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Firm Size and Judicial Efficiency in Italy: Evidence from the Neighbour's Tribunal

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Abstract
We investigate the causal relationship between judicial efficiency and firm size across Italian municipalities, exploiting spatial discontinuities in tribunals' jurisdiction for identification. Results show that halving the length of civil proceedings, average firm size would increase by around 8-12%, everything else equal. Results are robust to a number of different specifications, based on two different databases.

JEL Classifications: K4; L11; O18
Keywords: Justice efficiency, Firm size, Spatial discontinuity approach, Italy

1 Introduction

A well-functioning judicial system is essential in ensuring the enforcement of contracts and the protection of property rights. The importance of the quality of the judicial system for the working of market economies has been confirmed by a large body of empirical literature. For instance, it has been shown that judicial efficiency affects the development of financial and credit markets (Djankov et al., 2008), the availability and cost of credit (e.g. Bae and Goyal, 2009; Qjan and Strahan, 2007; Fabbri, 2010), the volume of trade (Berkowitz et al., 2006), sectoral specialization (Nunn, 2007) and competition in markets (Johnson et al., 2002).

In this paper we empirically investigate the relationship between judicial efficiency and firm size. In shaping the contractual environment in which firms operate, the judicial system may affect firms' choices regarding, among others, investments, employment, organizational models, contractual relationships with counterparts; all these aspects affect firms' size and, ultimately, aggregate employment.

In our analysis we employ a spatial discontinuity design to provide evidence of a causal effect. The identification strategy consists in restricting the sample to observations which are located nearby a spatial discontinuity affecting only the variable of interest and mean-differentiating all the variables within the group of observations which share the same discontinuity (see, among others, Black, 1999; Holmes, 1998, Duranton et al., forthcoming). We apply it to Italian municipalities exploiting spatial discontinuities in tribunals' jurisdiction. In particular, we compare average firm size in manufacturing across contiguous municipalities that are located on tribunal jurisdiction borders: this allows us to isolate the effects of judicial efficiency as municipalities on opposite sides of tribunal boundaries experience a discrete jump in this variable, but not in other unobserved factors. We use as a measure of judicial efficiency the average length of trials in tribunals.

We find that less efficient tribunals lead to smaller average firm size. These results are robust to the inclusion of additional controls at municipality level and to the use of different measures of judicial inefficiency and average firm size. The economic impact of our results is relevant: halving the length of civil proceedings would lead to a 8-12 per cent increase in average firm size. We also find that judicial inefficiency has a negative effect on total employment but does not affect the number of firms, we interpret these result as an indication of the fact that slow tribunals hinder firms' growth but do not affect firms' entry.

The main contribution of this paper is to provide evidence on the eco-

nomic impact of judicial efficiency in isolation from other institutions, both formal and informal. Previous studies on this topic, based on cross-country analysis, have employed either broad measures of quality of the legal system that do not distinguish between the content of the laws and their enforcement in courts (e.g. Kumar et al., 2001) or direct measures of courts' performance (e.g. Beck et al., 2006). In both cases these measures may reflect other (unobserved) features of the institutional setting of a country. The omitted variable issues are less severe in within-country studies where it is possible to discriminate between laws (that are uniform in the country) and their enforcement that may vary due to differences in the actual functioning of courts (Laeven and Woodruff, 2007; Fabbri, 2010). Nevertheless, also in this setting identification issues may arise due to within-country variation in informal institutions (unwritten norms and rules that affect the behaviors of individuals and organizations). As established in several studies following the seminal work of Putnam (1993), informal institutions vary widely across Italian regions and they produce significant economic effects (e.g., Guiso et al., 2004). Moreover, two recent studies show that they affect both the functioning of the judicial system (Giordano et al., 2010) and firm size (Cingano and Pinotti, 2011). Our identification strategy allows us to disentangle the effects of judicial efficiency (that changes in a discrete manner) from both the effects of substantive written laws (that do not change) and informal rules (that changes smoothly and are difficult to identify).

This paper also contributes to the debate on the determinants of small firm size in Italy. Compared to other European countries (UE-15) the size of Italian firms is on average 40 per cent smaller; significant disparities persist even if differences in sectoral specialization are accounted for. Small firm size is widely held to be a weakness of the Italian productive system and one of the causes of the low productivity growth experienced by the Italian economy in recent years; this is mainly due to the difficulties that small firms face in innovating and competing in foreign markets (Banca d'Italia, 2009). Although growth theory does not provide unambiguous predictions on the relationship between firm size distribution and growth (Peretto, 1999), a positive association has been found in empirical studies (Pagano and Schivardi, 2001; Acs et al., 1999). At the same time judicial efficiency in Italy is very poor: according to the World Bank's "Doing Business" report, Italy ranks 157 out of 183 countries in the *enforcing contracts* indicator. This is largely due to the extreme length of judicial proceedings. In Italy it takes 1,210 days to resolve a commercial disputes through courts; it is about four times the number of days needed in the US and three times the number of days needed in UK and in Germany. Previous studies on the effects of poor judicial ef-

ficiency in Italy have focused on the functioning of credit markets (Jappelli et al., 2005; Fabbri and Padula, 2004; Magri, 2010). Our paper shows that this inefficiency has also a negative impact on growth opportunities of Italian firms.

The paper is organized as follows: the next session briefly reviews the related literature and sketches the channels through which justice efficiency may affect firm size; the third section describes the empirical methodology; the fourth presents the results, and the fifth concludes.

2 Related literature

Previous empirical studies find a positive association between the quality of the judicial system and firm size, though they do not provide evidence of the existence of a causal relationship. Kumar et al. (2001) using data on firm size in Western European countries find that better judicial systems are associated with larger average firm size; the effects are bigger for industries where physical assets are less important. Beck et al. (2006) using firm level data on the largest industrial firms in 44 countries find that firm size is positively associated with institutional development (including judicial efficiency) and with the development of financial intermediaries. The link between firm size and judicial efficiency has also been proved exploiting within country variation in the functioning of courts. Laeven and Woodruff (2007) using census firm data in Mexico show that judicial efficiency has a positive link with average firm size and that this effect is larger for proprietorship than for corporations. Similar results are obtained by Fabbri (2010) on Spanish data; she finds that more efficient courts are associated with larger firms and less costly bank financing.

Various channels through which the efficiency of the judicial system may affect firm size are identified in the literature; all of them bear on the fact that lengthy trials reduce contract enforceability.

First, an inefficient judicial system affects firm size through investment decisions by entrepreneurs. Since poor contract enforcement increases the risks faced by entrepreneurs and raises the expected return, this can lead to less investment and reduce growth opportunities.

Second, the functioning of courts influences the employment decisions of firms as it affects the enforcement of employment protection legislation (EPL). Although the literature has not reached clearcut conclusions on the relationship between EPL and firm size, it can be argued that the potential constraints EPL imposes on firms' growth depend on its actual implementa-

tion through courts. For instance, in Italy the length of judicial proceedings on worker dismissal directly translate into higher firing costs for firms with more than 15 employees: if a dismissal is ruled to be unfair, firms have to compensate employees for the forgone wages in the time elapsing between the dismissal and the court's sentence.[1]

Third, as poor contract enforcement determines higher transaction costs, firms may respond vertically integrating their production process, thus increasing their size.

