeira and Azores islands.

**Figure 2.** Treated and Control Municipalities



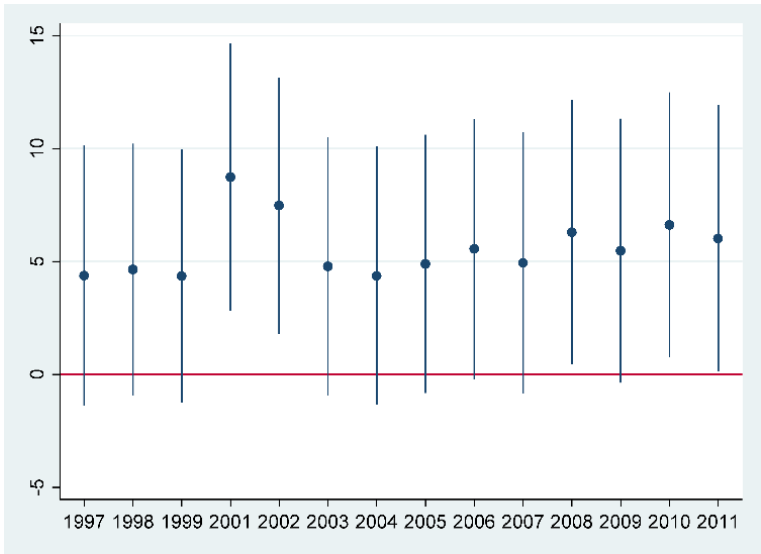
Notes: The figure plots the treated and control municipalities for the borderline municipalities. The borderline is defined by the thicker line. The map presents the treated group (inland), in the right-hand side and the control group (coastal), in the left-hand side. For this study, the control group comprises the municipalities in the coastal region marked in light grey and the treated group the municipalities in the inland region marked in dark grey. In black, we mark the municipalities excluded from the analysis: all municipalities in the Algarve region, and Odivelas, Trofa and Vizela municipalities.

Figure 3. Average Yearly Entry Rates.



Notes: The figure plots the average yearly entry rates for the period between 1997 and 2012 separately for the treated (inland) and control (coastal) municipalities. The vertical lines represent the several revisions of the tax reform. Note that in 2012, the benefits to inlandness were eliminated.

Figure 4. Event Study.



## Tables

**Table 1.** Differences between the treatment and control group (time range: 1997-1999)

Variable	N	Treated (Inland)	Control (Coastal)	Difference (Inland Coastal)	–
Entry rate	2,556	0.358 (0.021)	0.398 (0.021)	-0.040** (0.030)	
Birth job creation	2,556	0.355 (0.029)	0.267 (0.017)	+0.088*** (0.035)	
Incumbent job creation	2,556	0.040 (0.016)	0.045 (0.010)	-0.005 (0.020)	
Purchasing power	213	0.050 (0.001)	0.068 (0.002)	-0.018*** (0.002)	
Population density	213	5.005 (0.069)	6.025 (0.085)	-1.020*** (0.108)	
PS party	213	0.342 (0.045)	0.455 (0.050)	-0.112** (0.067)	
PSD party	213	0.474 (0.047)	0.364 (0.049)	+0.110* (0.068)	

Notes: The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively. The symbols presented are for a one-tailed test.

**Table 2.** Descriptive statistics for the municipality level analysis

Variable	N	Mean	Std. Dev.
Entry rate	11,736	0.431	0.845
Birth job creation	11,736	0.287	0.759
Incumbent job creation	11,736	0.037	0.423
Treated x Post Period	11,736	0.427	0.495
Purchasing power	11,736	0.067	0.018
Population density	11,736	5.485	0.965
PS party	11,736	0.397	0.489
PSD party	11,736	0.429	0.495

