Large Courts, Small Justice!

The inefficiency and the optimal structure of the justice sector

Antonio Peyrache*   Angelo Zago†

May 2015

Abstract. An important problem in the public sector, given the lack of output prices and exit decisions to sanction inefficient units, is finding the optimal industry structure. We apply a novel approach to the Italian courts of justice, the typical example of a sector in the public domain with a small size but important effects on economic agents' behavior, firm size, FDI, and on the overall economy. The suggested approach allows to decompose the courts inefficiency into different sources and to investigate the optimal structure of the judicial sector. Results show that technical inefficiency (lack of best practice) is almost 40% of total inefficiency, while size inefficiency (courts that are too big) is about 35%. The remaining is represented by input reallocation (17%) and merger (10%) inefficiencies. Given the relative difficulty of adopting best practices in inefficient courts, we suggest that the single most effective policy intervention would be splitting the biggest courts. We contrast this policy suggestion with the recent Monti's government decision to merge smaller courts to save on building costs, arguing that these implemented mergers might in fact worsen Italian courts efficiency.

*School of Economics, University of Queensland, St. Lucia, Qld. 4072, Australia. a.peyrache@uq.edu.au

†Dipartimento di Scienze Economiche, Università degli Studi di Verona, Via dell'Artigliere, 19, Verona 37129, Italy. angelo.zago@univr.it

1 Introduction

The 2008 financial crisis and the following sovereign debt crisis have produced a growing awareness of the need for structural reforms in the public sector. The idea is that these reforms should increase the efficiency of public service delivery and sustain higher economic prosperity. One of these reforms concerns the structure of the judicial system and its effects on the enforcement of contracts. With reduced public funds available, an underfunded and unreformed court system could weaken the economy and the access to justice (Economist, 2011). Some radical proposals in the UK suggest that courts could even be privatized (Gibb and Ford, 2013).

Although small in size when compared to the whole economy, the judicial system (and the rule of law) has a very significant impact on economic behaviour, investment choices and economic development (Aldashev, 2009). This impact is even greater in a situation where economic growth becomes so urgent in order to overcome budget deficits and repay public debts in the long run. A particularly negative effect of the delays in justice delivery is that economic agents (households and firms) might exploit them in order to strategically postpone their contractual obligations to other parties. For example, debtors might sue their creditors hoping to obtain a substantial delay of the repayment deadline (see, e.g., Bianco et al., 2002). Court inefficiencies have also a detrimental impact on firm size (see, e.g., Dougherty, 2013).

The judicial sector is also one typical example of a critical sector of the economy where the market system cannot work properly given the absence of a functioning output price mechanism. Lack of output price information means that it is difficult for agents to sanction inefficient units.[1] Therefore, it becomes particularly useful to envisage a method to measure the inefficiency and the potential optimal structure of the sector in order to set effective policies aimed at improving its overall efficiency.

In this paper, we investigate the efficiency of courts of justice, proposing an approach for estimating the optimal structure of the judicial sector. Efficiency analysis of courts of justice has received relatively limited attention in the literature (for a partial survey see St. Aubyn, 2008). More common are partial performance measures, such as trial length and the number of cases defined per judge (see CEPEJ, 2010). Efficiency analysis, however, allows the measurement of performance taking into account all the resources used and all the outcomes produced. The reason for the paucity of papers investigating judicial system efficiency might be that data at the court level are

[1] In addition, citizens cannot choose the court where their cases are processed. On the contrary, there is a fixed bureaucratic rule which assigns cases to the local court district.

difficult to obtain. In this paper, we use a rich dataset - describing all the Italian courts of justice (165 observations) from 2003 to 2008 - which allows us to estimate the overall efficiency of the judicial system.

By international standards, the Italian judicial system is quite inefficient. According to the World Bank's *Doing Business 2012*, in terms of enforcing contracts, Italy ranks 158^{th} out of the 183 countries covered in the survey (compare this, for example, to Germany (8^{th}), Belgium (20^{th}), UK (21^{st}), and Spain (54^{th})). In 2011, the average citizen had to wait about 900 days to obtain a trial with judgment (World Bank, 2012). In addition, while in Europe, the average disposition time for litigious civil and commercial cases was 282 days (median of 206), in Italy it was of 533 days (2008 data). In fact, of the 35 European countries considered in the survey, only Monaco, San Marino, Bosnia & Herzegovina and Malta were less efficient than Italy (CEPEJ, 2010).

The average trial's length is quite different across Italian regions as well (following in this the traditional dual structure of the Italian economy): in the poorer and less industrialized Southern regions the average length of trials is double that of the richer and industrialized Northern regions (Figure 1, top panel). The strategic use of judicial system inefficiencies can also (partially) explain the pattern of the demand for justice, which is higher (Figure 1, middle panel) in those areas with higher trial duration time, even though economic activity in those areas is considerably lower (Figure 1, bottom panel).

The detrimental impact of judicial inefficiencies on the Italian economy has been estimated to be a loss of about 1% of GDP (Draghi, 2011).[2] This loss is troublesome for a country like Italy, which in the last decade has lagged behind in terms of GDP growth compared to almost all other countries. In addition, that an inefficient judicial system may hinder firms' growth is particularly significant for Italy, considering that the average size of its firms is among the smallest in OECD countries (Alesina and Giavazzi, 2011; Giacomelli and Menon, 2013).

Because Italy is the third economy in Europe and a founding member of the Union, it is not surprising that international commentators have been focusing on the Italian case as representative of what is happening in Europe. In fact, Italy has a high public debt and a structural lack of much needed economic and institutional reforms. Because enforcement of law is one of the key factors that promotes a healthy economy, the reform of the judicial sys-

[2] Chemin (2009) investigates the positive impact of a judiciary reform in Pakistan through its effects on entrepreneurship. Using a difference-in-difference approach, he finds that a reform that cost 0.1% of GDP had a positive impact estimated at 0.5% of GDP.

tem may play a pivotal role for the long-term growth of the Italian economy and hence the sustainability of its public debt. It is also for this reason that the European Union recommends reducing the length of trials (see, e.g., the Council recommendation of 12 July 2011). The inefficiencies of the judicial system and the policy recommendations have motivated the implementation of public policies aiming at a reduction of trials' durations. The last series of measures, enacted in September 2012 by the Monti Goverment, have established the merger of 31 small size courts (out of 165 at the national level) with geographically adjacent larger ones.[3] However, the need for a rigorous analysis of the different policies seems pressing.

In this paper, we propose a methodology for estimating the optimal structure of the judicial sector and the efficiency of courts of justice. In order to reach this objective, we employ the directional distance function (DDF) (see Chambers et al., 1996) to measure inefficiency at the court level. DDF, a generalization of the more traditional radial distance functions (see, e.g., Grosskopf et al., 1995), requires information on quantities (inputs and outputs) without any reference to prices, and it can be easily computed using linear programming.

The optimal structure of the sector is identified by employing a comprehensive method which looks at efficiency gains potentially realizable thanks to size economies and reallocation effects (Peyrache, 2013). When courts are freely adjustable in size, they can be split (if too big) or merged with other contiguous ones (if too small). This, of course, implies a court level production technology which is non-additive and operates under variable returns to scale. The size economies argument can be easily understood by thinking of a classical U-shaped average cost function, with increasing returns which revert to decreasing returns after an optimal point (along a specified output ray). In fact, courts face increasing returns to scale when they are small due to economies of specialization of judges (specialized judges are more productive than non-specialized ones); after a certain point, this positive effect of specialization is offset by congestion and management costs that basically lead to coordination failures and lower productivity.

We define size inefficiency all those inefficiencies that result from courts operating on too as large a scale and would benefit from a break-up. Merger inefficiencies are, on the contrary, all those inefficiencies that arise because courts are operating on too small a scale and would benefit from mergers with other units.

Therefore, gains in production (i.e., trials length reduction) can be obtained via three very different channels and policies: i) technical inefficiency

[3]It is the legislative decree no. 155 of September 9th, 2012.

reduction via adoption of best practices; ii) break-ups of large courts which are operating on a too big scale; iii) mergers of small courts in order to exploit economies of specialization. These three main channels will also generate different components of inefficiency for the sector. And these different components can be added together in an overall measure of sector inefficiency.

Among the good features of the empirical model proposed in this study, we advocate the following: it does not require price information and is therefore generally applicable to public sector efficiency evaluation (for example health, education, public transport, etc.); it is easy to implement via linear programming; and it provides a comprehensive view of overall inefficiency by looking at size/merger inefficiency in addition to best practice efficiency. This last point is especially important considering that the evaluation of mergers and break-ups in the public sector is very difficult to implement because the relevant output price information is missing and because inefficient units do not exit the sector (via bankruptcy) as instead happens in a market economy.

Our empirical results indicate that for the Italian courts of justice, one third of total inefficiency is due to size inefficiency, implying that a significant reduction in trial length could be effectively achieved by splitting the largest courts of the sample. However, merger inefficiency represents only one tenth of the total inefficiency of the sector. The other important component is technical inefficiency (lack of best practice adoption).

We also find that while technical inefficiency follows the traditional Italian economic dualism, the size inefficiency component is homogeneously distributed across all the regions. This homogeneous distribution is probably due to the administrative rule, which establishes the presence of a fixed number of courts per district,[4] thus not allowing economies of scale to be appropriately exploited (for example, big cities have only one court, while they should have many).

This evidence suggests that a policy aimed at exploiting these size economies by means of break-ups would be an important contributing factor for improving overall sector efficiency. The government's last intervention, which had the objective of reducing public spending, goes in the opposite direction and establishes that some of the smaller courts should be merged into adjacent larger ones. While probably effective in reducing fixed costs of production, this policy is not necessarily the most appropriate if we approach the problem from an efficiency perspective: our estimated merger efficiency (that can be considered an upper bound for the increase in efficiency that might follow

[4]The territorial distribution of Italian courts mostly resembles the one designed after the country unification, in 1865, which was based on the ones prevailing with the previous states (Giacomelli and Menon, 2013).

from the proposed mergers) is only one tenth of overall industry inefficiency and should not be the priority of policy intervention. In addition, since many courts that are to be closed should merge with larger ones, the risk is in fact that these merging operations might worsen the overall inefficiency of the sector and increase the adverse effects on long-run economic development.

