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Antonio Peyrache, Angelo Zago

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School of Economics
University of Queensland
St. Lucia, Qld. 4072
Australia

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The inefficiency and the optimal structure of the Italian Justice sector*

Antonio Peyrache† Angelo Zago‡

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Abstract. Despite its economic development, the average length of trials in Italy is one of the highest in the world. In this paper we analyze the efficiency of the Italian courts of justice for the period 2003 to 2008. Results show that technical efficiency (lack of best practice adoption) is almost 40% and size inefficiency (courts operating on a too large scale) is about 35% of total inefficiency of the sector. It emerges clearly that the single most effective (and feasible) policy intervention is the splitting of large courts of justice. This would boost the ability of the system to process cases and it should put it on a sustainable path with beneficial effects for economic growth.

JEL: C44, C61, H11, H41, H76, K41, L3.

Keywords: Industry Efficiency, Directional Distance Function, Size Inefficiency, Break-ups, Mergers.

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†CEPA, 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

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 the average disposition time for litigious civil and commercial cases in Europe was 282 days (median of 206) for 2008, in Italy it was of 533 days. In fact, of the 35 European countries considered in the European survey, only Monaco, San Marino, Bosnia & Herzegovina and Malta did worse than Italy (CEPEJ, 2010). The average trial's length is quite different across the Italian regions as well (following in this the traditional dual structure of the Italian economy): in the southern regions, where the economy is less developed, the average length is double than that of the richer northern regions (Figure 1, top panel).

A particularly annoying effect of these delays in delivering justice is that economic agents (households, workers, and firms) might exploit these inefficiencies 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 Bianco et al., 2002). 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).

Though the judicial system represents only a small part of the economy, its inefficiencies have a deep influence on economic behaviour and economic growth. In fact, enforcement of law is one of the key factors which promote a healthy economy and, for such a reason, the reform of the judicial system may play a pivotal role in long term growth of the italian economy and sustainability of its public debt. The detrimental impact of judicial system inefficiencies on the economy has been estimated to be a loss of about 1% of GDP (Draghi, 2011). This is particularly 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, an inefficient judicial system may hinder firms' growth, a problem particularly important for Italy, whose firms are among the smallest among OECD countries (Alesina and Giavazzi, 2011). These detrimental effects of an inefficient judicial system on economic growth and agents' behavior have motivated the implementation of policies with the aim of reducing trials duration. The last series of measures,

enacted in July 2012 by the Monti's Goverment, while aiming at reducing public spending, have established the merger of 37 small size courts (out of 165 at the national level) with geographically adjacent bigger ones.[1]

In this paper we investigate the efficiency of Italian courts of justice, proposing an approach to estimate the sector optimal structure. Efficiency analysis of courts of justice has received a relatively limited attention in the literature (for a partial survey see, e.g., St. Aubyn, 2008). More common are partial performance measures, such as the trials length and the number of cases defined per judge (see, e.g., CEPEJ, 2010). Efficiency analysis, however, allows the measurement of court 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's level are 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.

The judicial sector is one typical instance 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 becomes difficult for agents to sanction inefficient units. Therefore it becomes particularly useful to envisage a method to establish the inefficiency and the potential optimal structure of the sector in order to set effective policies aimed at improving its overall efficiency. 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 only requires information on quantities (inputs and outputs) without any reference to prices and can be easily computed using standard linear programming.

More importantly, we investigate the optimal structure of the sector by looking at efficiency gains that may be realized thanks to size economies. When courts are freely adjustable in size, they can be splitted (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 terms of the courts of justice production function, this assumption is justified as follow: courts faces 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 economies is offset

[1] In August 2012, the number of courts to be merged was reduced to 31.

by congestion and management costs which basically leads to coordination failure and lower productivity. We call size inefficiency all those inefficiencies which raise from courts which are operating on a too large scale and would benefit from a break-up. Merger inefficiencies are, on the contrary, all those inefficiencies which arise because courts are operating on a too small scale and would benefit from mergers with other units.