**Table 3.** Descriptive statistics for the entrepreneurs and individual sample

	N	Mean	Std. Dev
<b>Panel A: Start-up level</b>			
Sales per employee	115,818	51,235	185,805
Employees	141,459	6.06	11.60
Firm age	141,459	4.11	3.26
Survival	14,578	0.74	0.44
Initial size	14,578	1.08	0.81
Founders	14,578	1.01	0.11
<b>Panel B: Founder level</b>			
Gender (male)	20,023	0.70	0.46
Age 20-29	20,023	0.27	0.45
Age 30-39	20,023	0.39	0.49
Age 40-49	20,023	0.24	0.43
Age 50-60	20,023	0.09	0.29
Very low education	20,023	0.22	0.42
Low education	20,023	0.48	0.50
Medium education	20,023	0.18	0.38
High education	20,023	0.11	0.32
Foreign	20,023	0.01	0.10
Industry experience	20,023	0.22	0.42
Managerial experience	20,023	0.13	0.33
Entrepreneurial experience	20,023	0.12	0.32
<b>Panel C: Individual level</b>			
Transition to entrepreneurship	6,156,986	0.003	0.06
Gender (male)	6,156,986	0.58	0.49
Age 20-29	6,156,986	0.27	0.44
Age 30-39	6,156,986	0.34	0.47
Age 40-49	6,156,986	0.25	0.43

Age 50-60	6,156,986	0.14	0.35
Very low education	6,156,986	0.33	0.47
Low education	6,156,986	0.46	0.50
Medium education	6,156,986	0.13	0.34
High education	6,156,986	0.07	0.26
Foreign	6,156,986	0.02	0.13

**Table 4.** Tax reform adoption in eligible municipalities

Probit (Treated)	(1)	(2)
PSD party	0.503*** (0.065)	
PS party		-0.206*** (0.062)
Purchasing power	-41.793*** (2.653)	-43.515*** (2.568)
Population density	-0.889*** (0.047)	-0.809*** (0.042)
Year fixed effects	Yes	Yes
Time range	1997-1999	1997-1999
N Observations	2,556	2,556
Pseudo <i>R</i> -squared	0.391	0.377

Notes: The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.



**Table 5.** The impact of the tax reform on entry and birth job creation

Panel A: Entry rate	OLS		Instrumental Variables (IV) estimations		
	(1)	(2)	(3)	(4)	(5)
	Policy	Policy	Policy per period	Placebo	After the end of the policy
Treated x Post Period	0.181*** (0.031)	0.411 (0.214)		-0.042 (0.083)	-0.504*** (0.111)
Treated x T1			0.378** (0.181)		
Treated x T2			0.219 (0.245)		
Treated x T3			0.321 (0.311)		
Purchasing power	-0.742 (1.497)	-0.578 (1.657)	0.569 (1.949)	3.626 (3.257)	1.583 (1.717)
Population density	0.610*** (0.174)	1.116** (0.531)	0.808 (0.795)	-0.292 (0.697)	-0.297 (0.303)
Other Controls	Yes	Yes	Yes	Yes	Yes
Time Range	1997-2011	1997-2011	1997-2011	1994-1999	2001-2012
Treatment Effect	2001-2011	2001-2011	2001-2011	1997-1999	2012
N Observations	11,736	11,736	11,736	5,112	9,850
Adjusted R-squared	0.636	0.632	0.634	0.663	0.603
Kleibergen-Paap F-statistics		228.7	41.1	464.4	203.0
N treated	5,016	5,016	5,016	1,368	380
Panel B: Birth job creation	OLS		Instrumental Variables (IV) estimations		
	(1)	(2)	(3)	(4)	(5)
	Policy	Policy	Policy per period	Placebo	After the end of the policy
Treated x Post Period	0.103*** (0.034)	0.236 (0.196)		0.030 (0.115)	-0.300*** (0.082)

Treated x T1			0.220		
			(0.186)		
Treated x T2			0.150		
			(0.285)		
Treated x T3			0.205		
			(0.374)		
Purchasing power	-3.002**	-2.907**	-2.430	1.045	-1.458
	(1.214)	(1.359)	(1.807)	(4.016)	(1.478)
Population density	0.460**	0.753	0.637	0.041	-0.125
	(0.182)	(0.517)	(0.999)	(0.775)	(0.285)
Other Controls	Yes	Yes	Yes	Yes	Yes
Time Range	1997-2011	1997-2011	1997-2011	1994-1999	2001-2012
Treatment Effect	2001-2011	2001-2011	2001-2011	1997-1999	2012
N Observations	11,736	11,736	11,736	5,112	9,850
Adjusted R-squared	0.375	0.374	0.374	0.339	0.382
Kleibergen-Paap F-statistics		228.7	41.1	464.4	203.0
N treated	5,016	5,016	5,016	1,368	380