The paper is organized as follows. In section 2, we explain the methodology adopted and we describe the dataset in section 3. Section 4 discusses our main empirical results. Section 5 gives a brief discussion of the main policy implications of this research. Finally, we offer our conclusions in section 6.

2 Methodology

In this section, for the sake of simplicity, we use the industrial organization phrasing, i.e., industry vs. firms instead of justice sector vs. courts. This phrasing, of course, does not affect the methodology, but it will make the findings more easily understandable. Consider an industry (or sector) where $\mathbf{x} \in R_+^N$ inputs produce $\mathbf{y} \in R_+^M$ outputs. Observations for a panel data are collected into two matrices: the input matrix $\mathbf{X}^t = \left[\begin{array}{ccc} \mathbf{x}_1^t & ... & \mathbf{x}_K^t \end{array}\right]$ of dimension $K \times N$ for each time period and the output matrix $\mathbf{Y}^t = \left[\begin{array}{ccc} \mathbf{y}_1^t & ... & \mathbf{y}_K^t \end{array}\right]$ of dimension $K \times M$ for each time period. The collection of these matrices:

$$\left(\mathbf{X}^t, \mathbf{Y}^t\right), \quad t = 1, ..., T, \tag{1}$$

can represent the dataset.

We define the *firm* production possibility set (or production set, or technology) as the variable returns to scale data envelopment (DEA) of the set of observations at time t:

$$\Psi^t = \left\{(\mathbf{x}, \mathbf{y}) : \lambda \mathbf{X}^t \leq \mathbf{x}, \lambda \mathbf{Y}^t \geq \mathbf{y}^t, \sum \lambda_k = 1, \lambda \geq \mathbf{0}\right\}. \tag{2}$$

We define the *group* technology (or *aggregate* technology) for a number $S \in \mathbb{N}$ of firms as the sum of those firm technologies (see Färe et al., 2008; Nesterenko and Zelenyuk, 2007; and Li and Ng, 1995):

$$\Psi^t\left(S\right) = \sum_{j=1}^{S} \Psi^t. \tag{3}$$

The *industry* production technology (as different from the *firm* production technology and the *aggregate* production technology) is defined as the union of all the possible aggregate production technologies:

$$\Psi_I^t = \bigcup_{S=1}^{+\infty} \Psi^t(S). \tag{4}$$

The firm and the aggregate technologies (2) and (3) are subsets of the industry technology (4), as can be seen from Figure 2 (top panel) in the case of a one input - one output technology. The firm technology, Ψ^t, is given by the bold line. The aggregate technologies, $\Psi^t(2)$ and $\Psi^t(3)$, are given by the dotted lines. Last, the industry technology, Ψ^t_I, is an enlargement of the firm technology and is represented by the dashed line.

The industry technology can be easily represented by changing the intensity constraint of the DEA program and transforming it into a mixed integer linear program:

$$\Psi^t = \left\{(\mathbf{x}, \mathbf{y}) : \lambda \mathbf{X}^t \leq \mathbf{x}, \lambda \mathbf{Y}^t \geq \mathbf{y}^t, \sum \lambda_k = S, \lambda \geq \mathbf{0}\right\}. \tag{5}$$

The firm directional distance function (DDF) expressses a functional representation of firm technology and is given by:

$$D^t\left(\mathbf{x}, \mathbf{y}, \mathbf{g}_x, \mathbf{g}_y\right) = sup_\beta \left\{\beta : (\mathbf{x} - \mathbf{g}_x\beta, \mathbf{y} + \mathbf{g}_y\beta) \in \Psi^t\right\}. \tag{6}$$

The DDF is searching the maximum expansion of outputs and contraction of inputs along the direction $(\mathbf{g}_x, \mathbf{g}_y)$, which is feasible with technology (2). For this reason, the DDF can be interpreted as an absolute measure of technical inefficiency, representing the firm physical output loss and inputs waste measured in terms of a fixed numeraire.

Its associated DDF gives a functional representation of the industry technology (4):

$$D^t_I(\mathbf{x}, \mathbf{y}, \mathbf{g}_x, \mathbf{g}_y) = sup_\beta \left\{\beta : (\mathbf{x} - \mathbf{g}_x\beta, \mathbf{y} + \mathbf{g}_y\beta) \in \Psi^t_I\right\}. \tag{7}$$

While the firm DDF (6) is a standard linear program, the industry DDF (7) requires solving a mixed integer linear program. The optimal solution will return the value of the DDF and an integer value for the intensity vector constraint. The optimal value of the intensity vector is interpreted as the optimal number of firms that should populate the industry if production has to be delivered efficiently.

2.1 Industry efficiency

The firm DDF (6) can be computed for each firm in the dataset and can be summed up (due to the fact that it is an additive notion) into an index of industry technical efficiency:

$$ITE^t = \sum_{k=1}^{K} D^t\left(\mathbf{x}^{\mathrm{t}}_{\mathrm{k}}, \mathbf{y}^{\mathrm{t}}_{\mathrm{k}}, \mathbf{g}_x, \mathbf{g}_y\right). \tag{8}$$

This indicator is a measure of waste in inputs and loss in outputs at the industry level due to the technical inefficiencies of the firms actually operating in the industry. We now define the total observed inputs and outputs at time t for the entire industry as: $\mathbf{I}^t = \sum \mathbf{x}_k^t$, $\mathbf{Q}^t = \sum \mathbf{y}_k^t$. The following mixed integer linear program indicates a measure of industry efficiency:

$$IE^t = D_I^t \left(\mathbf{I}^t, \mathbf{Q}^\mathbf{t}, \mathbf{g}_x, \mathbf{g}_y\right). \tag{9}$$

Here, we should note that even if all the firms in the industry are technically efficient (i.e., ITE=0), the industry could still be inefficiently organized (i.e., $IE^t > 0$). The discrepancy between the two indicators is a measure of organizational inefficiency of the industry:

$$IOE^t = IE^t - ITE^t. \tag{10}$$

This indicator cannot be smaller than zero ($ITE^t \leq IE^t$) and represents the inefficiency arising from the way the industry structure. Three main effects comprise this indicator: first, inefficiencies arising from firms that are operating on a too large scale and could be conveniently split into smaller firms; second, firms that are producing on a small scale and may be merged with other firms in order to exploit economies of scale and scope; third, re-allocation of inputs across firms. These components are defined in the following sub-sections.

2.2 Size Inefficiency and break-ups

Size inefficiency is defined as:

$$SE^t \left(\mathbf{x}_\mathrm{k}^\mathrm{t}, \mathbf{y}_\mathrm{k}^\mathrm{t}, \mathbf{g}_x, \mathbf{g}_y\right) = D_I^t \left(\mathbf{x}_\mathrm{k}^\mathrm{t}, \mathbf{y}_\mathrm{k}^\mathrm{t}, \mathbf{g}_x, \mathbf{g}_y\right) - D^t \left(\mathbf{x}_\mathrm{k}^\mathrm{t}, \mathbf{y}_\mathrm{k}^\mathrm{t}, \mathbf{g}_x, \mathbf{g}_y\right). \tag{11}$$

The firm is said to be size inefficient if $SE^t \left(\mathbf{x}_\mathrm{k}^\mathrm{t}, \mathbf{y}_\mathrm{k}^\mathrm{t}, \mathbf{g}_x, \mathbf{g}_y\right) > 0$. If a firm is size inefficient, it can be split into a number of smaller units inducing a gain in production efficiency. Size inefficiencies of individual firms can be summed up to obtain an indicator of size inefficiency at the industry level:

$$ISE^t = \sum_{k=1}^{K} SE^t \left(\mathbf{x}_\mathrm{k}^\mathrm{t}, \mathbf{y}_\mathrm{k}^\mathrm{t}, \mathbf{g}_x, \mathbf{g}_y\right). \tag{12}$$

This last indicator represents the gain in production that could be obtained if all the large firms were split into an optimal number of smaller units. In Figure 2 (bottom panel) we give an example of size efficiency. Firm

B is size efficient: no gain in production can be obtained by splitting it into separate firms. Notice that firm B is operating in a decreasing returns to scale region, i.e., decreasing returns are not sufficient for size inefficiency to arise. On the other hand, firm C is size inefficient, since by splitting it into two separate firms it is possible to gain $SE = y'_C - y_C$ in production at the industry level. Analogously, by splitting firm D into three separate firms it is possible to increase industry production by $SE = y'_D - y_D$.