Therefore gains in production (for example trials lenght reduction) can be obtained via three very different channels and policies: i) technical inefficiency reduction via adoption of best practices available elsewhere; ii) break-ups of large production units which are operating on a too big scale; iii) mergers of small units in order to exploit economies of specialization. These three main channels will also ingenerate 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 evaluation of mergers and break-ups in the public sector are very difficult to run due to lack of price information.

Our empirical results indicate that for the Italian courts of justice one third of total inefficiency is due to size inefficiency. This basically means that a reduction in trial lenght could be effectively pursued by splitting the largest courts in the sample. On the contrary, merger inefficiency is only one tenth of the total inefficiency of the sector. The other important component is technical inefficiency (lack of best practice adoption). We find that while technical inefficiency follows the traditional dual economy partition of Italy, the size inefficiency component is homogeneously distributed accross all the regions. This is probably due to an effect of a rigid administrative rule which enforces the presence of a fixed number of courts per district, thus not allowing economies of scale to be appropriately exploited (for example, big cities have only one court, while they should have many).

This last result leads us to think that a policy aimed at exploiting these size economies by means of break-ups would be an important contributor to the overall inefficiency reduction of the sector. The last intervention enacted by the Government, with the objective of reducing public spending, goes in the opposite direction and establishes that some of the smaller courts should be merged into adjacent bigger ones. While being 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 from the proposed mergers) is only one tenth of the 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 bigger 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 follow. In section 2 we explain the methodology adopted. In section 3 the dataset is described. Section 4 discusses our main empirical results. Section 5 gives a brief discussion of the main policy implications of this research. Finally section 6 concludes.

2 Methodology

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; an 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 dataset can be represented by the collection of those matrices:

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

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):

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

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 aggreate 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). 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:

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

A functional representation of the firm technology is given by the firm directional distance function (DDF):

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

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.

A functional representation of the industry technology (4) is given by its associated DDF:

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

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 which should populate the industry if production has to be delivered efficiently.

2.1 Industry technical 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:

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

This indicator is a measure of waste in inputs and loss in output 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: $\mathbf{I}^t = \sum \mathbf{x}_k^t$, $\mathbf{Q}^t = \sum \mathbf{y}_k^t$. A

measure of industry efficiency is given by the following mixed integer linear program:

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

It should be noted that even if all the firms in the industry are technical 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 is always larger than zero ($ITE^t \leq IE^t$) and represents the inefficiency arising from the way the industry is strucutred. Three main effects compose this indicator: first, inefficiencies arising from firms which are operating on a too large scale and could be conveniently split in smaller firms; second, firms which 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 will be defined in the next sub-sections.

2.2 Size Inefficiency and break-ups

Inefficiencies linked to the size of the firm can be conveniently described in terms of the notion of size inefficiency. 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 and a gain in production can be made. 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 to be split into an optimal number of smaller units.

2.3 Mergers

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

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

In other words the combined firm has more potential for expansion of outputs (and contraction of inputs) than the two original firms taken separately. This also means that 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 can be summed-up into a single indicator for the whole industry (IME).

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 which arises at industry level due to possible re-allocation effects of inputs accross 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 is a measure of loss in outputs and waste in inputs at the industry level. The right-hand side imputes this inefficiency to different 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); potential gains from re-allocation of inputs accross firms (IRE). A more direct interpretation of this decomposition can be provided 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 $\%IRE^t = \frac{IRE^t}{IE^t}$. Equation (14) measures inefficiency as an absolute number (the total number of additional cases that could be potentially processed in each year): this allows comparing performance in absolute terms but poses some probelms if

one is interested in a relative measure of inefficiency. To overcome this problem we also computed an indicator which allow a straightforward comparison in relative term (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 2 additional inputs. This choice was first suggested by Lewin et al. (1982) and used by Marselli and Vannini (2004) as well and it is defended on a common sense ground: without pending cases there are no processed case, therefore no output. In general, in any system there is a percentage of pending cases and this 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).[2] The average size in terms of defined civil cases is about double that of the criminal cases, with an increase in the last part of the period under consideration, i.e., in 2007 and 2008. The number of judges is stable over 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 the civil part, while stayed quite the same for the criminal ones.