Notes: Other controls include quadratic time trend, monthly fixed effects, and fixed effects per municipality. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table 6.** The impact of the tax reform on firm entry by firm size and industry

<b>Panel A: Effect on entry rate by size</b>	(1)		(2)		(3)		(4)	
	1 employees	– 2	3 employees	– 10	11 employees	– 50	More than 50 employees	
Treated x Post Period	0.110		0.240		0.058		0.003	
	(0.074)		(0.136)		(0.044)		(0.003)	
Other Controls	Yes		Yes		Yes		Yes	
Time Range	1997-2011		1997-2011		1997-2011		1997-2011	
Treatment Effect	2001-2011		2001-2011		2001-2011		2001-2011	
N Observations	11,736		11,736		11,736		11,736	
Adjusted <i>R</i> -squared	0.525		0.493		0.161		0.033	
Kleibergen-Paap F-statistics	228.7		228.7		228.7		228.7	
N treated	5,016		5,016		5,016		5,016	
<b>Panel B: Effect on entry rate by industry</b>					(3)			
	(1)		(2)		Trade (Retail and Wholesale)		(4)	(5)
	Manufacturing		Construction				Services	Other Industries
Treated x Post Period	0.038		0.222*		0.121		0.017	0.013
	(0.048)		(0.105)		(0.072)		(0.031)	(0.021)
Other Controls	Yes		Yes		Yes		Yes	Yes
Time Range	1997-2011		1997-2011		1997-2011		1997-2011	1997-2011
Treatment Effect	2001-2011		2001-2011		2001-2011		2001-2011	2001-2011
N Observations	11,736		11,736		11,736		11,736	11,736
Adjusted <i>R</i> -squared	0.314		0.305		0.460		0.378	0.264
Kleibergen-Paap F-statistics	228.7		228.7		228.7		228.7	228.7
N treated	5,016		5,016		5,016		5,016	5,016

Notes: Other controls include quadratic time trend, monthly fixed effects, and fixed effects per municipality. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table 7.** The impact of the tax reform on start-ups' performance

	Survival		Productivity	
	(1)	(2)	(3)	(2)
Estimator	OLS	IV	OLS	IV
Treated x Post Period		0.370*** (0.138)		1.013** (0.486)
<b>Firm characteristics</b>				
Firm age			1.457*** (0.017)	1.439*** (0.019)
Initial size	0.040*** (0.004)	0.040*** (0.004)		
Number founders	0.009** (0.004)	0.008* (0.004)	0.033*** (0.011)	0.032*** (0.011)
<b>Founder characteristics</b>				
Gender (male)	0.020*** (0.006)	0.021*** (0.006)	0.074*** (0.018)	0.073*** (0.018)
Age 30-39	0.026*** (0.007)	0.025*** (0.007)	0.107*** (0.019)	0.108*** (0.019)
Age 40-49	0.032*** (0.008)	0.031*** (0.008)	-0.002 (0.023)	-0.002 (0.023)
Age 50-60	0.036*** (0.010)	0.033*** (0.010)	0.035 (0.031)	0.035 (0.031)
Low educated	-0.003 (0.007)	-0.002 (0.007)	0.071*** (0.018)	0.070*** (0.018)
Medium educated	0.012 (0.009)	0.014 (0.009)	0.093*** (0.028)	0.093*** (0.028)
High educated	0.021* (0.012)	0.025** (0.012)	0.086** (0.039)	0.088** (0.039)
Foreign	-0.062** (0.029)	-0.060** (0.029)	-0.352*** (0.127)	-0.351*** (0.126)
Industry experience	0.017** (0.007)	0.017*** (0.007)	0.054*** (0.018)	0.054*** (0.018)

Managerial experience	-0.016	-0.012	0.158***	0.161***
	(0.014)	(0.014)	(0.045)	(0.045)
Entrepreneurial experience	0.011	0.007	-0.080*	-0.083*
	(0.014)	(0.014)	(0.045)	(0.045)
<b>Municipality characteristics</b>				
Purchasing power	-0.703	-1.635*	-47.135***	-48.399***
	(0.790)	(0.865)	(2.031)	(2.114)
Population density	-0.079	0.409*	0.017	0.268
	(0.129)	(0.224)	(0.431)	(0.450)
Constant	1.521*	-1.309	10.514***	9.176***
	(0.792)	(1.324)	(2.690)	(2.782)
N Observations	20,023	20,023	115,818	115,818
Adjusted R-squared	0.294	0.281	0.194	0.194
Kleibergen-Paap F-statistics		71.4		426.29