2.3 Mergers

A merger between firm A and firm B leads to a gain in production if:

$$\begin{aligned} ME^t\left(\mathbf{x}^{\mathrm{t}}_{\mathrm{A}}+\mathbf{x}^{\mathrm{t}}_{\mathrm{B}}, \mathbf{y}^{\mathrm{t}}_{\mathrm{A}}+\mathbf{y}^{\mathrm{t}}_{\mathrm{B}}, \mathbf{g}_x, \mathbf{g}_y\right) &= D^t\left(\mathbf{x}^{\mathrm{t}}_{\mathrm{A}}+\mathbf{x}^{\mathrm{t}}_{\mathrm{B}}, \mathbf{y}^{\mathrm{t}}_{\mathrm{A}}+\mathbf{y}^{\mathrm{t}}_{\mathrm{B}}, \mathbf{g}_x, \mathbf{g}_y\right) - \\ &\quad -D^t\left(\mathbf{x}^{\mathrm{t}}_{\mathrm{A}}, \mathbf{y}^{\mathrm{t}}_{\mathrm{A}}, \mathbf{g}_x, \mathbf{g}_y\right) - \\ &\quad -D^t\left(\mathbf{x}^{\mathrm{t}}_{\mathrm{B}}, \mathbf{y}^{\mathrm{t}}_{\mathrm{B}}, \mathbf{g}_x, \mathbf{g}_y\right) \geq 0. \end{aligned} \tag{13}$$

In other words, the combined firm has more potential for expansion of outputs (and contraction of inputs) than the two original firms taken separately. Furthermore, the technology is locally super-additive at the point where the merger is evaluated. All the possible combinations of firms observed in the dataset can be evaluated with the previous formula in order to determine the overall gain in production obtainable by merger operations. This overall gain in production can be summed up with a single indicator for the whole industry (IME).[5]

2.4 Structural decomposition of industry inefficiency

Once all the possible break-ups and mergers have been considered, there is a residual component of inefficiency arising at an industry level due to possible re-allocation effects of inputs across firms. This indicator is defined as the deviation between the industry organizational indicator and the indicators defined in the previous two sections: $IRE^t = IOE^t - ISE^t - IME^t$. With all those components in place, the industry inefficiency indicator (9) can be conveniently decomposed in the following way:

$$IE^t = ITE^t + ISE^t + IME^t + IRE^t. \tag{14}$$

The left-hand side reflects a measure of loss in outputs and waste in inputs at the industry level. The right-hand side imputes this inefficiency to different

[5] In Peyrache (2013), the interested reader can find further details and a graphical representation of mergers inefficiency.

components: inefficiency arising from technical inefficiency of the individual firms (ITE), inefficiencies arising from individual firm size inefficiencies (ISE), potential gains from merger operations (IME), and potential gains from reallocation of inputs accross firms (IRE). A more direct interpretation of this decomposition can be expressed in percentage terms:

$$\%ITE^t + \%ISE^t + \%IME^t + \%IRE^t = 1, \tag{15}$$

where $\%ITE^t = \frac{ITE^t}{IE^t}$, $\%ISE^t = \frac{ISE^t}{IE^t}$, $\%IME^t = \frac{IME^t}{IE^t}$ and $\%IRE^t = \frac{IRE^t}{IE^t}$. This equation (14) measures inefficiency as an absolute number (e.g., the total number of additional cases that could be potentially processed in each year). It allows for comparing performance in absolute terms but poses some problems if one is interested in a relative measure of inefficiency. To overcome this problem, we computed an indicator that allows for a straightforward comparison in relative terms (i.e., a number between zero and one, see next section).

3 Input and Output Specification and Data

The measures we have available for inputs and outputs are the following. For outputs, we consider the number of cases that were processed in a particular year, distinguishing between civil and criminal cases (two outputs). For the inputs, we consider the number of judges (distinguishing between professional and non-professional judges) and the number of non-judges staff (mainly administrative staff). We also consider the number of pending cases at the beginning of the year (again distinguishing between civil and criminal cases) as two additional inputs. This choice was first suggested by Lewin et al. (1982) and used by Marselli and Vannini (2004), and it is defended on common sense ground: without pending cases, there are no processed cases and therefore, no output. In general, in any system, there exists a percentage of pending cases, and these cases can be interpreted as an intermediate input stock (raw material inventory or working capital).

Table 1 reports descriptive statistics for the inputs and outputs available for the pooled sample of 165 courts over the period 2003-2008 (a total of 990 observations).[6] The average size in terms of defined civil cases is about double that of criminal cases with an increase in the last part of the period under consideration (2007 and 2008). The number of judges is stable over

[6]For the court of Bolzano, data on other staff is not available. We therefore imputed them using the *impute* command in *Stata* with the regression method and the number of judges and other staff as exogenuos variables.

time with a slight decline in 2008. Other staff decreased from an average of 100 employees in 2003 to about 96 in 2008. Last, the pending cases slightly decreased for the civil part while stayed quite the same for the criminal ones.

We set $g_x = 0$ and employ an *output* DDF with $g_y = 1$: the inefficiency measure associated with this numeraire represents the total number of cases that could be additionally (potentially) processed in a given year. This choice reflects two important features of our empirical problem. First, courts are given a limited quantity of input resources, and they are required to use those resources efficiently. Second, our interest focuses basically on reducing trial length in order to maximize the positive effects on the economy, but reducing trial length can be achieved only by increasing output production (and keeping the level of inputs fixed). These two arguments justify our choice of the directional vector.[7]

4 Empirical Results

4.1 Industry Efficiency and its Decomposition

Table 2 reports the aggregate results for each year and on average for the whole period. To reiterate, the industry inefficiency in absolute terms corresponds to the number of cases that would be possible to further process if the industry was to be organized efficiently. Industry inefficiency is on average slightly less than one million cases per year in our sample. This number compares to the actual number of cases processed and pending. Every year about 4 million cases are processed and about 4.5 millions are pending: if all inefficiencies were eliminated, about 1 million more of the pending cases could be processed in each year. In another sense, the average wait time for a case to be processed is above one year (and in fact every year half million pending cases will add to these figures); eliminating half of the inefficiency from the system would put it on a steady-state where the number of pending cases would not grow and the processing time would fall below one year.

Industry inefficiency grows in the first part of the period; it reaches a peak in 2005 and then decreases to the miminum of 891,000 cases in 2008, demonstrating an overall improvement in efficiency during the period under investigation. This pattern may be related to the Collective Clemency Bill passed in 2006 (for an analysis of its effects see Drago et al., 2009).

The other columns in Table 2 report the components embedded in the

[7]We performed some robustness checks by changing the directional vector. We found that the empirical results (and their policy implications) remain the same. These results are available upon request.

equation (14). Industry technical efficiency (ITE), which represents the summation of the courts technical inefficiencies (lack of best practice adoption), represents on average 38% of industry inefficiency that amounts to about 370,000 more cases per year that could be further processed. In other words, more than one third of the industry inefficieny is due to deviations from best practices. ITE is higher at the beginning of the period (with a peak of 41% in 2004), decreasing over time but with an increase in the last year considered, 2008. With the exception of 2007, ITE is the largest source of industry inefficiency.

The second most important source of industry inefficiency is size inefficiency (ISE). On average, this component accounts for about 35% of industry inefficiency, with about 335,000 more potential cases that could be processed every year. Breaking-up the largest courts can bring about this enhancement in efficiency. The trend over time is changing, but in almost all years, ISE represents at least one third of industry inefficiency, and in 2007, it is more significant than ITE itself.

Reallocation efficiency (IRE) is almost 17% of industry inefficiency, with about 163,000 cases that could be further defined every year by reallocating inputs across courts. IRE is variable over time, but it reaches a peak in 2007, with over 216,000 cases (i.e., almost a fourth of industry inefficiency). The last component is industry merger inefficiency (IME), which accounts on average for 10% of the total industry inefficiency: just above 102,000 cases on average could be potentially further processed each year by merging the smaller courts. IME is decreasing over time, starting from over 137,000 (14% of industry efficiency) in 2003 to 68,000 (7%) in 2008.[8]

To summarize, during the period under investigation and for the entire Italian judicial system, industry inefficiency (IE) is quite high - almost one million cases on average - but decreasing over time. The biggest component is technical efficiency (ITE), accounting for about 38% of total inefficiency, followed by size efficiency (about 35%), reallocation (17%) and merger (10%) efficiency. This decomposition allows to determine which source - and possibly which economic policy - is the most important for improving court efficiency. In fact, the first two components alone account for about 72% of the industry inefficiency and should definitely be the target of policy making. First, policy should push less performing courts to adopt best practices and increase their efficiency and hence the speed with which justice is deliv-

[8]Notice that when computing mergers, our Matlab algorithm does not impose any geographical constraint, that is mergers are possible between any court in the country. Since some of the mergers might not be practically feasible due to location of the potentially merging courts, this measure provides in fact an upper bound of the possible gains from court mergers.

ered. Second, large courts should be the target of break-up policy operations to eliminate inefficiencies associated with size and move courts back to the optimal operation point.

4.2 The Differences across Regions

In this section, we synthesize all the results provided so far with two aims. First, using the results in percentage terms, we want to have an efficiency ranking of the Italian regions. Second, using the inefficiencies expressed in absolute terms, we can focus on the regions where the inefficiency reduction would have the biggest impact in terms of additional processing of cases and thus in terms of shortening the length of trials nationwide.[9]

Considering overall industry inefficiency in relative terms, Valle d'Aosta and Trentino A.-A. are the most efficient regions, followed by Emilia-Romagna, Marche, Umbria, Veneto and Lombardia. The least efficient regions are in the South and on the Islands: Basilicata, Calabria, Sardegna and Sicilia are constantly among the worst performers during the period. In the Northwest, Liguria appears to be among the worst performers for all years (Figure 3, left panels).

By looking at the absolute values (Figure 3, right panels), however, it is worth noticing that Campania and Sicilia are the regions in which - for every year of the period 2003-2008 - the inefficiencies are above 100,000 potential cases per year. Lazio is the other major source of inefficiency with around 100,000 potential cases. (It actually goes above this number in the years 2004, 2007, and 2008.) If we were to concentrate policy interventions in selected areas, these three regions would be the primary target.

Consider now the diferent sources of (in)efficiency, and start with Industry technical Efficiency (ITE, see Figure 4). Here, the most efficient regions are in the North (for all years considered), while the worst performers are in the South. This means that the ITE component basically follows the dualism of the economy (see also Figure 4, right panels, where the inefficiency is in absolute values). Notice that although ITE is overall higher in the North, some efficient courts are present also in the centre of Italy (Toscana and Marche) and in the South and on the Islands (Calabria, Campania, Puglia, Sardegna and Sicilia). This trend is clearly visible when we consider the efficiency at the court level (see Figure 5). However, the efficient courts are mostly those in the North, and their number increases over time. In other words, there is a dualism between North and South in terms of courts

[9]In the following figures, due to space limitatios, we report only the results for even years, i.e., 2004, 2006 and 2008. Other results are available from the authors.

efficiency, and the differences seem to be increasing over the period under consideration.