Fourth, if formal contract enforcement institutions are not efficient, parties rely more on relational contracting and are less willing to work with new partners; this reduces the demand for a given firm's output and hinders its growth. Yet, the overall effect on average firm size is ambiguous as relational contracting also creates barriers to entry for new firms that are usually smaller than incumbent firms, thus reducing average firm size (Johnson et al., 2002).

Finally, firm size can be indirectly influenced through the credit channel. Well functioning judicial systems, providing stronger creditors protection, increase the availability of credit and improve the contractual terms for prospective borrowers, thus lessening financial constraint to growth for existing firms. Yet, also in this case, the overall effect of a more efficient credit market on average firm size is ambiguous: since also prospective entrepreneurs would have better access to external finance and usually new firms are smaller, this could reduce the average size.

To summarize, the first and second channel imply that justice has a negative impact on average firm size, the third channel suggests a positive effect, while the overall impact of the remaining channels is ambiguous since the effect is negative on both incumbents' growth and entry rate. Therefore, existing theories do not provide a definitive answer on the sign of the relationship between judicial efficiency and average firm size; thus, the question needs an empirical answer.

3 Identification strategy

Our identification strategy is based on a spatial discontinuity design, introduced by Black (1999) and applied by Holmes (1998) and Duranton et al. (Forthcoming), among others.[2] The methodology consists in restricting

[1] Besides the reinstatement of the employee, unless she or he opts for a further severance payment equal to 15 months of salary.

[2] Black (1999) applies the methodology to housing prices as a function of school quality in the U.S., by comparing the difference in prices of similar neighbouring houses located

the sample to observations which are located nearby a spatial discontinuity affecting only the variable of interest, and in mean-differentiating all the variables within the group of observations which share the same discontinuity. Two are the crucial assumptions behind this approach: 1) spatial discontinuities affecting the variable of interest should not introduce any sharp discontinuity in other variables; 2) the spatial border should introduce a sharp discontinuity in the variable of interest.

We apply this methodology to a sample of Italian municipalities located along tribunal jurisdiction borders, the outcome variables being firm size and growth. We restrict the sample only to municipalities located along a jurisdiction border, and we then regress the outcome variable on the efficiency of the local tribunals and a border dummy. The fact that our identification only exploits mean-differences among municipalities which are very close to each other implies that our estimates are not biased by omitted local factors. Figure 1 and 2 show municipalities borders (gray lines) and tribunal jurisdiction borders (bold black lines) in Northern Italy, while coloured areas indicate municipalities that share common jurisdiction borders. In a nutshell, our approach consists in restricting the sample to coloured municipalities, and mean-differentiating all the variables among municipalities of the same colour (by including a group dummy).

at different sides of schools districts. Holmes (1998) instead exploits spatial variation in US State legislations to find that there is a large increase in manufacturing activity when one crosses a state border from an antibusiness state into a probusiness state. Duranton et al. (Forthcoming) use municipalities border in the U.K. to investigate the effect of local taxation on firm location and growth.

Figure 1: Tribunals' jurisdiction, North Italy

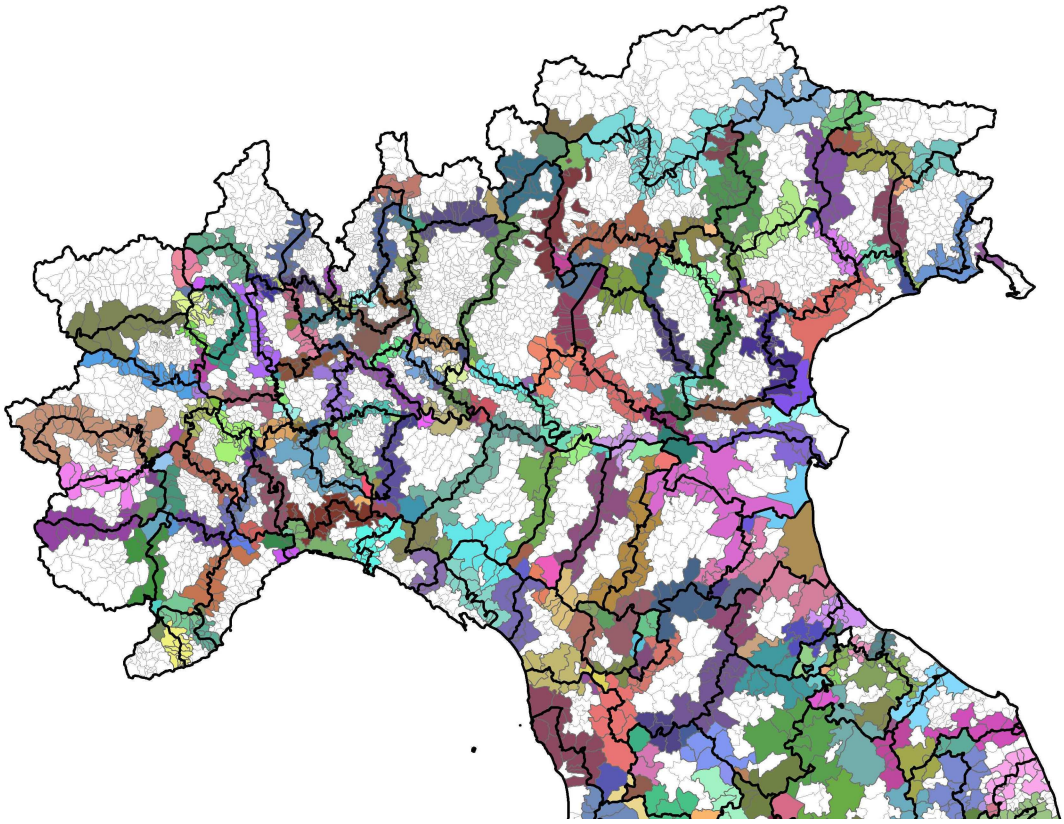
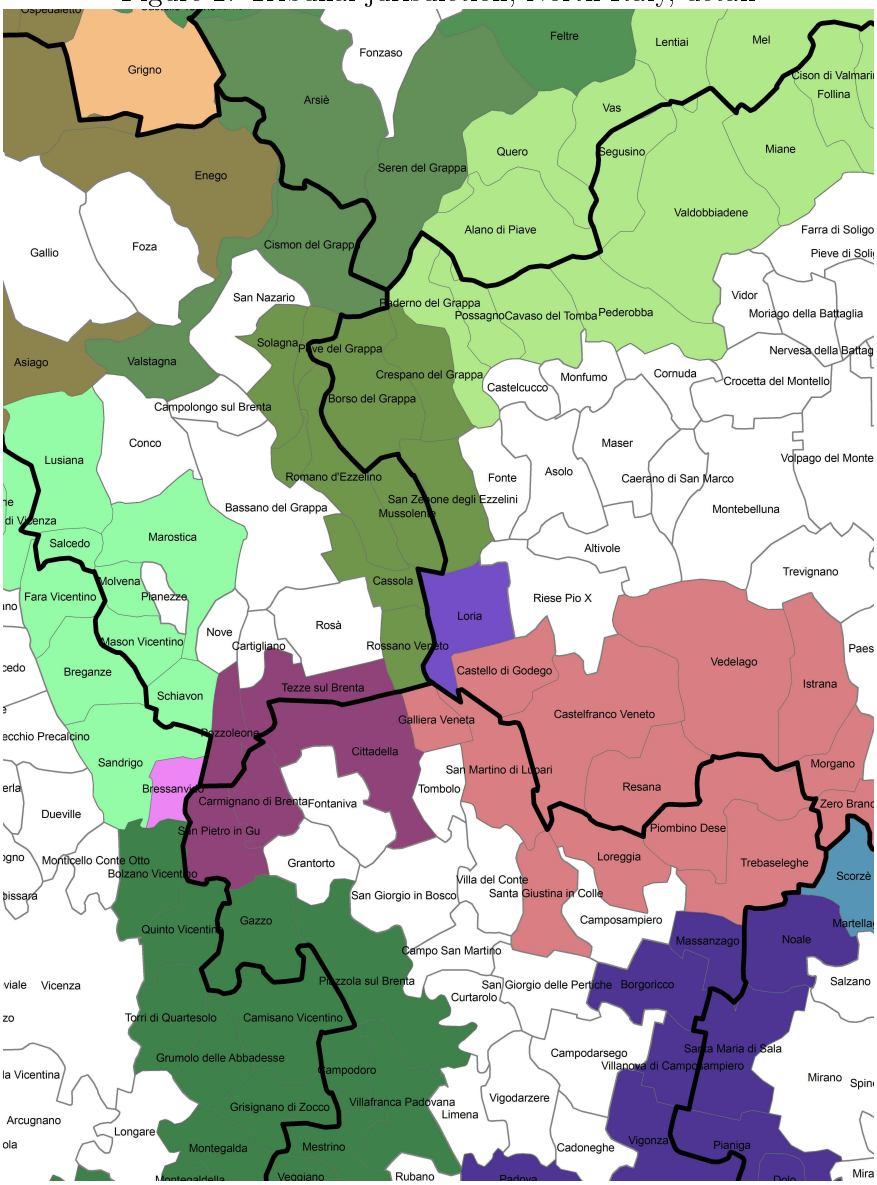