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Notes: All models include municipality and industry fixed effects and quadratic time trend. In Columns (2) and (4), treated municipalities are instrumented using a dummy variable that equals one if the mayor elected belonged to PSD party. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table 8.** The impact of the tax reform on the decision to transition to entrepreneurship

	(1)
	Become Entrepreneur
Treated x Post Period	0.318*** (0.015)
<b>Individual Characteristics</b>	
Gender (male)	0.002*** (0.000)
Age 30-39	0.001*** (0.000)
Age 40-49	0.001*** (0.000)
Age 50-60	0.001*** (0.000)
Low educated	0.002*** (0.000)
Medium educated	0.003*** (0.000)
High educated	0.004*** (0.000)
Foreign	-0.002*** (0.000)
<b>Municipality-level</b>	
Purchasing power	-1.175*** (0.058)
Population density	0.593*** (0.028)
Constant	-3.461*** (0.162)
N Observations	6,156,986
Kleibergen-Paap F-statistics	626.7

Notes: The model includes municipality and industry fixed effects, and quadratic time trend. Treated municipalities are instrumented using a dummy variable that equals one if the mayor elected belonged to PSD party. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table 9.** Impact of the tax reform on the characteristics of the entrepreneur

	(1)	(2)		
<b>Panel A: Gender</b>	Male	Female		
Treated x Post Period	0.351*** (0.020)	0.288*** (0.026)		
N Observations	3,571,253	2,585,733		
Kleibergen-Paap F-statistics	437.8	167.9		
	(1)	(2)	(3)	(4)
<b>Panel B: Age</b>	20-30	30-40	40-50	50-60
Treated x Post Period	0.135*** (0.009)	0.348*** (0.027)	0.792*** (0.155)	-0.825*** (0.313)
N Observations	1,657,444	2,069,536	1,553,362	876,644
Kleibergen-Paap F-statistics	766.9	242.2	28.07	7.242
	(1)	(2)	(3)	(4)
<b>Panel C: Education</b>	Very Low	Low	Medium	High
Treated x Post Period	0.078*** (0.004)	-0.324*** (0.019)	0.134*** (0.018)	0.183*** (0.044)
N Observations	2,059,231	2,858,083	803,394	436,278
Kleibergen-Paap F-statistics	3344	436.9	205.8	50.65
	(1)	(2)		
<b>Panel D: Nationality</b>	Foreign	Portuguese		
Treated x Post Period	-0.057*** (0.022)	0.310*** (0.014)		
N Observations	113,109	6,043,877		
Kleibergen-Paap F-statistics	28.95	673.2		

Notes: The table presents the coefficient  $\lambda$  for Equation (3) using IV regression for different subsamples of individuals. The dependent variable is transition to entrepreneurship. All models include individual and municipality characteristics, municipality and industry fixed effects, and quadratic time trend. Treated municipalities are instrumented using a dummy variable that equals one if the mayor elected belonged to PSD party. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