Given these results, it seems that the major inefficiencies follow the traditional dual economy of the country. But this is not necessarily true if one looks at size efficiency (Figure 6). Here, the story is different, because size inefficiencies, although very strong in the South, are more homogeneously and pervasively present all across the country. In fact, even in the northern regions, size inefficiencies are the major component of industry overall efficiency. For example, Milano (the economic capital of the country, in the North) has pretty much the same size inefficiency as Palermo (in the South) and much higher than many of the cities of the South. Therefore, size inefficient courts are geographically distributed quite evenly across the country and they mostly coincides with the ones located in the largest cities such as Genova, Torino, Milano, Bologna, Firenze, Rome, Napoli, Bari, Catania and Cagliari. This is quite visible if we consider the distribution of size inefficiency in absolute values (Figure 6, right panels).

This evidence points to the fact that size matters across the country, and it does not have a structural relationship with the dualism of the Italian economy. In Figure 7, we consider explicitly the courts that should be split. Considering 2008, the last year for which we have data available, it appears that above one third of the courts are too big and should undergo breakup operations. We believe this is quite as stong a result, but probably it should not be surprising: the actual courts configuration is still based on that decided in 1865, when Italy was unified, but when its population was about of twenty-two million inhabitants (compared to about sixty millions now).

As a further piece of information we can provide with the approach we use in this study, we consider in how many smaller courts each large court should be divided (Table 3).[10] Roma, Milano and Napoli suffer from the most severe size inefficiency. Roma, in particular, could process, on average every year, over 58,000 additional cases, and in 2007, this number exceeded 71,000. This result suggests that about 5-7% of the national overall industry inefficiency is due to size inefficiency of the capital city. Napoli shows a similar figure, with an average of over 54,000 cases per year. In the North, Milano presents an average of over 26,000 cases representing size inefficiency, that is the increase in industry efficiency that could be attained by breaking it up.

[10] We only report those courts which should be split into more than three units.

5 Policy implications

This research emphasizes that the two main contributors to the inefficiency of the Italian judicial system are the lack of best practice adoption (technical inefficiency) and courts operating on a too large scale (size inefficiency). The first contributor is geographically distributed following the traditional North-South dualism of the Italian economy, with southern courts showing a difficulty in adopting best practices. The second contributor is instead homogeneously distributed all accross the country and does not reflect the typical economic dualism. These results suggest that the main reason behind such a detrimental growth in the dimension of the courts might be due to an institutional constraint. In fact, it still remains in place the organizational structure enacted after the unification of the country in 1865, with policies of the type one district-one court.

According to these findings, the two most important policies the government should pursue in order to increase the efficiency of the judicial sector are: *first*, best-practice adoption (especially in the South of the country); and *second*, break-ups of large courts. Adoption of best practices presents, of course, many challenges and could be inhibited by external factors that limit the speed by which these practices diffuse. On the other hand, an effective break-up policy for the larger courts should be implementable without major difficulties (abstracting from political/lobby resistance). Such policies would lead the system towards a higher processing capacity, reducing the number of pending cases. In the long term, the system would converge to a trial duration comparable with the other European countries, promoting a fairer justice system and higher economic growth.

If this is the bright side of the picture, the dark side is that in order to implement a break-up and increase the efficiency of the system, it may be necessary, in some cases, to increase the fixed cost of operations (e.g., new buildings, etc.). Increasing the fixed costs could probably be avoided by splitting courts only at the administrative level and keeping them operating in the same building, thus allowing for a zero cost break-up operation. In fact, if agglomeration economies are in place, such an operation could further improve the performance of courts.

The type of policies we are proposing in this study are somehow different from those that recent governments have proposed to implement. Because the problems associated with the Italian judicial system have quite a long history, there has also been a long lasting policy debate on the reforms needed in order to bring the system towards a more efficient operation. In 2008, for instance, the Ministry of Economy calculated the elasticity of scale of Italian courts (2006 data) and found that about 85% of them were too small (this evidence confirmed earlier results for the years 1996 and 2001; see Marchesi (2003; 2008)). The associated policy recommendation was "...to revise judiciary geography, by merging the smaller courts in order to realize economies of scale and specialization ..." (Commissione Tecnica per la Finanza Pubblica, 2008: 46).

More recently, the Monti government (appointed to manage the economic and political crisis in Italy) tried to implement a reform in order to meet the EU country-specific policy recommendations aimed at "reducing the length of contract law enforcement procedures " (Council of the European Union, 12 July 2011). However, the policy debate about this reform has been mainly driven from a (myopic?) cost reduction strategy. Mergers were proposed as the preferred tool to be used in order to close down the smaller courts and save on the fixed costs associated with court operations (mainly building maintenance). The main scientific justification of these operations was relying on the idea that such operations would have allowed to exploit economies of scale in the production of justice.

The evidence we provide shows that the array of policies needed to increase the efficiency of the judicial system is quite different. In fact, we find that merger operations would reduce the inefficiency of the system by (at most) 10% of the overall observed inefficiency. If one considers that the mergers proposed by the government are mainly based on a cost reduction strategy (rather than an efficiency enhancing strategy) this potential 10% is probably well out of reach. Moreover, of the 31 courts that should be closed, 20 will be merged with courts that are already size inefficient (see Table 4). All this means that the suggested operations might in fact increase size inefficiency, with only a possible modest reduction in merger inefficiency.[11]

6 Concluding remarks

The judicial system has a pivotal role in the enforcement of contracts, the definition of property rights and, therefore, for the proper functioning of market economies. In this paper, we estimate the efficiency of Italian courts of justice, the textbook example of a very inefficient system, with excessive length of trials that affects the lives of citizens, discourages foreign investments, and ultimately hinders economic growth.

We employ a methodology that allows for decomposing industry (or total) inefficiency into technical inefficiency, size efficiency, merger inefficiency

[11] In Table 4 we can see that the first proposal of reform, made public in July 2012, would have had a less detrimental effect on size inefficiency, since most of the "incorporating" courts were not too big. The second proposal of the government is in this sense pejorative.

and reallocation inefficiency. We find that the most important source of inefficiency is technical: by adopting best practices, courts (on average) could increase the number of defined cases by almost 40%. We also find a geographical dualism in the distribution of these inefficiencies, with efficient courts in the North and Centre and inefficient ones in the South and Islands. The second source of inefficiency (almost 35% of the total) is due to the size of the largest courts. We have shown that this second major source of inefficiency is homogeneously distributed accross all the country and is concetrated in the largest cities. Following this result, we proposed a policy of breaking ups of the largest courts with the aim of reducing their size and bringing them back to operate on a more desirable scale.

The methodology we adopt in this paper is particularly useful for services or sectors in the public domain where, given the absence of a functioning price mechanism, the market is unable to sanction inefficient units. Our analysis allows for individuating the units - whether these units be jurisdictions, regions, areas, etc. that are less efficient - and targeting them with policies aimed at reducing technical inefficiency, size inefficiency, merger inefficiency, or reallocation inefficiency. In other words, it becomes possible to set priorities by anticipating their impact on (in)efficiency and focus these policies to different geographical areas.

We find that the possible most effective policy intervention would be the splitting of large courts. However, the Monti government has recently implemented policies that apparently steer the course in an opposite direction. It has suggested a reduction in the number of courts by implementing merger operations (thus hoping to save on fixed costs). As we argue in the paper, the effect of these operations on overall industry inefficiency might be negligible (merger inefficiency is only a modest fraction of total industry inefficiency) or might even be pejorative. The risk is that, in fact, the overall inefficiency of the system will increase. Increased inefficiency would further weaken the rule of law and, ultimately, worsen long-term economic growth prospects.

References

Aldashev, G. (2009), 'Legal institutions, political economy, and development', *Oxford Review of Economic Policy* **25 (2)**, 257–270.

Alesina, A. and F. Giavazzi (2011), Giustizia lenta, imprese piccole, Corriere della sera, June 5, Milano.

Bianco, M., T. Jappelli and M. Pagano (2002), Courts and banks: effects of judicial enforcement on credit markets, Discussion paper no. 3347, CEPR.

CEPEJ (2010), European judicial systems (edition 2010), Strasbourg, European Commission for the Efficiency of Justice.

Chambers, R.G., Y. Chung and R. Färe (1996), 'Benefit and distance functions', *Journal of Economic Theory* **70(2)**, 407–419.

Chemin, M. (2009), 'The impact of the judiciary on entrepreneurship: Evaluation of Pakistan's "Access to Justice Programme', *Journal of Public Economics* **93**, 114–125.

Dougherty, S. M. (2013), Legal reform, contract enforcement and firm size in Mexico, working paper no. 1042, OECD Economics Department.

Draghi, M. (2011), Considerazioni finali, Technical report, Banca d'Italia.

Drago, F., R. Galbiati and P. Vertova (2009), 'The deterrent effects of prison: Evidence from a natural experiment', *Journal of Political Economy* **117(2)**, 257–280.

Economist, The (2011), The feeblest branch. an underfunded court system weakens the economy as well as access to justice, October 1st.

Färe, R., S. Grosskopf and V. Zelenyuk (2008), 'Aggregation of nerlovian profit indicator', *Applied Economics Letters* **15**, 845–847.

Giacomelli, S. and C. Menon (2013), Firm size and judicial efficiency: evidence from the neighbour's Court, Temi di discussione (working papers) no. 898, Banca d'Italia.

Gibb, F. and R. Ford (2013), Courts to be privatized in radical justice shake-up, May 28, The Times.

Grosskopf, S., K. Hayes and J. Hirschberg (1995), 'Fiscal stress and the production of public safety: A distance function approach', *Journal of Public Economics* **57**, 277–296.