We decided to 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 reflect two important feature of our empirical problem. First courts are given a limited quantity of input resources and they are required to use it efficiently. Second, our interest focus basically on reducing trials lenght in order to maximize the positive effects on the economy and this can be reached only by increasing output production by keeping the level of inputs fixed. This two arguments fully justify, in economic terms, our choice

[2]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.

of the directional vector. We tried some robustness exercises by changing the directional vector and we have find that all the main empirical results (and their policy implications) are substantially the same.

4 Main 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. This figure is on average slightly less than one million cases per year in our sample. This number should be contrasted to the actual numbers of cases processed and pending. Every year about 4 millions cases are processed and about 4.5 millions are pending: if all inefficiencies were to be eliminated, about 1 million more of the pending cases could be processed in each year. Another way of looking at this number is as follow: at the present moment the average waiting 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); by squeezing out half of the inefficiency from the system would put it on a steady-state where the number of pending cases will not grow and the processing time will 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, witnessing an overall improvement in efficiency in the period under investigation. This pattern may be ascribed to the Collective Clemency Bill passed in 2006 (for an analysis of its effects see, e.g., Drago et al., 2009).

The other columns in Table 2 report the components embedded in 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: this amounts to a potential of about 370,000 more cases that could be processed per year. In other words, more than one third of the industry inefficieny is due to inefficiencies related 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. Apart from 2007, ITE is the biggest source of the industry inefficiency.

The second most important source of industry inefficiency is related to size inefficiencies (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. This enhancement in efficiency may be pursued via break-up operations of the largest courts. The trend over time is changing, but in almost all years ISE is at least one third of industry inefficiency, and in 2007 it is more important 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 and outputs 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 merger inefficiency (IME), which accounts on average for 10% of the total industry inefficiency: just above 102,000 cases could be potentially further processed each year via operations of merging of smaller courts. IME is decreasing over time, starting from over 137,000 (14% of industry efficiency) in 2003 to 68,000 (7%) in 2008.[3]

To sum up, over 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 thus to determine which source - and possibly economic policy - is the most important for improving courts efficiency. In fact the first two components alone accounts for about 72% of the industry inefficiency and should definitely be the targets of policy making. First, policy should push less performing courts to adopt best practices and increase the efficiency (and the speed) with which justice is delivered. Second, large courts should be the target of break-up policy operations: this would eliminate inefficiencies associated with size and move courts back to the optimal operation point. These figures confirm our intuition that any reform of the justice sector should start with these two building blocks: how to adopt best practice and how to break-up big courts. These two policies may be able to put the system in a state of affair that would reduce, in a few years, the number of pending cases so that the waiting time of any new case would fall below one year, like in most other developed countries.

[3]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 courts mergers.

4.2 The Differences across Areas and Regions

In order to be able to assess where it would be most effective to intervene, we now consider differences in industry inefficiency and its determinants across the different areas of the country (Figure 2). First, notice that when considering the absolute values of inefficiency the South is the area where inefficiencies are the highest, with the Islands , the Centre (poor especially for size efficiency), North-West and North-East following (this ranking is quite stable across different years). Notice that Islands and South are respectively two and three times less efficient than the North-East, the most efficient area. To prioritize interventions geographically, one can safely say that economic policies should target Southern and Insular regions to effectively reduce industry inefficiency.

While the inefficiency expressed in absolute values helps to prioritize, the one expressed in percentage allows to make units (areas, regions, courts) more comparable.[4] When inefficiency is expressed in percentage terms (Figure 3), the North-East area is the most efficient (with industry efficiency above 80% at the beginning of the period, and almost 90% in 2008), followed by North-West and the Centre. In the bottom rank, however, it appears that now the Islands are less efficient than the South (about 50-55% against over 70% for industry efficiency). Overall, efficiency is improving over time, for all components and areas, with few exceptions: a decreasing trend for size efficiency in the Centre and for merger and reallocation efficiency in the South and Islands.