Figure 2: Tribunal jurisdiction, North Italy, detail



Our setting fits well the assumptions required by the identification strategy. As regards the first assumption, the territorial organization of the Italian judicial system is based on 165 tribunal jurisdiction areas (*circondari di tribunale*); within these areas, *tribunali* are the first-instance courts both for civil and criminal justice. The current territorial distribution of courts has been mainly determined by historical factors: it largely resembles the one shaped in 1865, right after the unification of the country, which in turn was set on the basis of the court systems of pre-existing states. Since then, no existing jurisdiction has ever been removed, although a few new *tribunali* have been lately carved out within the existing classification.[3] This system is widely recognized to be inefficient and anachronistic - due to the presence of a large number of very small courts whose diffusion might have been necessary in the past to ensure access to justice, but which nowadays is not justified - and, after a long lasting debate and strong opposition at local level, it will undergone a major revision during 2012.

Tribunal jurisdiction areas do not systematically match other administrative territorial classifications, though in some cases tribunal boundaries coincide with regional and provincial boundaries.[4] In these circumstances spatial discontinuities not related to the efficiency of justice might be introduced. This would be a cause of concern only if these discontinuities were correlated with tribunal efficiency. However, this is unlikely to occur since the judicial system is fully autonomous from local administrative bodies and Regions and Provinces do not have competences in the functioning of local tribunals.

Nonetheless, since Regions have relevant regulatory powers on economic activity, we control for regional differences on opposite sides of tribunal jurisdiction borders adding regional fixed effects in the regressions. We are less concerned about the coincidence of tribunal borders with provincial borders as, unlike Regions, Provinces have very limited autonomous power and their main competences are in subjects with little impact on business activities.[5] Still, in the robustness section we exclude from the sample all the tribunal jurisdictions whose borders coincide with the provincial ones.

As regards the second assumptions, neighboring tribunals show signifi-

[3] Over the last 50 years, 11 new small *tribunali* have been established (five in the '60s and six in the '90s). As we will discuss later, our results are unaffected by the exclusion of these tribunals.

[4] Regions and Provinces are the administrative territorial units which correspond respectively to level 2 and level 3 in the Eurostat NUTS classification.

[5] Such as environment protection, roads maintenance, schools (buildings construction and maintenance), waste disposal.

cant differences in efficiency. As we can see from Figure 3, which maps the average estimated trials length by jurisdiction in the period 2002-2007, although there is a clear geographical component in the index value (with Southern tribunals on average twice as slow as Northern ones), there is enough variation even within regions and between neighbouring tribunals.

Furthermore, since civil proceedings are assigned to courts on geographical bases, the spatial variation in tribunal efficiency leads to spatial variation in judicial efficiency for local firms. As a general rule, the Italian civil procedure code provides that cases are assigned to tribunals according to the residence of the law-suited subject, unless parties agree otherwise in a contract. This implies that if a firm sues an insolvent customer and there is not a previous agreement on a different forum, the residence of the customer determines the jurisdiction of the tribunal. In these cases, it is not possible to establish once and for all which is the relevant tribunal. However, in certain matters, some of which are very relevant for firms' activity, the tribunal's jurisdiction is always determined by the residence of the firm, irrespective of whom is initiating the legal action, for instance in labor and bankruptcy proceedings. Consequently, crossing a jurisdiction border does correspond to a sharp discontinuity in the average duration of at least some types of proceedings potentially involving a given firm. Yet, as not all the proceedings in which a given firm is a part are held in the local tribunal, it is worth stressing that our analysis assess the effect of the efficiency of the *local* tribunal, not of the national judicial system as a whole.