Lewin, A., R. Morey and T. Cook (1982), 'Evaluating the administrative efficiency of courts', *OMEGA International Journal of Management Science* **4**, 401–411.

Li, S.K. and Y.C. Ng (1995), 'Measuring the productive efficiency of a group of firms', *International Advances in Economic Research* **1**, 377–390.

Marchesi, D. (2003), *Litiganti, avvocati e magistrati. Diritto ed economia del processo civile*, Il Mulino, Bologna.

Marchesi, D. (2008), L'enforcement delle regole. Problemi di efficienza della giustizia civile, riforme intraprese e riforme possibili, I temi dei rapporti trimestrali - Roma, ISAE.

Marselli, R. and M. Vannini (2004), L'efficienza tecnica dei distretti di corte d'appello italiani: aspetti metodologici, benchmarking e arretrato smaltibile, Working paper, CRENos.

Nesterenko, V. and V. Zelenyuk (2007), 'Measuring potential gains from reallocation of resources', *Journal of Productivity Analysis* **28**, 107–116.

of the European Union, Council (12 July 2011), Council recommendation, Strasbourg, Official Journal of the European Union.

Peyrache, A. (2013), 'Industry structural inefficiency and potential gains from mergers and break-ups: a comprehensive approach', *European Journal of Operational Research* **230**, 422–430.

St. Aubyn, M. (2008), Law and order efficiency measurement - A literature review, working paper no. 19, Technical University of Lisbon.

World Bank (2012), *Doing business 2012 - Italy*, World Bank, Washington.

Table 1: Inputs and outputs (990 obs.)

Variables	**2003** Mean (St.dev.)	**2004** Mean (St.dev.)	**2005** Mean (St.dev.)	**2006** Mean (St.dev.)	**2007** Mean (St.dev.)	**2008** Mean (St.dev.)
Outputs						
Defined cases, civil	15,507	15,800	15,809	15,426	16,186	16,844
	(24,962)	(25,258)	(24,644)	(24,209)	(24,877)	(25,638)
Defined cases, criminal	7,538	7,599	7,265	6,822	7,083	7,324
	(10,069)	(10,095)	(9,461)	(8,572)	(8,481)	(9,083)
Inputs						
Professional judges	28	28	28	28	28	27
	(45)	(45)	(45)	(45)	(45)	(44)
Non professional judges	12	12	12	12	12	11
	(17)	(17)	(16)	(16)	(17)	(16)
Other staff	100	99	97	96	93	96
	(141)	(139)	(136)	(133)	(129)	(131)
Pending cases, civil	21,775	21,257	20,998	21,014	21,231	21,106
	(33,761)	(32,527)	(32,001)	(31,883)	(31,817)	(31,990)
Pending cases, criminal	6,697	6,568	6,648	6,640	6,809	6,782
	(11,498)	(11,860)	(11,523)	(10,710)	(10,205)	(10,120)

Table 2: Industry Efficiency and its decomposition

Year	Industry Efficiency	Techical Efficiency	Size Efficiency	Mergers Efficiency	Reallocation Efficiency
2003	974,191	398,943	293,917	137,199	144,131
	(100%)	(40.95%)	(30.17%)	(14.08%)	(14.79%)
2004	1,027,415	425,037	355,633	126,770	119,974
	(100%)	(41.37%)	(34.61%)	(12.34%)	(11.68%)
2005	1,053,657	405,570	393,039	104,492	150,556
	(100%)	(38.49%)	(37.30%)	(9.92%)	(14.29%)
2006	937,714	338,590	307,819	100,168	191,138
	(100%)	(36.11%)	(32.83%)	(10.68%)	(20.38%)
2007	938,871	304,914	340,922	76,191	216,844
	(100%)	(32.48%)	(36.31%)	(8.12%)	(23.10%)
2008	891,493	350,037	319,292	68,007	154,157
	(100%)	(39.26%)	(35.82%)	(7.63%)	(17.29%)
Average	970,557	370,515	335,104	102,138	162,800
	(100%)	(38.11%)	(34.51%)	(10.46%)	(16.92%)

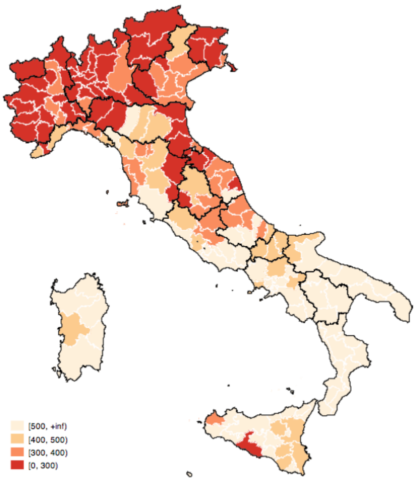
Table 3: Courts that Should be Splitted

Courts	**Area**	**Region**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Genova	N.-W.	Liguria	13,008	12,238	14,531	13,433	11,208	9,879
			(5)	(4)	(6)	(6)	(8)	(6)
Milano	N.-W.	Lombardia	31,491	23,545	28,672	29,060	29,479	18,242
			(10)	(14)	(12)	(12)	(11)	(13)
Torino	N.-W.	Piemonte	11,132	20,926	17,169	12,361	13,907	11,587
			(7)	(7)	(7)	(9)	(9)	(9)
Bologna	N.-E.	Emilia-Romagna	8,402	10,290	12,316	3,723	9,061	7,028
			(3)	(3)	(4)	(4)	(4)	(4)
Venezia	N.-E.	Veneto	2,782	9,981	8,190	3,804	6,459	5,008
			(3)	(3)	(3)	(3)	(3)	(4)
Firenze	Centre	Toscana	11,347	17,760	13,225	11,207	13,254	12,113
			(4)	(4)	(5)	(5)	(5)	(6)
Roma	Centre	Lazio	49,091	59,564	53,580	55,844	71,299	62,957
			(23)	(20)	(26)	(26)	(21)	(23)
Agrigento	Islands	Sicilia	1,512	1,377	2,395	3,417	2,138	0
			(2)	(2)	(4)	(4)	(3)	(1)
Cagliari	Islands	Sardegna	7,375	5,709	7,379	6,122	3,889	7,069
			(3)	(3)	(5)	(6)	(5)	(6)
Caltanissetta	Islands	Sicilia	2,324	1,525	2,601	2,820	2,017	1,157
			(2)	(2)	(3)	(4)	(3)	(2)
Catania	Islands	Sicilia	20,746	21,974	20,986	18,756	21,572	16,668
			(5)	(5)	(6)	(5)	(7)	(9)
Messina	Islands	Sicilia	2,381	1,974	3,930	4,203	4,387	5000
			(2)	(2)	(3)	(2)	(3)	(4)
Palermo	Islands	Sicilia	24,249	23,119	27,294	28,101	30,828	27,490
			(7)	(6)	(8)	(8)	(10)	(11)
Siracusa	Islands	Sicilia	2,398	672	3,520	2,233	1,641	3,817
			(2)	(2)	(3)	(2)	(3)	(5)
Bari	South	Puglia	0	11,953	5,545	7,502	0	3,614
			(1)	(4)	(4)	(4)	(1)	(5)
Brindisi	South	Puglia	1910	2,440	4,025	3,566	2,842	3,938
			(2)	(2)	(4)	(3)	(4)	(4)
Catanzaro	South	Calabria	3,835	2,432	3,310	4,638	3,873	0
			(2)	(3)	(4)	3)	(2)	(1)
Lecce	South	Puglia	6,001	3,456	7,949	4,984	5,194	7,578
			(3)	(2)	(5)	(2)	(4)	(5)
Napoli	South	Campania	55,760	70,592	62,056	47,203	44,061	47,426
			(9)	(9)	(12)	(10)	(16)	(13)
Reggio Cal.	South	Calabria	3,255	4,399	5,465	4,607	5,660	6,926
			(2)	(3)	(3)	(3)	(4)	(5)
Salerno	South	Campania	6,893	9,507	9,214	9,674	8,288	8,057
			(3)	(3)	(5)	(3)	(4)	(4)
Santa M.C.V.	South	Campania	5,172	13,352	17,026	5,466	11,063	12,848
			(5)	(4)	(4)	(3)	(4)	(4)

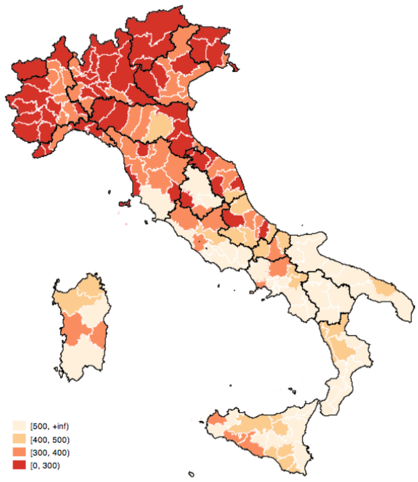
Table 4: Courts to be closed by the Monti's Government