#### Appendix A. Legislative process

**Table A. 1.** Chronology of the legislative process

Law No. 127-B/97, December 20 <sup>th</sup> (State Budget 1998)	This Law authorises the Government to create an incentive system applicable to micro and small firms.
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Members' bill (Projeto de Lei) No. 522/VII, May 13 <sup>th</sup> , 1998	The main opposition political party in the Portuguese Parliament (PSD) issued a bill for an incentive system to trigger the location of new firms in the Inland region of Portugal.
Law No. 171/99, September 18 <sup>th</sup>	This Law establishes the Portuguese tax incentives to inlandness to enter into force on January 1 <sup>st</sup> , 2000, and defines the general criteria for municipalities to qualify for these tax incentives.
Law No. 30-C/2000, December 29 <sup>th</sup>	The Portuguese Parliament establishes a deadline of 60 days for the Government to define objective criteria and issues the list of eligible municipalities. It also reviewed the corporate income tax rate applicable to eligible municipalities (amending Law No. 171/99).
Circular-Letter No. 147, March 30 <sup>th</sup> , 2001	The preliminary issue of the list of eligible municipalities. Establishes the effective date of entering into force – January 1 <sup>st</sup> , 2001.
Decree-Law No. 310/2001, December 10 <sup>th</sup>	Defines some rules to ensure proper implementation of the tax incentives. This follows the 'no objection' decision of the European Commission regarding these tax incentives.
Ministerial Order No. 2086/2001, December 13 <sup>th</sup>	This Ministerial Order lays down (again) eligibility criteria and eligible municipalities.
Ministerial Order No. 1467-A/2001, December 31 <sup>st</sup>	Definition of eligibility criteria and eligible municipalities (same content as the Ministerial Order No. 2086/2001).
Ministerial Order No. 170/2002, February 28 <sup>th</sup>	Following the European Commission's decision regarding the tax incentives, this Ministerial Order publishes excluded industries, as well as the limit of incentives per region, and firm.
Law No. 55-B/2004, December 30 <sup>th</sup>	Incorporates the tax incentives to inlandness into the Portuguese Tax Benefits Code. Lowers even further the corporate income tax rate applicable to eligible municipalities in the inland region. Established different reduced corporate income tax rates for existing and new firms. Entered into force in 2005.
Law No. 67-A/2007, December 31 <sup>st</sup>	Lowers even further the corporate income tax rate applicable to eligible municipalities in the inland region, entering into force in 2008.
Decree-Law No. 55/2008, March 26 <sup>th</sup>	Adjusts the eligibility criteria for the tax incentives to inlandness.
Ministerial Order No. 1117/2009, September 30 <sup>th</sup>	The issue of a new list of eligible municipalities (much the same as the previous list). Entered into force from 2009 onwards (as set by Decree-Law No. 55/2008).
Law No. 64-B/2011, December 30 <sup>th</sup>	Abolishes the Portuguese tax incentives to inlandness after 2011.



## Appendix B. Data and Construction of Variables

### Quadros de Pessoal

The matched employer-employee dataset (Quadros de Pessoal or SISED - Sistema de Informação de Salários, Emprego e Duração do Trabalho), which is a mandatory survey submitted annually in October by all firms with at least one employee. This database collects information on an average of 227,000 firms and two million individuals per year, covering virtually all employees and firms in the Portuguese private sector.

This database is generally available annually from 1982 onwards. However, we restrict our analysis to the period between 2001 and 2007. Data are unavailable for the year 2000.

The database contains three related sets of records: one at the firm level, other at the establishment level and the last one at the employee level. Employees, firms, and establishments are cross-referenced by a unique identifier. Each year, firms report their year of incorporation, location (concelho or municipality where the main offices are located), primary industry, number of employees, number of establishments, initial capital, ownership structure, and sales. At the establishment level, firms report the number of employees, location, and primary industry. At the individual level, the database contains information on gender, age, date of hire, education, occupation, working hours, and October's earnings. However, the employee records include redundant data or data with frequent changes in gender and/or year of birth for individual employees. We consider these observations to be errors, corresponding to individuals whose identification number was not inserted or wrongly identified by the respondent. We drop individuals whose gender and year birth change in more than 70 per cent of the total number of observations.

From the firm and employee databases, we construct the following variables:

**Year of foundation** is computed as the minimum of the year of creation reported in the database, the year that the firm first appeared in the database and the year of the hire of the first employee.

**The month of foundation** is computed as the month of the hire of the first employee when the year of hire coincides with the year of foundation.

**Survival** is an indicator variable equalling one for start-ups that survived their first three years. Firms are classified as non-survivors if they do not appear in the database in the following years. To compute the survival rate, we exclude the last two years of the database (2010 and 2011). Firms can fail to appear in the database, even if they remain going concerns. For instance, a firm might fail to send the survey in by the due date for two consecutive years. Using data from previous years, however, we estimate that the probability of such non-response occurring in two successive years is less than one per cent.

**Size** is the start-up's initial number of employees. This measure is computed as the total number of individuals in the employee records in the foundation year.

**Gender** is a dummy variable equalling one for men and zero for women.

**Age** is coded in years in the database. We define four categorical variables: Age20-29 is coded one for individuals with age between 20 and 29; Age30-39 is coded one for individuals with age between 30 and 39; Age40-49 is coded one for individuals with age between 40 and 49; Age50-60 is coded one for individuals with age between 50 and 60.