Going at the regional level in the North-West (Figure 4), we can notice that Lombardia is the region with the highest inefficiencies in absolute terms, followed by Piemonte, Liguria and Valle d'Aosta. Valle d'Aosta is fully efficient, being on the efficient frontier for all years (with the exception of 2003). Thinking in terms of policy intervention, the splitting of big courts in Lombardia would have the biggest impact on inefficiency reduction (therefore shortening trials length in the North-West area).

When considering inefficiency in percentage terms (Figure 5), Valle d'Aosta is the most efficient (100%), followed by Lombardia (about 85%) and Piemonte (around 82%). Liguria is the worst performing region in the NW area, with an average industry efficiency of about 70%, due to exceptionally high levels of technical and size inefficiencies.[5]

[4] A big unit could be efficient (in percentage) compared to a smaller one, but appears as inefficient when expressed in absolute values because of its size. We calculate the percentage version of technical inefficiency TE^t as $TE^t = y_k^t/(D^t(x, y; g_x, g_y) + y_k^t)$, with y_k^t being the defined civil cases.

[5] In the case of Liguria, it is easy to see the different information given by the efficiency measures expressed in absolute and percentage terms. This relatively small region seems

In the North-East area, in absolute terms Trentino-Alto-Adige is the most efficient region, followed by Friuli-Venezia-Giulia, Emilia-Romagna and Veneto (Figure 6). In this area, it is more difficult to find a unique effective policy to reduce inefficiencies. Here, an optimal policy should target both Veneto and Emilia-Romagna, by promoting best-practices to increase technical efficiency (one third of cases could be further defined working in this direction), by splitting bigger courts (about one third of cases) and by working on merger plus reallocation efficiencies (the remaining third, on average).

In percentage terms, Trentino A.A. maintains its higher effieciency, at almost full efficiency at the end of the period. The second most efficient region is Emilia-Romagna, followed by Veneto and Friuli V.G. It is interesting to note that all these regions have some problems with size inefficiency (see Figure 7). Friuli V.G. is the least performing in all sources of inefficiency (apart from size efficiency where it does better than the others).

Among the regions in the Centre of Italy, Lazio and Toscana are those with the highest number of cases that could potentially be defined if courts were to be organized efficiently (Figure 8). Note that the trend is slightly deteriorating for Lazio, and slightly improving for the other regions. These numbers suggest that the single most effective policy for the Centre of Italy would be to reduce courts' size by mean of break-up operations (this is especially true for Lazio). In percentage terms (Figure 9), Lazio confirms its bad overall industry performances (below 80%), due especially to size inefficiency.

In the South, Campania is the most inefficient region in absolute terms, and most of its inefficiency comes from size inefficiency (Figure 10). The other two big regions - Calabria and Puglia - follow, while the smaller ones (i.e., Abruzzo, Basilicata and Molise) have a very low absolute inefficiency. Size inefficiency is once again an important component of inefficiency in the South, implying that the most effective policy would be to implement break-up operations. In percentage terms, however, the ranking is different (Figure 11). Calabria and Basilicata are the worst in terms of industry inefficiency (around 60-65% of efficiency), with a decreasing trend as well. Puglia and Abruzzo are the most efficient overall (on average 80%). Campania is about 75% efficient in terms of industry efficiency, with a good performance in terms of technical efficiency (the best performer in the area, with above 90%), while it scores the lowest in size efficiency (below 85% on average), given the presence of courts that are too big.

Finally, in the Islands, Sicilia is the more inefficient in absolute terms

to be faring relatively well in terms of absolute inefficiencies, i.e., the number of cases that could be further defined were the Liguria courts fully efficient. However, when looking at percentage terms, it shows that in fact Liguria is the least efficient region in the North-West area.