Courts	Area	Region	Merging into[1,3]	Merging into[2]
Acqui Terme	North-West	Piemonte	Alessandria	Torino (9)
Alba	North-West	Piemonte	Asti	Torino (9)
Casale Monf.to	North-West	Piemonte	Alessandria	Torino (9)
Chiavari	North-West	Liguria	Genova	Genova
Crema	North-West	Lombardia	Cremona	Brescia (2)
Mondovì	North-West	Piemonte	Cuneo	Torino (9)
Pinerolo	North-West	Piemonte	Torino (9)	Torino (9)
Saluzzo	North-West	Piemonte	Cuneo	Torino (9)
Sanremo	North-West	Liguria	Imperia	Genova (6)
Tortona	North-West	Piemonte	Alessandria	Torino (9)
Vigevano	North-West	Lombardia	Pavia	Milano (13)
Voghera	North-West	Lombardia	Pavia	Milano (13)
Bassano D.G.	North-East	Veneto	Vicenza	Venezia (4)
Tolmezzo	North-East	Friuli V.G.	Udine (2)	Trieste
Camerino	Centre	Marche	Macerata (2)	Ancona
Cassino	Centre	Lazio	Frosinone	–
Montepulciano	Centre	Toscana	Siena	Firenze (6)
Orvieto	Centre	Umbria	Terni	Perugia (3)
Urbino	Centre	Marche	Pesaro (2)	Ancona
Ariano Irpino	South	Campania	Benevento (3)	Napoli (13)
Avezzano	South	Molise	Aquila	Aquila
Castrovillari	South	Calabria	Cosenza	–
Lamezia terme	South	Calabria	Catanzaro	–
Lanciano	South	Abruzzo	Chieti	Aquila
Lucera	South	Puglia	Foggia	Bari (5)
Melfi	South	Basilicata	Potenza	Potenza
Paola	South	Calabria	Cosenza	–
Rossano	South	Calabria	Cosenza (2)	Catanzaro
Sala Consilina	South	Calabria	Lagonegro	Salerno (4)
Sant'Angelo D.L.	South	Campania	Avellino (3)	Napoli (13)
Sulmona	South	Abruzzo	Aquila	Aquila
Vasto	South	Abruzzo	Chieti	Aquila
Caltagirone	Islands	Sicilia	Ragusa	–
Mistretta	Islands	Sicilia	Patti	Messina (4)
Modica	Islands	Sicilia	Ragusa	Catania (9)
Nicosia	Islands	Sicilia	Enna	Caltanissetta (2)
Sciacca	Islands	Sicilia	Agrigento	–

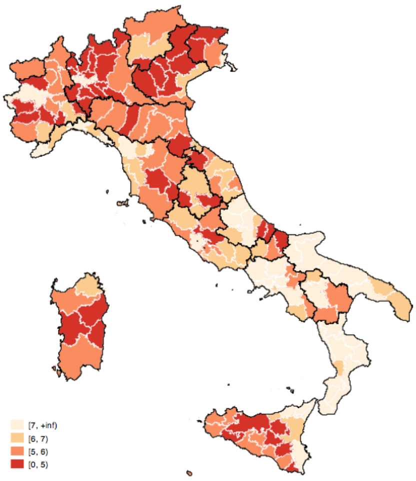
Legend: 1 = According to the first proposal, July 2012,
2 = According to the second proposal, enacted in September 2012.
3: If size inefficient, in brackets the n. of subunits it should be splitted into.



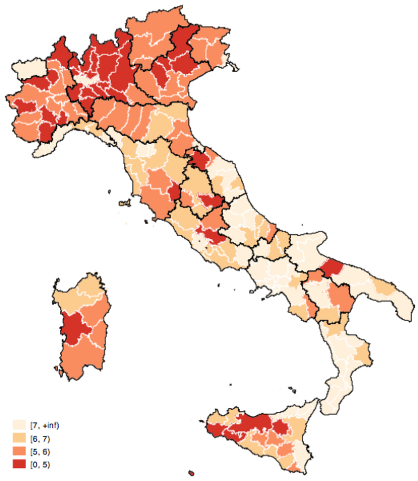
(a) Length of trials (days) - 2003



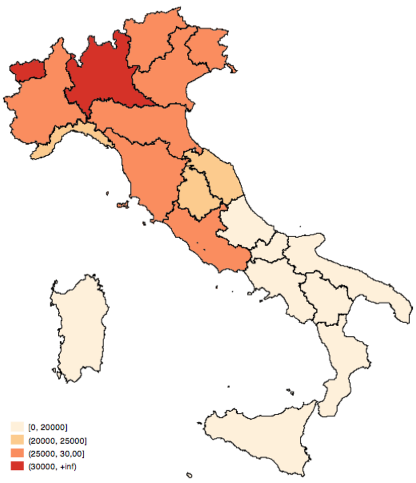
(b) Length of trials (days) - 2008



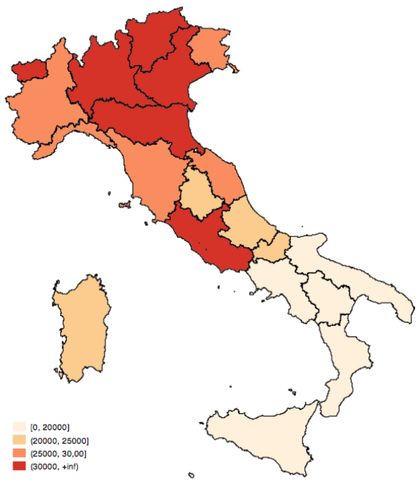
(c) Cases (x 100) per person - 2003



(d) Cases (x 100) per person - 2008

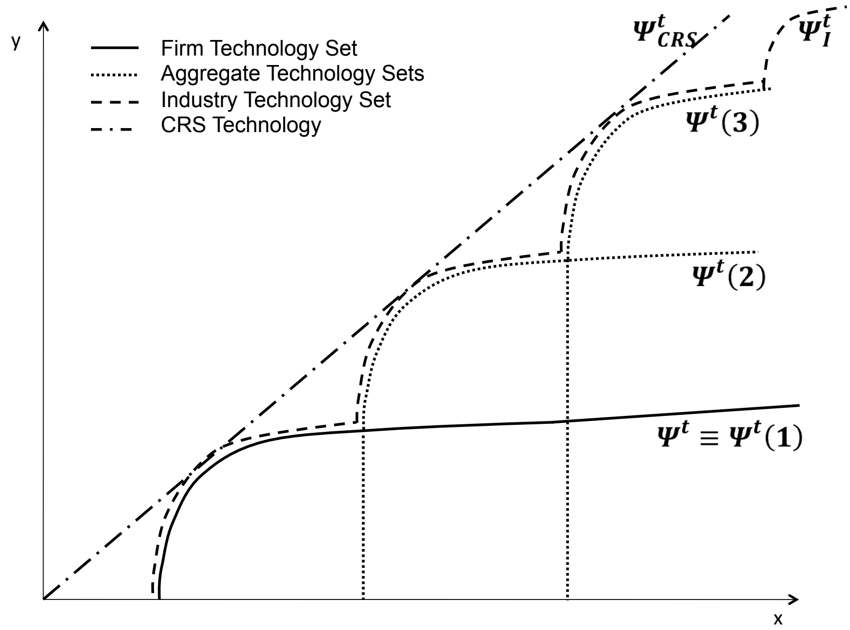


(e) GDP per person (Euro) - 2003

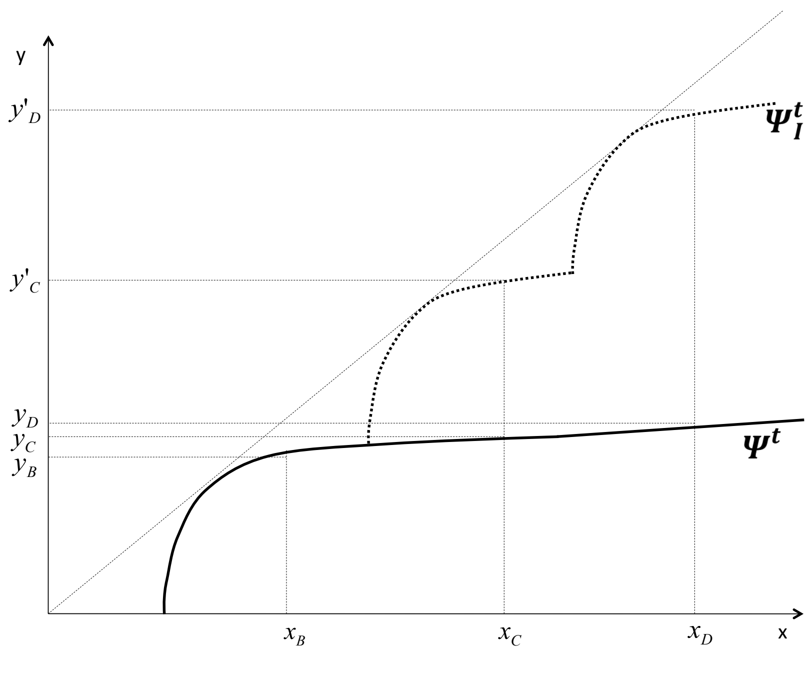


(f) GDP per person (Euro) - 2008

Figure 1: Supply, Demand of Justice, and Economic activity

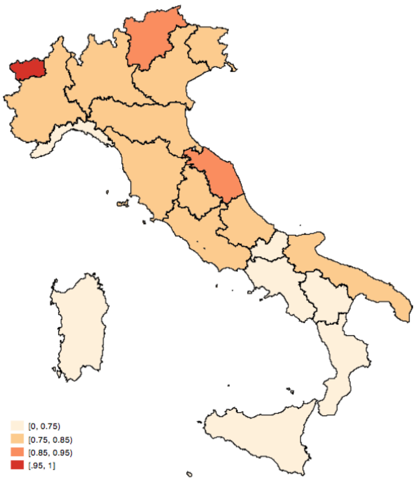


(a) Firm, aggregate, and industry technologies

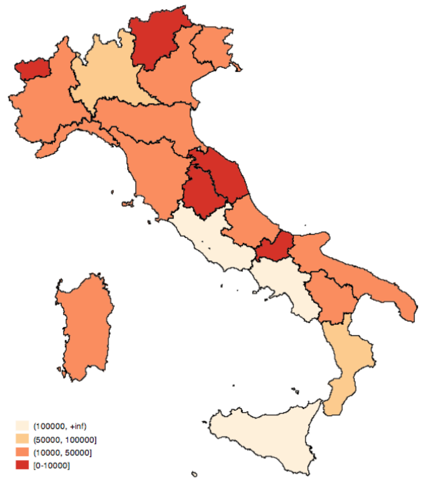


(b) Size efficiency

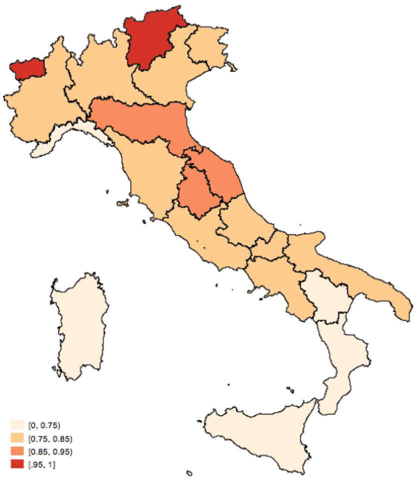
Figure 2: One input - one output technology