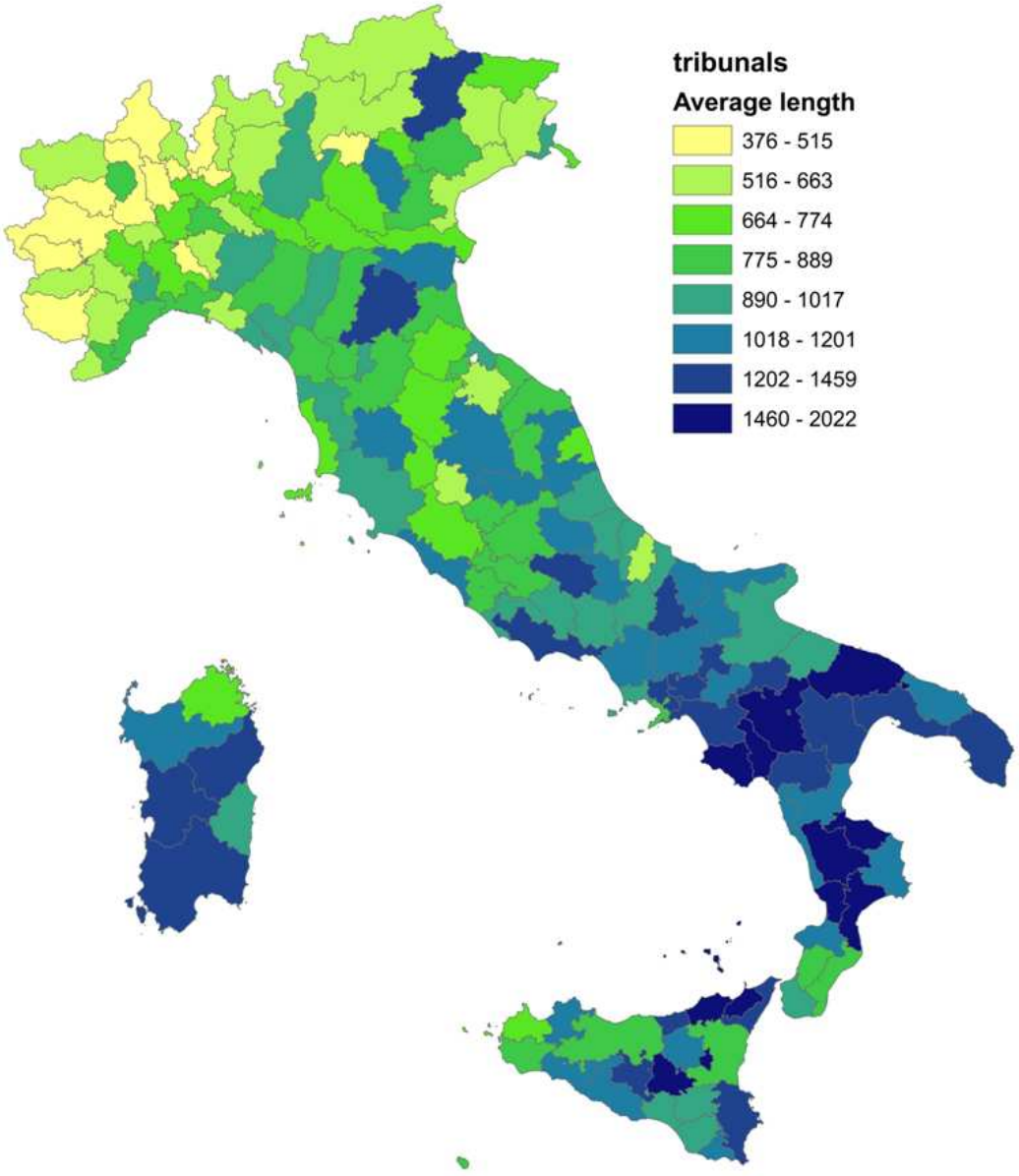
3.1 Econometric specification

A simple formalization may help understanding the econometric properties of the methodology. We are interested in assessing the effect of tribunal efficiency on the average firm size at municipality level (and on related outcome variables). We are thus estimating the following model:

$$y_{i,p} = E_{k,p}\beta + X_i\gamma + f(p)\delta + \varepsilon_i \tag{1}$$

i.e., average firm size y in municipality i in the hypothetical 'place' (an unique point in the space) p is a function of the efficiency E of the tribunal k in the same place p, and of a vector X of observable characteristic of municipality i. The function *f(p)* represents unobserved factors influencing the outcome variables which vary across space, and potentially correlated with both E and X. In such a setting, our estimates of β is biased. In theory, we could obtain unbiased estimates by differentiating across observations

Figure 3: Tribunal jurisdiction and trials average length, 2002-2007



located in the same place p:

$$y_{i,p} - y_{j,p} = (E_{k,p} - E_{k,p})\beta + (X_i - X_j)\gamma + [f(p) - f(p)]\delta + \varepsilon_i - \varepsilon_j \quad (2)$$

This model is however useless, as our variable of interest (the variation in E) is always zero. But we can take a reasonably small variation of p next to a tribunal area border, from p_1 to p_2, leading to a change in the tribunal area efficiency, from E_k to E_q. If the following condition holds:

$$Corr((f(p_1) - f(p_1)), (E_k - E_q)) = 0 \quad (3)$$

i.e., the change in the local unobservables in the two contiguous place is uncorrelated with the change in tribunal efficiency, the estimate of β is unbiased.

Another useful feature of this approach is the following: we can assume that the side of the border (S=0 or S=1) where the municipality is located is uncorrelated with its observable characteristics X:

$$E[X|S] = E[X] \quad (4)$$

which implies that, on average, municipalities on one side of the border are similar to municipalities on the other side. This also implies that adding additional controls to our specifications may increase the efficiency of the estimate of the tribunal effect, but does not affect the consistency (and the value of the point estimates).

Operationally, we estimate the following model by OLS, restricted to the sample of municipalities contiguous to a tribunal border b:

$$y_{mjb} = E_j\beta + X_m\gamma + \sum_{b=1}^{B} \delta_b + \varepsilon_{mjb} \quad (5)$$

where

- y_{mjb} is a measure of average firm size, total employment, or total number of firms in municipality m, *located* in jurisdiction j, and belonging to the border group b
- E_j is a set of efficiency measures of jurisdiction j
- X_m is a set of municipality controls
- δ_b is a full set of border group dummies (equal on both sides of the border).

We identify 377 different border groups (the colored areas in figure 1). In order to minimize arbitrariness and to allow replicability, their composition results from a completely automated procedure through a Geographic Information System (GIS).[6] On average, they comprehend 10 municipalities each, with a minimum of 2 and a maximum of 64. All the results we present are robust to the exclusion of border groups with more than 10 municipalities.

3.2 Other identification challenges

There are a few additional challenges to our identification strategy.

The first one relates to sorting of plants. If firms choose their location after observing the efficiency of the local tribunal, and if larger firms expect to benefit more from faster tribunals, then part of the effect we find is not due to a growth-enhancing effect of justice efficiency, but rather to an attraction effect. However, if sorting were driving our results, we would not find any significant effect on firms' growth, but only on firms' average size. We anticipate, however, that this is not the case, the two set of results being extremely similar. In the robustness section we address a related concern, i.e., the possibility that border municipalities with faster (slower) tribunals have more (less) large plants than non-border municipalities within the same tribunal jurisdiction, due to cross-border sorting of plants among municipalities belonging to the same border group. This would lead to an overestimate of the real effect, but our test suggests that this is not the case.

To the extent that larger firms increase the local demand for civil justice, reverse causality might also appear as a potential source of bias. This would definitively be an important limit in a standard OLS regression, suggesting that we may find a positive bias in our inconsistent, full sample regressions. However, the spatial discontinuity approach is also robust to reverse causality: there is no reason why the local demand for justice should vary *discontinuously* across jurisdiction borders. Therefore, the border group dummy is fully absorbing the reverse causality effect. In other words, if assumption 1 is verified, i.e., tribunal jurisdiction borders are truly exogenous, then risks of reverse causality can be ruled out for our consistent estimates.

[6] For each municipalities, we ask the GIS to identify all jurisdiction polygons at zero distance from the municipality border. Border municipalities are those with 2 (or more) jurisdictions at zero distance (the one the municipality belongs to, and the contiguous one). If there are more than one contiguous jurisdictions, only one is selected, based on the distance between the municipality and jurisdiction centroids. Each border group is composed by all municipalities sharing the same couple of zero-distance jurisdictions.

4 Data and variable definition

We assembled a dataset with data on judicial efficiency, firm size (employment and accounting based measures) in the manufacturing sector and controls at municipal level.