**Education** is measured with four categorical variables: high education is a dummy variable equalling one for founders with bachelors, masters or doctoral degrees; medium education is a dummy variable equalling one for individuals reporting a high school diploma or vocational school degree; low education is a dummy variable equalling one for individuals that attended junior high school, and very low education is a dummy variable equalling one for individuals who never attended or completed the elementary school.

**Industry Experience** is coded one for entrepreneurs with experience in the same industry (four-digit level) as that of the firms they found. Industry classification changed in 1994 and 2007, and there is no unequivocal relation between the old and new codes. To mitigate errors, we use all unique relations to translate old to new codes and, vice versa. Then, we compute the variable industry experience for the new and old codes and aggregate both results. Alternatively, we also use an algorithm, which is based on how the majority of firms changed industry codes from 1994 to 1995 to translate old into new codes. For 2007, this problem is mitigated because the database provides information on the new and old industry classification.

**Table B. 1.** Variables' Name and Definitions

<b>Municipality-level</b>	
Entry rate	a Entry rate (business stock approach) is measured as the number of new firms in year $t$ divided by the number of incumbent firms in year $t-1$ , multiplied by 100.
Birth job creation	a Birth job creation is measured by the number of jobs created by new firms in year $t$ divided by the total workforce in year $t-1$ , multiplied by 100.
Treated	– Treated is a dummy variable, equalling one if the start-up is established in an inland borderline (eligible) municipality and zero otherwise.
Post Period	– Post Period is a dummy variable, equalling one from 2001 onwards and zero otherwise.
Purchasing power	b Purchasing power is the per capita purchasing power by municipality retrieved from Statistics Portugal (INE).
Population density	b Population density is the logarithm of annual average population per perimeter territory in Km.
PS party	c PS party is a dummy variable equalling one if the mayor is from the same political party as the government ( <i>PS</i> ) and zero otherwise.
PSD party	c PSD party is a dummy variable, equalling one if the mayor is from the main opposition party ( <i>PSD</i> ) and zero otherwise.
T1	– Period 1 (T1) is a dummy variable equalling one for the period between 2001 and 2004, and zero otherwise.
T2	– Period 2 (T2) is a dummy variable equalling one for the period between 2005 and 2007, and zero otherwise.
T3	– Period 3 (T3) is a dummy variable equalling one for the period between 2008 and 2011, and zero otherwise.
<b>Firm-level</b>	
Productivity	a Productivity is the logarithm of sales per employee
Employees	a Number of employees in each year
Firm age	a Firm age is the logarithm of the age of the firm plus one
Founders	a Founders is the number of founders
Survival	a Survival is a dummy variable equalling one if the firm survives the first three years, and zero otherwise
Initial size	a The initial size is the logarithm of the initial number of employees
<b>Founder level</b>	
Gender (male)	a Gender (male) is a dummy variable equalling one for men founders and zero for women founders.
Age 20-29	a Age 20-29 is a dummy variable equalling one if the founder's age is between 20 and 29 and zero otherwise.



Age 30-39	a Age 30-39 is a dummy variable equalling one if the founder's age is between 30 and 39 and zero otherwise.
Age 40-49	a Age 40-49 is a dummy variable equalling one if the founder's age is between 40 and 49 and zero otherwise.
Age 50-60	a Age 50-60 is a dummy variable equalling one if the founder's age is between 50 and 60 and zero otherwise.
Very low education	a Very low education is dummy variable equalling one if the founder never completed elementary school and zero otherwise.
Low education	a Low education is dummy variable equalling one for founders that attended junior high school and zero otherwise.
Medium education	a Medium education is dummy variable equalling one for founders with a high school diploma or equivalent and zero otherwise.
High education	a High education is dummy variable equalling one for founders reporting bachelor's degree or more advanced degree and zero otherwise.
Foreign	a Foreign is a dummy variable equalling one for foreign founders and zero for Portuguese founders.
Industry experience	a Industry experience is a dummy variable equalling one for founders that previously worked in the same four-digit industry digit code in the five years before the firm founding, and zero otherwise.
Managerial experience	a Managerial experience is a dummy variable equalling one when a founder has at least one year of top-management experience in the five years before the firm founding, and zero otherwise.
Entrepreneurial experience	a Entrepreneurial experience is a dummy variable equalling one if a founder had any founding experience in the past five years before founding the firm, and zero otherwise