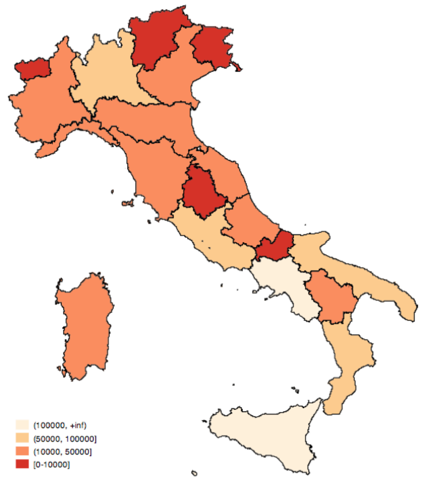
(a) 2004 (%)



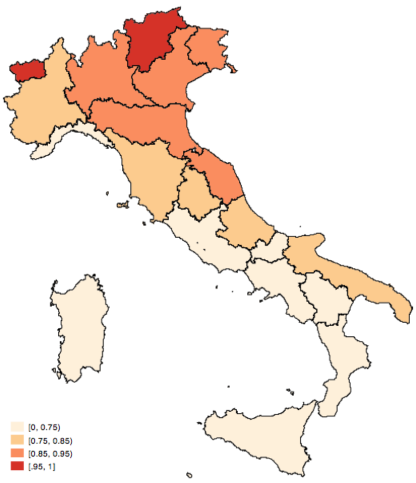
(b) 2004 (Abs. values)



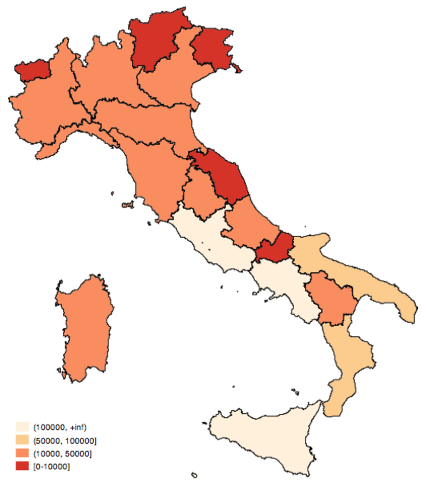
(c) 2006 (%)



(d) 2006 (Abs. values)

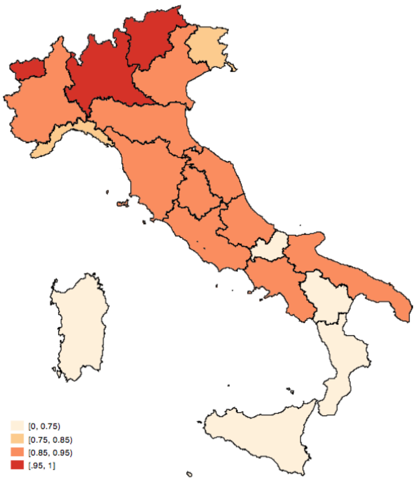


(e) 2008 (%)

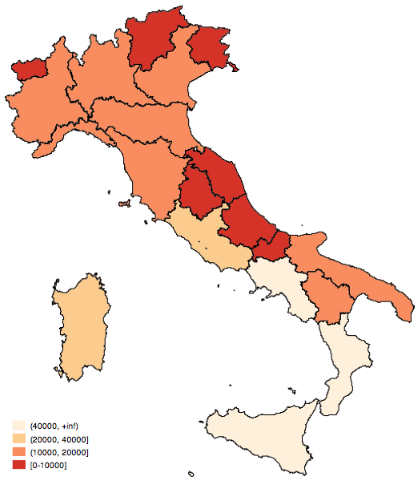


(f) 2008 (Abs. values)

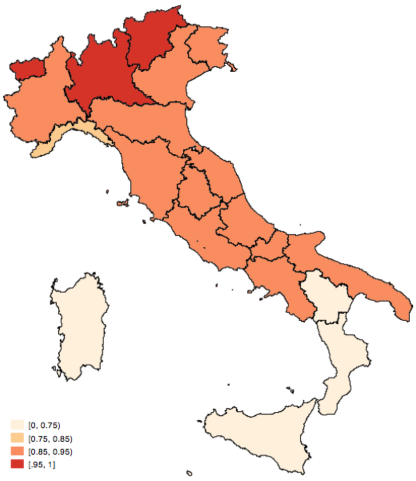
Figure 3: Industry Efficiency by Regions



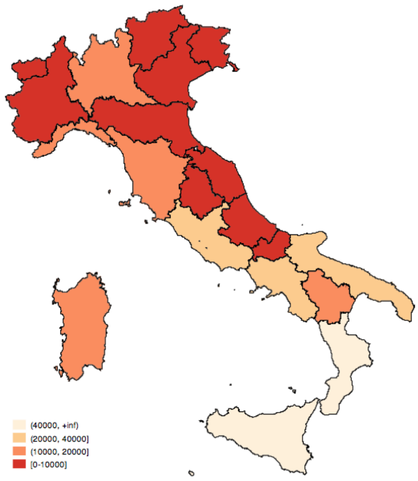
(a) 2004 (%)



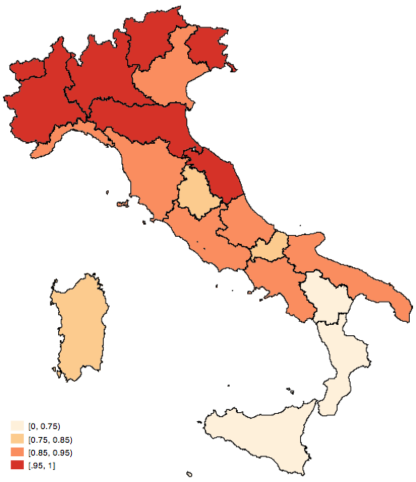
(b) 2004 (Abs. values)



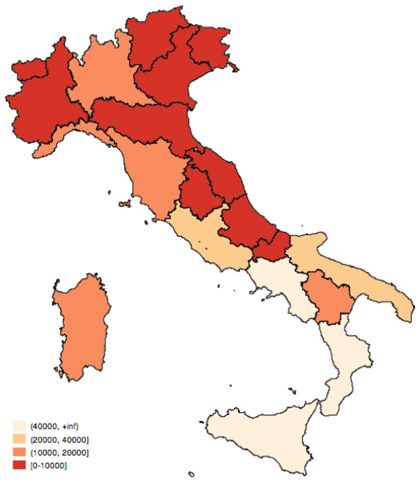
(c) 2006 (%)



(d) 2006 (Abs. values)

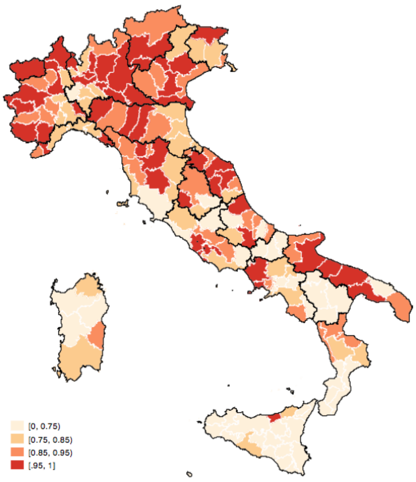


(e) 2008 (%)

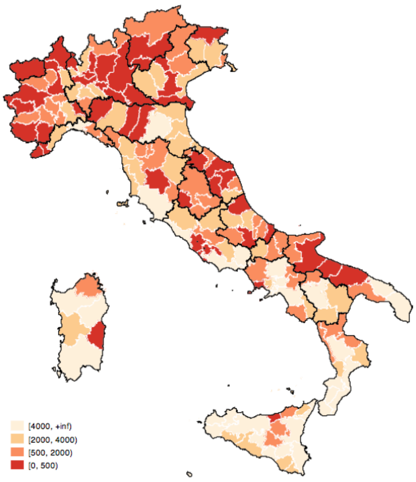


(f) 2008 (Abs. values)

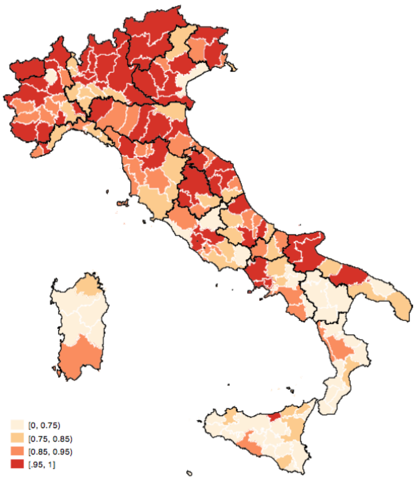
Figure 4: Technical Efficiency by Regions



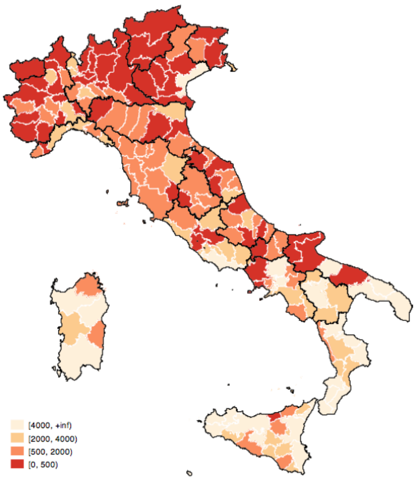
(a) 2004 (%)