4.1 Judicial efficiency

Data on the functioning of the judicial system are provided by the Italian Ministry of Justice. Since data on the actual duration of civil proceedings are not available, we use caseflow data to construct an index that proxies the average length of proceedings (in years) which is calculated as follows:

$$D_t = \frac{P_t + P_{t+1}}{E_t + F_t} \tag{6}$$

where P are pending cases at the beginning the year t, F are the new cases filed during the year and E are the cases concluded with a judicial decision or withdrawn by the parties during the year. This index provides an estimate of the average lifetime of proceedings in a tribunal.[7]We consider two kinds of civil proceedings: ordinary civil proceedings (which include disputes on contracts, property law, tort, corporate law) [8] and labor proceedings. While our focus is on the functioning of the civil justice, we need to control for the efficiency of tribunals in deciding criminal cases since, as already pointed out, the same court decides both for civil and criminal cases. For criminal proceedings we use data on the actual duration which are available. Our data cover the period 2002-2007 and we use the average value across the six years.

We also use data on judicial proceedings to build a litigation index to account for potential reverse causality issues between size and judicial efficiency: firms may be bigger in municipality where business activity is higher, but in turn the latter variable may be positively correlated with tribunal's workload and thus trial length. The index is calculated as the ratio of the number of new cases in the period 2002-2007 over total jurisdiction population in year 2001.

[7]This is the index used by the Italian Minister of Justice and by the Italian National Institute of Statistics (Istat) to estimate the duration of proceedings when actual data are not available. In the robustness section, we show that our results are consistent with the use of a different version of the index.

[8]Unfortunately, disaggregated data for each of these subjects are not available.

4.2 Firm size

We first measure firm size using data on employment. As we cannot rely on unit based data, to calculate employment-based proxies we use the database ASIA produced by the Italian National Institute of Statistics (Istat) which contains information, at municipal level, on the number of firms, the number of plants, the number of employees and the distribution of firms and plants by size bins. These data refer to the year 2008 and are available only for municipalities with more than 5,000 inhabitants, hence the sample is restricted accordingly. We consider both firm and plant-level data. Since the majority of Italian firms are mono-plant and plant-level data produce slightly more precise results, in what follows we use plant-level data.

Our first measure is the ratio between the total number of employees and the total number of plants. However, this indicator can be misleading in the presence of a large number of very small firms and as we are ultimately interested in assessing whether judicial inefficiency is an obstacle to the presence of large firms, we also adopt an alternative measure, originally proposed by Davis and Henrekson (1997) and later adapted by Kumar et al. (2001) to data at the level of firm size bins, that places more emphasis on large firms. Following Kumar et al. (2001), we use an employee-weighted average size indicator (EWAS) that is calculated as follows:

$$EWAS = \sum_{bin=1}^{n} \left(\frac{emp_{bin}}{emp_{tot}} \right) * \left(\frac{emp_{bin}}{firms_{bin}} \right) \tag{7}$$

Where emp_{bin} and emp_{tot} refers to total employment in the plant size bin and in the sector, respectively, and $firms_{bin}$ corresponds to the number of firms (or plants) in the size bin. The size bins we used are those originally defined in the ASIA archive: 1-9, 10-19, 20-49, 50-99, 100-199, 200-499, 500-999, 1,000-4,999, and more than 5,000.

Our measures of average size do not allow us to disentangle whether judicial efficiency affect growth's prospects of firms, firms' birth or both. For instance, small average size may be due to a high entrepreneurship rate, considering that newly born firms are generally smaller, rather than to the lack of growth of older firms. In order to shed some light on these aspects, we also estimate separately the effects of judicial efficiency on total employment and on the number of plants and we interpret average plant size and the total number of plants as static proxies respectively for firms' growth and firms' birth.[9]

[9]We use this indicator as reliable measures of firms' birth are not available in Italy.

Summing up, we run the same model with four different dependent variables (in logs): the average plant size, the employee-weighted average size, the total number of plants, and total employment. When interpreting the results, we should keep in mind that the difference of the log of total employment and total number of firms corresponds to the log of the average plant size. Hence, we can sketch three main different scenarios. First, justice slowness has a negative and comparable effect on both firms' growth and entry. In such a case, the coefficients would be negative for the total number of plants and total employment and insignificant for average size. Second, justice slowness affects only firms' growth, but not entry; in this case, the coefficients would be negative for average size and total employment and insignificant for the number of plants. Third, the efficiency of justice has a negative effect on enty, but not on firms' growth: this would lead to a negative coefficient for the number of plants, to an insignificant coefficient on total employment, and to a positive coefficient for average size.

Accounting based measures of size are taken from the CERVED database that contains balance sheet data for most Italian corporations. From this dataset we construct a measure of firm size and a measure of firms' growth both based on total turnover. More precisely, we consider the average value of turnover of corporations at municipal level over two years[10] for the two periods 2008-2009 and 2001-2002. The average turnover value for the period 2008-2009 is our measure of firm size, while the growth rate between the two periods is our measure of firms' growth. Furthermore, we keep in the sample only mono-plant firms[11] which survived for the whole period and, as the data are quite noisy, we also dropped the first and last centile of the firm distribution of total turnover growth.

4.3 Local variables

Our dataset include a number of control variables at municipal level. As a proxy for the size of the municipality we use the municipal population as recorded in the Census data in 2001. To take into account the effects of the availability of skilled workers on firms' growth potential, we include the share of high school graduates on population as a measure of local human capital. High crime rates may discourage economic activity, hence birth and growth

[10] We average the value of turnover over a two-year period to smooth short term disturbances.

[11] In the CERVED archive there is not a plant identifier, but only a firm one. Therefore, it is not possible to correctly calculate to individual contribution to firm turnover of different plants.

of firms, and at the same time congest local tribunals; to take into account these factors we include as a proxy for crime rates the ratio of reported crimes over population. We include the share of non-Italian on population as foreigner workers increase labour supply, especially in manufacturing. As financial development is an important determinant of firm size, we include in our dataset the number of retail banking branches. In order to control for tribunal congestion (and a possible reverse causality channel), we include a measure of litigation intensity within the tribunal, expressed as the ratio of the number of filed proceedings in the period 2002-2007 over the total population of the jurisdiction in year 2001. We finally include a measure of local taxation on business real estates (Imposta Comunale sugli Immobili), since this is the most relevant policy at municipality level which may affect plants' location choices and growth opportunities.

In table 2 we report the main descriptive statistics of the variables used in the empirical analysis, either in the full and the restricted sample. As it is possible to see, there are no statistically significant differences among the two groups. This suggests that the restricted sample of border municipalities is representative of the the full sample of Italian municipalities. In the regression analysis, all variables are expressed in logarithmic form.

5 Results

5.1 Employment

We first estimate eq. 5 using employment-based measures of firm size.

Table 3 presents the inconsistent estimates, based on the whole sample of municipalities and including all the control variables and regional fixed effects. The coefficient of the judicial efficiency variable for civil proceedings (our main variable of interest) is insignificant in all the regressions. This is likely to be due to the bias generated by positive reversed causality, as discussed above, or by omitted variables which positively correlate both with firm size and length of proceedings; both would push toward zero the expected negative coefficient. A possible omitted variable is the presence of industrial districts associated with a smaller average firm size: to the extent that districts are more frequent in areas with higher endowments of civicness and better performing institutions, this may explain the bias toward zero. The coefficient of criminal justice is instead negative and highly significant.