(ratio of four to one compared to Sardegna, see Figure 12), for all components. An effective intervention here would target Sicilian courts, both with the adoption of best practices (to reduce technical inefficiency) and the splitting of big courts (to reduce size inefficiency). In percentage terms, Sicilia is still the worse performer (about 50-55% against 60% for Sardegna, as in Figure 13), due to size inefficiency.

4.3 The Differences across Regions: Where to Intervene?

In this paraghaph, we pull together all the results provided so far with two aims. First, using the results in percentage terms, we want to have an efficiency ranking of all Italian regions. Second, using the inefficiencies expressed in absolute terms, we can focus on the regions where the decrease of inefficiencies would have the biggest impact on the sector in terms of additional potential cases processed and thus in terms of shortening the length of trials nationwide.

Considering industry inefficiency, Valle d'Aosta and Trentino A.-A. are the most efficient, followed by Emilia-Romagna, Marche, Umbria, Veneto and Lombardia. The least efficient ones are in the South and the Islands: Basilicata, Calabria, Sardegna and Sicilia are constantly among the worst performers across the period. In the North-West, Liguria appears to be among the worst performers for all years (Figure 14).

Looking at the absolute values, it is worth noticing that Campania and Sicilia are the regions in which - for every year of the period 2003-2008 - the inefficiencies amounts at above 100,000 potential cases per year. Lazio is the other big source of inefficiency with around 100,000 potential cases (it actually goes above this number in the years 2004, 2007, 2008; see Figure 15). Overall it seems that sector inefficiencies follow the traditional dual economy of the country. But this is not necessarily true if one looks at the figures for the single components.

Looking at technical efficiency (Figure 16), the most efficient regions are in the north (for all years considered) and the worst performers are again in the South. This means that the ITE component basically follows the dualism of the economy (Figure 17). ITE is higher in the North, but efficient courts are present also in the Centre of Italy (Toscana and Marche) and in the South and Islands (Calabria, Campania, Puglia, Sardegna and Sicilia). The same trend and geographical distribution is confirmed when looking at the technical efficiency measured in percentage terms (Figure 23). Indeed, 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 also in terms of courts efficiency, and the differences are increasing in time.

In terms of size inefficiency the story is slightly different because size inefficiencies, though 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 inefficiency. 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. Figure 24 considers the distribution of size inefficiency in absolute values. Geographically, the size-efficient courts are distributed quite evenly across the country, with efficient ones present in all regions. Size inefficient courts seem to coincide with the ones located in the largest cities, such as: Genova, Torino, Milano, Bologna, Firenze, Rome, Napoli, Bari, Catania, and Cagliari. Looking at the evolution over time, it appears that in the early years (2004 in particular) there were many size-efficient courts. These numbers get worse starting in 2005. The same patterns emerge if we consider size efficiency in percentage terms (Figure 25). It is clear that 2005 was a particular bad year but also 2007 and 2008 show a prevalence of size-inefficient courts. This empirical evidence points out to the fact that size matters all accross the country and it does not have a structural relationship with the dualism of the italian economy.

In Figure 26, we consider explicitly the courts that should be splitted. The greatest number is in 2005 (we count 69 of them), while the lowest is in 2004 (only 37). On average, it appears that about one third of the operating courts are too big and should be splitted in order to allow a better functioning of the judicial system. Apart from a couple of execptions, most regions host courts which are too big to be size efficient. As a further piece of evidence, we consider in how many smaller courts each big court should be divided into (Table 3).[6] Roma, Milano and Napoli are the biggest ones: Roma, in particular, should be divided into more than 20 courts. Every year it has on average over 58,000 cases of absolute inefficiency, and in 2007 it reaches over 71,000. This implies that about 5-7% of the national overall inefficiency industry is due to Roma size inefficiency. Napoli has on average over 54,000 cases per year of size inefficiency and it should be splitted into around ten different courts. In the North, Milano has on average over 26,000 cases of size inefficiency and should be splitted into ten courts as well.