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Notes: <sup>a</sup> Ministry of Solidarity, Employment and Social Security (*Quadros de Pessoal* dataset). <sup>b</sup> INE – Portuguese National Statistical Institute. <sup>c</sup> CNE – Portuguese National Election Commission

**Appendix C. Additional Results**

**Table C. 1.** Correlation of political dummies (IV) with dependent variables

Probit (Treated)	(1)	(2)	(3)	(4)
	Entry Rate	Entry Rate	Birth job creation	Birth job creation
PSD party	-0.039 (0.181)		-0.105 (0.094)	
PS party		0.039 (0.181)		0.105 (0.094)
Time range	1997- 1999	1997- 1999	1997- 1999	1997- 1999
N Observations	2,556	2,556	2,556	2,556
Pseudo R-squared	0.027	0.027	0.051	0.051

Notes: Other controls include a quadratic time trend and municipality fixed effects. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table C. 2.** Reduced form for

**Table 5,** Column 2

	(1)
	Reduced form
PSD party	0.214** (0.102)
Purchasing power	0.619 (3.215)

Population density	-2.165*** (0.381)
Other Controls	Yes
Time Range	1997-2011
Treatment Effect	2001-2011
N Observations	11,736
Wald <i>F</i> -test	228.7

Note: Wald test of exogeneity ( $\rho = 0$ ):  $\chi^2(1) = 228.7$ ;  $\text{Prob} > \chi^2 = 0.0000$ . The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table C. 3.** Reduced form for Table 7, Column 1

	(1) Reduced form
PSD party	0.098*** (0.012)
<b>Firm characteristics</b>	
Initial size	-0.001 (0.001)
Number founders	0.004** (0.002)
<b>Founder characteristics</b>	
Gender (male)	-0.002 (0.002)
Age 30-39	0.002 (0.003)
Age 40-49	0.000 (0.003)
Age 50-60	0.006 (0.004)
Low educated	-0.001 (0.003)
Medium educated	-0.003 (0.004)
High educated	-0.008* (0.005)
Foreign	-0.006 (0.004)
Industry experience	-0.001 (0.003)
Managerial experience	-0.012** (0.005)
Entrepreneurial experience	0.013**

	(0.005)
<b>Municipality characteristics</b>	
Purchasing power	2.761***
	(0.286)
Population density	-1.313***
	(0.063)
Constant	7.561***
	(0.382)
Wald <i>F</i> -test	7.33

Note: Wald test of exogeneity ( $\rho = 0$ ):  $\chi^2(1) = 71.40$ ;  $\text{Prob} > \chi^2 = 0$ . The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table C. 4.** Impact of the tax reform on novice entrepreneurs

	(1)
	Novice Entrepreneur
Treated x Post Period	0.159***
	(0.009)
<b>Individual Characteristics</b>	
Gender (male)	0.001***
	(0.000)
Age 30-39	0.001***
	(0.000)
Age 40-49	0.000***
	(0.000)
Age 50-60	0.000***
	(0.000)
Low educated	0.001***
	(0.000)
Medium educated	0.002***
	(0.000)
High educated	0.002***
	(0.000)
Foreign	-0.001***
	(0.000)
<b>Municipality-level</b>	
Purchasing power	-0.584***
	(0.034)
Population density	0.295***
	(0.016)
Constant	-1.722***
	(0.095)

N Observations	6,147,540
Kleibergen-Paap F-statistics	603.5

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Notes: The model includes municipality and industry fixed effects, and quadratic time trend. Treated municipalities are instrumented using a dummy variable that equals one if the mayor elected belonged to PSD party. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table C. 5.** The impact of the tax reform on established firm exit

	(1)
	Firm Exit
Treated x Post Period	0.146 (0.484)
Purchasing power	-16.642 (17.083)
Population density	-1.025 (1.599)
Other Controls	Yes
Time Range	1997- 2011
Treatment Effect	2001- 2011
N Observations	978
Adjusted R-squared	0.082
Kleibergen-Paap F-statistics	44.42
N treated	418

Notes: Other controls include a quadratic time trend and municipality fixed effects. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.