Table 4 shows the simplest version of the consistent model, obtained by restricting the sample to those municipalities situated along a border of tribunal jurisdictions, and by introducing a set of fixed effects for all the

groups of municipalities sharing the same border. By identifying a very small group of observations located in the same area, these fixed effects control for a wide set of observable and unobservable factors, while still leaving within-group variability in the judicial efficiency variables due to the change in tribunal jurisdiction. Now the coefficient of the length of civil proceedings turns negative and significant. The magnitude of the effect is relevant. As regressions are log-linear and coefficients can be interpreted as elasticities, our estimates imply that, halving the length of civil proceedings, average plant size would decrease by around 8.5%. Since the slowest tribunal in the top decile for efficiency (Trento) is roughly 1,4 times faster than the fastest in the bottom decile (Nola), these results also indicate that moving from the jurisdiction of the tribunal of Trento to the jurisdiction of the tribunal of Nola would lead to a reduction in average plant size of 23%. This elasticity value, however, has to be scaled in proportion to the tiny average size of Italian plants, equal to 8,2 employees in our sample. Therefore, the absolute effect for the average plants moving from Trento to Nola is in the reason of two employees.

The effect of the length of judicial proceedings is even stronger when the dependent variable is the EWAS index which place more weight on bigger plants (the coefficient in column 4 is three times as big as the coefficient of column 1, although the difference is not statically significant).

The length of criminal proceedings is negative and significant for average plant size, though the coefficient is smaller, while it is not significant for the EWAS index. The length of labour proceedings is not significant for both our measures of plant size.

As we also find that the length of civil proceedings has a negative effect on total employment (col. 3) but does not affect the number of plants (col. 2), we interpret these result as an indication of the fact that judicial inefficiency is an obstacle to firms' growth and not to firms' entry. Furthermore, these results suggest that our estimates are not biased due to sorting of larger firms into municipalities with more efficient tribunals: indeed, if this were the case, one would also expect a larger number of plants in those municipalities.

In (table 5) we presents the results obtained including in the regressions a full set of additional controls - including regional fixed effects. As expected, the inclusion of additional controls produces only minor changes in the point estimates of the coefficients of the variables of interest. Regional fixed effects are generally significant, but leave the tribunal coefficients unaffected. This is particularly supportive of the robustness of our methodology, since, as already pointed out, Regions in Italy are the local authorities with the strongest autonomy and decisional power in subjects which are relevant for

business activity. As to other controls, they are generally not significant with the exception of the share of college graduates and, in the regression of the EWAS index, population which have the expected signs. It is also interesting to point out that our proxy of local taxation is not significant for firm size, while it is significant and has a negative sign on the number of plants. This is consistent with previous finding indicating that local taxes are more effective in the extensive margin, rather than in the intensive one, because part of their effect is capitalized into rents (Duranton et al, Forthcoming).

5.2 Turnover

In table 6 columns 1-3 the dependent variable is the average turnover level in years 2008-9; the specifications mirror those of the regressions run using employment-based measures. In particular, col. 1 presents the inconsistent model estimated on the full sample, cols. 2 and 3 the consistent model, without and with controls, respectively. The main results are confirmed: the point estimates are even larger, although standard errors are much higher. This suggests that the effect on turnover is bigger than on employment, since balance sheet data are noisier and we should take into account also attenuation bias from classic measurement error. The larger standard errors also suggests that employment is a better proxy for firm size (or the ASIA archive, based on the full sample of Italian firms, a better source for this kind of analysis). Columns 4-6 presents the results of the estimations where the dependent variable is turnover growth and the specifications are those of the previous columns. There are some advantages in running these regressions. First, by so doing we implicitly control for time-invariant unobserved factors potentially correlated with average plant size. Second, as mentioned above, it rules out a possible bias due to sorting of larger firms into municipalities with faster tribunals, since we use a closed sample of firms (we exclude firms which enter or exit during the whole period). Finally, we directly test the effect of judicial inefficiency on firm's growth. In this case, coefficients are remarkably similar to those of employment regressions, providing further support to our interpretation that judicial inefficiency hinders firm's growth. It also suggests that effects on levels and on flows are comparable, and that measuring firm size with employment or turnover does not change the main picture.

5.3 Robustness checks

We run a series of robustness checks on our estimates, which leaves the main results unaffected.

A first concern is related to the possibility that border municipalities with faster (slower) tribunals have more (less) large plants than non-border municipalities in the same tribunal jurisdiction, due to sorting of plants among municipalities belonging to the same border group. For instance, let's assume that there is an industrial district (composed by several municipalities) with a very friendly business environment, and a jurisdiction border is crossing the district. Plants may want to marginally change their location and move to the "good side" of the tribunal border, while still enjoying the positive district business environment. The short move would eventually help plants growth more. In our setting, this would lead to overestimating the effect, because border municipalities (included in the analysis) would have more and larger plants than other non-border municipalities in the same tribunal jurisdiction (excluded from the sample), although the efficiency of the local tribunal is the same. Fortunately, there is an easy way to test this. If sorting were in place, we would find that border municipalities in the "good (bad) side", i.e., those where the local tribunal is faster (slower) than the in the neighbouring jurisdiction, are endowed with larger (smaller) plants, on average, than non-border municipalities in the same tribunal jurisdiction. We therefore define two binary dummy variables identifying border municipalities located in the good and bad side, respectively. Using the full sample of municipalities (border and non-border ones), we then regress our set of independent variables on the two dummies, on the controls, and on tribunal jurisdiction fixed effects. Results (table 7) show that, although the coefficients have the expected sign, they are never significant, and rather small in magnitude. We conclude that our results are not significantly biased by this kind of sorting.

Another cause of concern is the coincidence of tribunal and provincial borders. To account for this we exclude from our sample the observations for which tribunals and provincial borders are fully coincident. The results are presented in table 8. Our main findings on the effects of judicial inefficiency are fully confirmed as to the employment-based measures of average size, while the estimations are less precise as to the EWAS index when additional controls are included in the specification, probably due to the smaller sample size.

As we mentioned above, although the general shaping of tribunal areas goes back to year 1864, 11 small tribunals have been added during the '60s

and the '90s. We may worry that tribunals which were created more recently would show endogenous borders: for instance, a politically influential major may manage to get her municipality included within the more efficient tribunal, and her activism may also affect the growth of local firms. To test that, we exclude from the sample all border groups involving a tribunal created after the 1960. Results unreported for brevity but available from the author upon request - where almost identical to those of the main regressions.