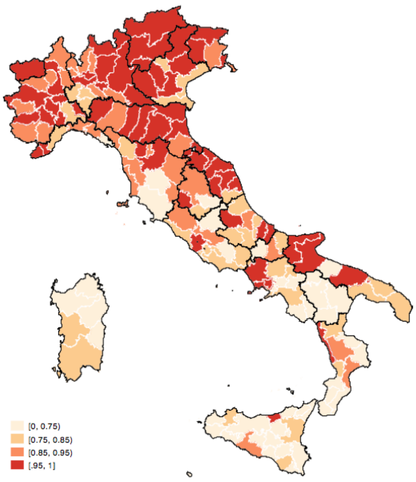
(b) 2004 (Abs. values)



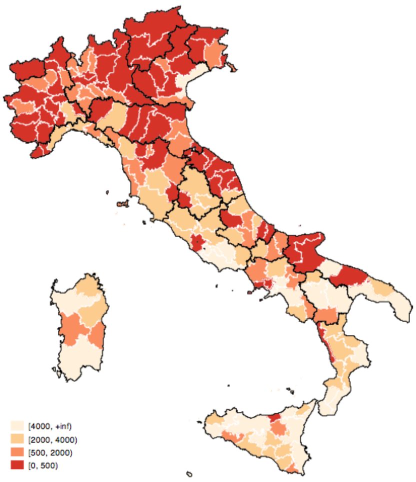
(c) 2006 (%)



(d) 2006 (Abs. values)

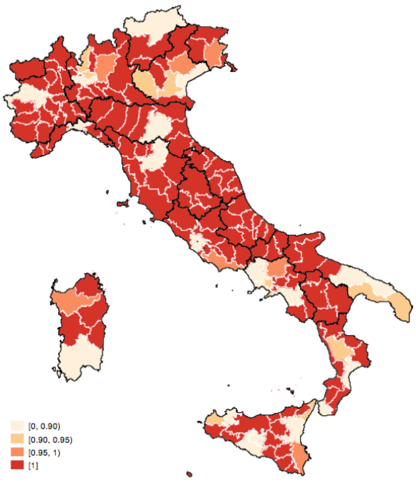


(e) 2008 (%)

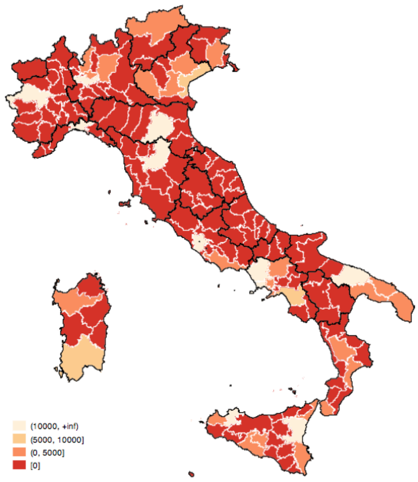


(f) 2008 (Abs. values)

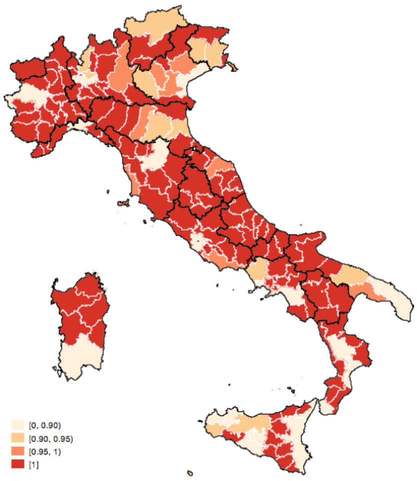
Figure 5: Technical Efficiency by courts



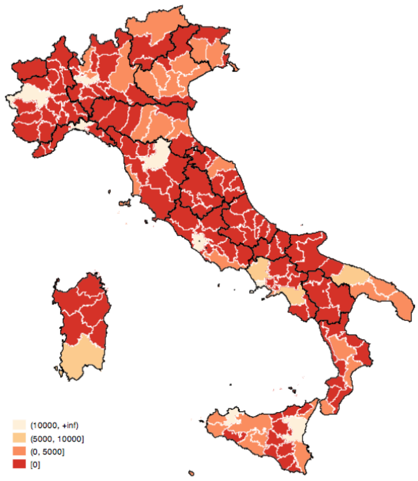
(a) 2004 (%)



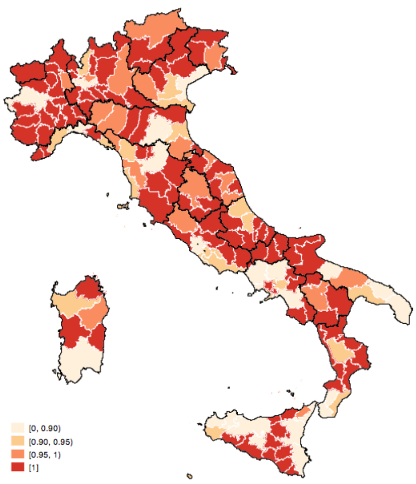
(b) 2004 (Abs. values)



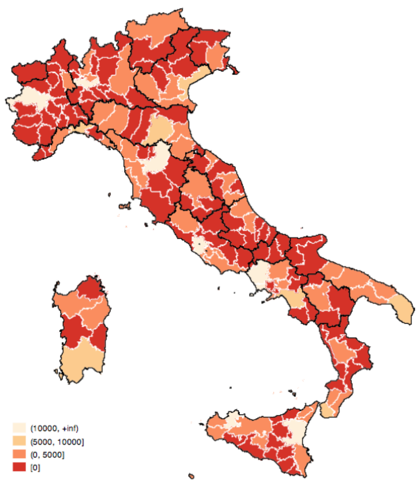
(c) 2006 (%)



(d) 2006 (Abs. values)



(e) 2008 (%)



(f) 2008 (Abs. values)

Figure 6: Size Efficiency by courts

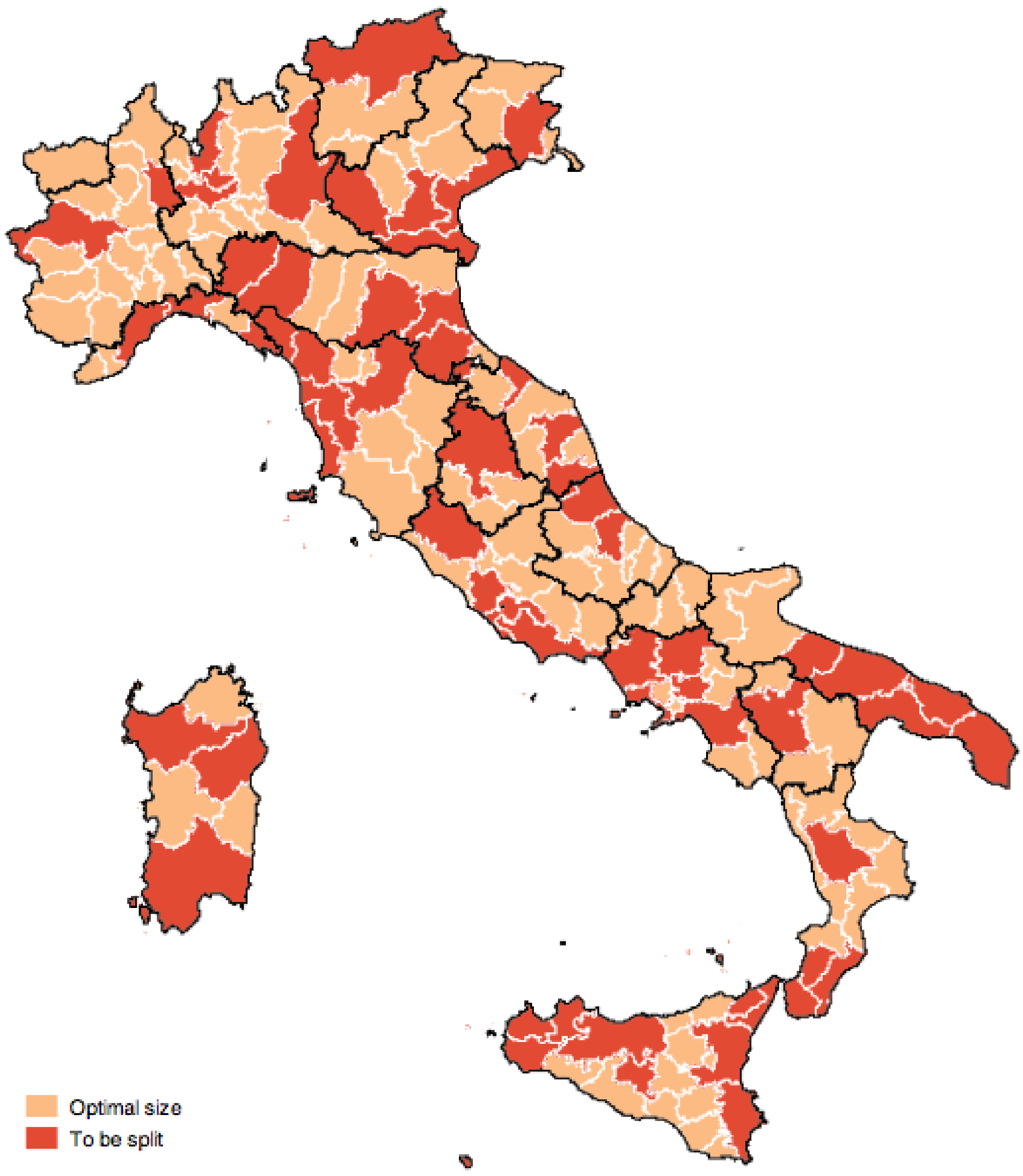


Figure 7: Size efficiency: Courts that should be split, 2008