**Table C. 6.** Robustness checks: Full sample of mainland municipalities

Panel A: Entry rate	OLS		Instrumental Variables (IV) estimations		
	(1)	(2)	(3)	(4)	(5)
	Policy	Policy	Policy per period	Placebo	After the end of the policy
Treated x Post Period	0.134*** (0.015)	0.337*** (0.112)		0.083 (0.061)	-0.351*** (0.051)
Treated x T1			0.313** (0.149)		
Treated x T2			0.265 (0.239)		
Treated x T3			0.368 (0.319)		
Purchasing power	-0.749* (0.408)	-1.464** (0.694)	-1.417 (1.706)	-0.878 (1.403)	0.490 (0.632)
Population density	0.158** (0.074)	0.650** (0.280)	0.706 (0.889)	0.838* (0.455)	-0.734*** (0.121)
Other Controls	Yes	Yes	Yes	Yes	Yes
Time Range	1997-2011	1997-2011	1997-2011	1994-1999	2001-2012
Treatment Effect	2001-2011	2001-2011	2001-2011	1997-1999	2012
N Observations	43,272	43,272	43,272	18,648	36,478
Adjusted R-squared	0.599	0.596	0.597	0.627	0.558
Kleibergen-Paap F-statistics		716.3	59.7	1253.0	913.0
N treated					
Panel B: Birth job creation	OLS		Instrumental Variables (IV) estimations		
	(1)	(2)	(3)	(4)	(5)
	Policy	Policy	Policy per period	Placebo	After the end of the policy
Treated x Post Period	0.075*** (0.018)	0.357** (0.153)		-0.024 (0.086)	-0.269*** (0.069)

Treated x T1			0.404		
			(0.260)		
Treated x T2			0.494		
			(0.430)		
Treated x T3			0.612		
			(0.581)		
Purchasing power	-1.405 <sup>***</sup>	-2.397 <sup>***</sup>	-3.731	-0.072	-0.477
	(0.532)	(0.809)	(2.884)	(1.510)	(0.835)
Population density	0.064	0.746 <sup>**</sup>	1.482	-0.074	-0.495 <sup>**</sup>
	(0.136)	(0.368)	(1.592)	(0.621)	(0.214)
Other Controls	Yes	Yes	Yes	Yes	Yes
Time Range	1997-2011	1997-2011	1997-2011	1994-1999	2001-2012
Treatment Effect	2001-2011	2001-2011	2001-2011	1997-1999	2012
N Observations	43,272	43,272	43,272	18,648	36,478
Adjusted R-squared	0.273	0.268	0.263	0.294	0.259
Kleibergen-Paap F-statistics		716.3	59.7	1253.0	913.0
N treated	21,252	21,252	21,252	5,796	1,600

Notes: In this analysis, we include all mainland municipalities, excluding the Algarve municipalities. In the Algarve region, the reform targeted municipalities and parishes and our data only has information at the parish level after 2003. We also excluded Odivelas, Trofa and Vizela municipalities because they were only founded in 1998. Other controls include a quadratic time trend, monthly fixed effects, and fixed effects per municipality. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

**Table C. 7.** Robustness checks: Include year 2000, include the year 2000 and post-period since 2000 and remove 2000

Entry Rate	(1)	(2)	(3)
	Include 2000	Post Period since 2000	Remove 2011
Treated x Post Period	0.321** (0.146)	0.246** (0.118)	0.412* (0.215)
Purchasing power	-0.715 (1.448)	-0.828 (1.271)	-0.604 (1.755)
Population density	1.004** (0.406)	0.711** (0.294)	1.187** (0.596)
Other Controls	Yes	Yes	Yes
Time Range	1997- 2011	1997-2011	1997-2010
Treatment Effect	2001- 2011	2000-2011	2001-2010
N Observations	12,588	12,588	10,932
Adjusted R-squared	0.638	0.638	0.663
Kleibergen-Paap F-statistics	444.1	387.2	224.8
N treated	5,016	5,472	4,560

Notes: The tax reform was initially scheduled to enter into force in 2000, yet it was only effective one year later. In columns (1), we include the year 2000. In columns (2), the variable Post Period starts in 2000 rather than in 2001. In columns (3), we remove the year 2011 to exclude the most severe crisis year from our sample. Other controls include a quadratic time trend, monthly fixed effects, and fixed effects per municipality. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1%, respectively.

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