Further robustness checks are presented in table 9. In columns 1-3 we estimate separate regressions for each kind of proceedings to account for possible multicollinearity. Inefficiency in deciding civil disputes and criminal cases have a negative effects on average firm size, while lengthy labour proceedings do not affect firm size. In column 4 we tackle concerns related to the index used to approximate the length of proceedings. We build an alternative index, originally suggested by Clark and Merryman (1976), based on the following formulation:

$$D = \frac{Pt + F}{E} - 1 \tag{8}$$

where P are pending cases at the beginning of the year, F are the new cases filed during the year and E are the cases completed or withdrawn during the year. The index is averaged across the six years we have data on (2002-2007).[12] The new index is correlated at 97% with the previous one, and leads to almost identical results. Since an imprecise index may also introduce a measurement error, and thus an attenuation bias in the estimates, we also try to instrument the first index with the second; to the extent that the measurement error in the two indexes is uncorrelated, the IVE strategy is consistent. The 2SLS coefficient, however, is only 10% bigger (in absolute value), suggesting that the component of the measurement error linked to the choice of the index is negligible (results are not reported).

A further robustness test relates to possible outliers due to the presence of a small number of extremely large plants in small municipalities (for instance, the automotive industry plants in Italy are mainly located in small municipalities). We therefore exclude from the calculation of all the dependent variables the plants with more than 200 employees. Results, unreported for brevity but available upon request, are not dissimilar to our main estimates, albeit less significant. A last point of concern is the large variability in municipality population. Those in our sample span from a minimum of

[12]More precisely, we summed all the components over the whole period, and then we calculated the index on the aggregate figures.

5,062 to a maximum of 2,545,860, with a standard deviation of 72,566 and a 95th percentile of 53,219. Dropping from the sample the municipalities in the top 5% of population, however, leaves results unaffected. Weighting the restricted sample by population gives very similar results, although less precise (again, results omitted and available upon request).

6 Conclusion

We explore the effect of justice (in)efficiency on the size of firms. Since theory does not provide an ultimate answer on the expected sign of the relationship, we resort to empirics to shed light on the subject. We address the identification and causality issues by applying a spatial discontinuity design to Italian municipalities, exploiting the fact that tribunal jurisdictions have been shaped in the XIX century and are irrelevant for nowadays administrative geography. More specifically, we compare average firm size across contiguous municipalities that are located on tribunal jurisdiction borders; this allows us to isolate the effects of judicial efficiency, as municipalities on opposite sides of tribunal boundaries experience a discrete jump in this variable, but not in other unobserved factors. We use as a measure of judicial efficiency the average length of trials in tribunals.

We find that in municipalities where civil trials are longer average firms size in manufacturing industries is smaller. These results are robust to the inclusion of additional controls at municipalities level (population, human capital, financial development, court workload) and to the use of different measures of judicial inefficiency and average firm size. The effect of criminal justice inefficiency on firm size is also negative, but smaller and less significant.

The economic impact of our results is relevant: reducing by the half the length of ordinary civil proceedings would lead to about 8 to 12 per cent increase in average firm size. We also find evidence that judicial inefficiency hinders firms' growth rather than firms' entry. This is consistent with previous evidence from Duranton et al., (Forthcoming), who find that local taxes produce the same effects. The authors suggest that local factors are capitalized into rents only marginally for incumbent, due to mobility constraints; instead new entrants are perfectly mobile and need to negotiate rents, therefore for them the capitalization of local factors is higher.

Though our data do not allow for direct testing of the channels through which judicial inefficiency affects firm size, our results indicate that the negative effects on investment decisions, on the willingness to engage in relation-

ships with new trading partners and on the cost and availability of external financing prevail over the incentive to expand by vertically integrating the production process; we do not find evidence of an effect through EPL enforcement.

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Table 1: Summary of variable description

Variable	definition	Area	Period	source
Av. plant size	Employment over number of plants	Muncip.	2008	ASIA-ISTAT
Plants/pop.	Number of plants over population	Muncip.	2008/2001	ASIA-ISTAT
Empl/.pop.	Employment over population	Muncip.	2008/2001	ASIA-ISTAT
EWAS	Av. plant size with greater weight on large plants (see sect. 4)	Muncip.	2008	ASIA-ISTAT
Av. turnover 2008-9	Average plant turnover	Muncip.	2008-2009	CERVED
Turnover growth 2001-9	Plant turnover in 2008-9 over plant turnover in 2001-2 divided by the number of surviving plants	Muncip.	2001-2009	CERVED
Length civil	Estimated length in days of civil cases (see sect. 4)	Trib. jur.	2002-2007	Italian Ministry of Justice
Length labour	Estimated length in days of labour cases (see sect. 4)	Trib. jur.	2002-2006	Italian Ministry of Justice
Length criminal	Estimated length in days of criminal cases (see sect. 4)	Trib. jur.	2002-2007	Italian Ministry of Justice
Population	Total population residing in the municipality	Muncip.	2001	Census of Population 2001, ISTAT
Litigation rate	Number of new cases over total population	Trib. jur.	2002-2007	Italian Ministry of Justice
Share of foreigners	Non-Italian resident over total population	Muncip.	2001	Census of Population 2001, ISTAT
Bank branches	Number of bank branches	Muncip.	2001	Atlante Stastico Comunale, ISTAT
Share of graduates	Hi-school graduates (diplomati) over total population	Muncip.	2001	ISTAT
Crime	Number of reported crime over total population	Muncip.	2004-2009	Italian Interior Ministry
Local tax rate		Muncip.		Bank of Italy

Table 2: Descriptive statistics

VARIABLES	Mean	s.d.	Mean	s.d.
Sample	All (2,163)		Border (1,131)	
Av. plant size	8.3	5.5	8.2	5.6
Plants/pop.	0.011	0.006	0.011	0.007
Empl/.pop.	0.1	0.095	0.1	0.094
EWAS	88	249	92	296
Average turnover 2008-9	6,291	19,687	6,114	12,221
Turnover growth 2001-9	1.4	0.74	1.4	0.85
Length civil	931	307	914	301
Length labour	718	297	725	309
Length criminal	299	152	311	161
Population	20,577	73,029	24,167	97,320
Foreigner share	0.021	0.015	0.021	0.015
Bank branches	10	42	12	55
Share of graduates	0.23	0.042	0.23	0.042
Nr of crimes/pop.	0.15	0.86	0.15	0.96
Litigation rate	0.0062	0.0019	0.0063	0.002
Local tax rate	6.2	0.68	6.3	0.68

Table 3: Full sample of municipalities

VARIABLES	(1) Av. plant size	(2) Plants/pop.	(3) Employment/pop.	(4) EWAS
Length civil	0.090	0.073	0.163	0.175
	(0.058)	(0.088)	(0.113)	(0.124)
Length labour	0.020	0.016	0.036	0.081
	(0.039)	(0.059)	(0.073)	(0.085)
Length criminal	-0.094**	-0.059	-0.153*	-0.140
	(0.045)	(0.058)	(0.084)	(0.090)
Population	0.081***	-0.075***	0.006	0.515***
	(0.018)	(0.015)	(0.028)	(0.039)
Litigation rate	-0.006	0.079	0.073	-0.038
	(0.041)	(0.064)	(0.080)	(0.093)
Share of foreigners	-0.002	0.075***	0.073**	0.007
	(0.021)	(0.024)	(0.036)	(0.041)
Bank branches	0.001	0.125***	0.126**	0.047
	(0.034)	(0.035)	(0.060)	(0.073)
Share of graduates	0.235***	-0.387***	-0.152	0.647***
	(0.085)	(0.086)	(0.141)	(0.175)
Crime	-0.017	-0.017	-0.034	-0.015
	(0.032)	(0.034)	(0.056)	(0.068)
Local tax rate	-0.128	-0.418***	-0.546***	-0.177
	(0.099)	(0.096)	(0.156)	(0.234)
Constant	1.874***	-2.239***	-0.365	0.204
	(0.696)	(0.823)	(1.192)	(1.294)
Observations	2,185	2,185	2,185	2,185
R-squared	0.444	0.497	0.554	0.387

Robust standard errors in parentheses. All variables are in logarithms.
All regressions include regional fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Border municipalities, without additional controls

	(1)	(2)	(3)	(4)
VARIABLES	Av. plant size	Plants/pop.	Employment/pop.	EWAS
Length civil	-0.175**	-0.107	-0.282*	-0.476**
	(0.080)	(0.099)	(0.157)	(0.196)
Length labour	-0.016	0.096*	0.080	0.002
	(0.041)	(0.056)	(0.082)	(0.084)
Length criminal	-0.108**	-0.045	-0.153	-0.149
	(0.048)	(0.068)	(0.098)	(0.123)
Constant	3.601***	-4.325***	-0.723	7.259***
	(0.631)	(0.716)	(1.154)	(1.490)
Observations	1,061	1,061	1,061	1,061
R-squared	0.624	0.658	0.715	0.499

Robust standard errors in parentheses. All variables are in logarithms.
All regressions include border group fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Border municipalities, with additional controls

	(1)	(2)	(3)	(4)
VARIABLES	Av. plant size	Plants/pop.	Employment/pop.	EWAS
Length civil	-0.221**	-0.112	-0.333*	-0.503**
	(0.103)	(0.112)	(0.187)	(0.227)
Length labour	-0.012	0.089	0.077	0.024
	(0.045)	(0.060)	(0.089)	(0.101)
Length criminal	-0.133**	-0.009	-0.142	-0.133
	(0.056)	(0.069)	(0.104)	(0.132)
Population	0.043	-0.057**	-0.014	0.442***
	(0.028)	(0.023)	(0.044)	(0.061)
Litigation rate	0.011	0.047	0.058	-0.114
	(0.049)	(0.068)	(0.096)	(0.127)
Share of foreigners	0.025	0.072*	0.096*	0.056
	(0.045)	(0.040)	(0.055)	(0.096)
Bank branches	0.048	0.127**	0.175*	0.155
	(0.069)	(0.049)	(0.097)	(0.143)
Share of graduates	0.341*	-0.547***	-0.206	1.137***
	(0.177)	(0.139)	(0.227)	(0.384)
Crime	-0.025	0.027	0.001	-0.070
	(0.061)	(0.064)	(0.099)	(0.133)
Local tax rate	0.046	-0.521***	-0.476*	-0.060
	(0.185)	(0.150)	(0.256)	(0.422)
Constant	4.451***	-2.168*	2.283	5.126**
	(1.227)	(1.269)	(2.055)	(2.439)
Observations	1,019	1,019	1,019	1,019
R-squared	0.644	0.697	0.726	0.592

Robust standard errors in parentheses. All variables are in logarithms.
All regressions include regional and border group fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Effect on turnover: level and growth

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Average turnover 2008/09			Av. turnover growth 2001-09		
Sample	All	Border	Border	All	Border	Border
Av. turnover 2001/02				-0.025		-0.050*
				(0.016)		(0.028)
Length civil	0.049	-0.408*	-0.371	0.061	-0.223**	-0.187*
	(0.128)	(0.233)	(0.250)	(0.053)	(0.086)	(0.103)
Length labour	0.076	0.018	0.053	0.031	-0.036	-0.019
	(0.077)	(0.139)	(0.140)	(0.029)	(0.049)	(0.055)
Length criminal	-0.176*	-0.366**	-0.266	-0.017	-0.116	-0.152
	(0.096)	(0.155)	(0.180)	(0.032)	(0.088)	(0.111)
Litigation rate	0.060		0.087	-0.022		0.010
	(0.089)		(0.134)	(0.032)		(0.065)
Population	0.236***		0.182***	0.030**		0.010
	(0.037)		(0.047)	(0.012)		(0.025)
Share of foreigners	0.086*		0.181*	-0.023		0.028
	(0.044)		(0.100)	(0.016)		(0.040)
Bank branches	0.146*		0.210	-0.003		-0.022
	(0.078)		(0.139)	(0.031)		(0.067)
Share of graduates	-0.105		0.121	-0.074		-0.098
	(0.192)		(0.424)	(0.066)		(0.166)
Crime	-0.055		-0.089	-0.009		0.013
	(0.059)		(0.131)	(0.026)		(0.045)
Local tax rate	-0.491**		-0.176	-0.132		0.204
	(0.216)		(0.436)	(0.101)		(0.178)
Constant	9.010***	13.411***	13.555***	-0.509	2.667***	2.357*
	(1.455)	(2.128)	(2.787)	(0.582)	(1.001)	(1.304)
Observations	1,942	984	967	1,942	984	967
R-squared	0.299	0.512	0.549	0.025	0.306	0.328

Robust standard errors in parentheses. All variables are in logarithms.
All regressions include regional and border group fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Robustness: sorting within jurisdictions

VARIABLES	(1) Av. plant size	(2) Plants/pop.	(3) Employment/pop.	(4) EWAS	(5) Av. turnover growth 2001-09
badside	-0.048	-0.027	-0.074	-0.077	0.014
	(0.030)	(0.032)	(0.049)	(0.067)	(0.026)
goodside	0.015	0.038	0.053	0.045	0.026
	(0.033)	(0.035)	(0.056)	(0.071)	(0.027)
Other controls	YES	YES	YES	YES	YES
Observations	2,051	2,051	2,051	2,051	1,942
R-squared	0.506	0.615	0.627	0.445	0.132

Robust standard errors in parentheses. All variables are in logarithms.
All regressions include regional and border group fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Robustness: excluding jurisdictions coinciding with provinces

VARIABLES	(1)	(2)	(3)	(4)
	Av. plant size		EWAS	
Length civil	-0.206**	-0.283*	-0.641***	-0.534
	(0.091)	(0.151)	(0.225)	(0.348)
Length labour	-0.001	0.012	0.088	0.105
	(0.074)	(0.081)	(0.157)	(0.174)
Length criminal	-0.137**	-0.157**	-0.327*	-0.300
	(0.067)	(0.073)	(0.172)	(0.191)
Other controls	NO	YES	NO	YES
Observations	687	646	687	646
R-squared	0.632	0.669	0.538	0.643

Robust standard errors in parentheses. All variables are in logarithms.
Regressions in columns 2 and 4 include regional fixed effects.
All regressions include border group fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Robustness: one variable at the time and alternative index

	(1)	(2)	(3)	(4)
VARIABLES			Av. plant size	
Length civil	-0.253**			
	(0.102)			
Length labour		-0.063		
		(0.045)		
Length criminal			-0.155***	
			(0.054)	
Length civil				-0.249***
(alternative index)				(0.095)
Other controls	YES	YES	YES	YES
Observations	1,019	1,019	1,019	1,019
R-squared	0.642	0.640	0.642	0.642

Robust standard errors in parentheses. All variables are in logarithms.
All regressions include regional and border group fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

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