[6]We report only the bigger courts, that is those that should be splitted into more than three parts.

5 Policy implications

There has been a long lasting policy debate on the reforms needed in order to bring the italian judicial system towards a more efficient operation. More recently the policy debate has been mainly driven from a (myopic) cost reduction strategy. Mergers are implemented in order to close down a number of courts, with the idea of saving on the fixed costs associated with courts operation (mainly building maintenance). Even without considerations on the appropriateness of these merger operations, one should really ask if this is the best approach in order to reach efficiency, increase institutional reliability and stability and boost long-term growth.

The evidence we provide shows that the array of policies needed to put the system on a sustainable path are more complicated. In fact, merger operations will reduce the inefficiency of the system by (at the most) 10% of the overall observed inefficiency. If one considers that the proposed merger operations are based on a cost reduction strategy, rather than an efficiency enhancing strategy, this potential 10% is probably well out of reach. On the contrary, this research emphasizes that the two main contributors to the inefficiency of the system are: lack of best practice adoption (technical inefficiency) and size inefficiency (courts operating on a too large scale). 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 indeed homogeneously distributed all accross the country and does not reflect the typical economic dualism. This leads us to think that the main reason behind such a detrimental growth in the dimension of the courts is due to an institutional constraint, with policies of the type one district-one court (irrespective of the density of population).

These empirical findings suggest that the two most important policies the government should pursue are: *first*, best-practice adoption; *second*, break-ups of large courts. Adoption of best practices presents of course many challenges and could be limited by external factors which limit the extent to which best practices can be adopted in the South. On the other hand, a consistent policy of break-up of large courts should be implementable without major difficulties (abstracting from political/lobby resistance). Such a policy 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 more fair 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 (new building, etc.). Increase in the fixed costs could perhaps 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 also improve further the performance of courts. All in all, these empirical findings show the type of policy intervention that the government should pursue in order to reach a fairer justice system. This policy intervention should look at break-up operations and an underlying philosophy that looks at the long run gains which are associated with a more efficient system.

6 Concluding remarks

The judicial system has a pivotal role for the enforcement of contracts, the definition of property rights and hence 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 an excessive length of trials that affects the life of citizens, discourages foreign investments, and ultimately hinders economic growth.

We employ a methodology that allows to decompose industry (or total) inefficiency into technical inefficiency, size efficiency, merger inefficiency and reallocation inefficiency. We find that the most important source of inefficiency is technical: courts (on average) could increase the number of defined cases by almost 40% by adopting best practices. We also find a dualism between efficient courts in the North and Centre and inefficient ones in the South and Islands. The second source of inefficiency (almost 35%) is size inefficiency and the associated gains that could result by splitting the largest courts.

The methodology we suggest is particularly useful for services or sectors in the public domain and where the market system, given the absence of a functioning price mechanism, cannot sanction inefficient units. Our analysis allows to individuate the units - being it jurisdictions, regions, areas, etc. - less efficient and target them with policies aimed at reducing technical inefficiency, size inefficiency, merge inefficiency, or reallocation inefficiency. In other words, it becomes possible to set priorities by anticipating their impact on (in)efficiency and relate them to different geographical areas and policy interventions.

Investigating the Italian judicial system for 2003-2008, we find that the possible most effective policy intervention would be to split large courts. However, this seems to be in the opposite direction of recent policies im-

plemented by the Monti's Government, that suggested instead reducing the number of courts by implementing merger operations (thus hoping to save money of fixed costs). As we argue in the paper, the effect of these operations on industry inefficiency might be negligible (merger inefficiency is only a modest fraction of total industry inefficiency), or might even be pejorative. The risk is, in fact, that the overall inefficiency of the system will not be reduced, thus weakening the rule of law and, ultimately, long run economic growth.

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Table 1: Inputs and outputs (990 obs.)

Variables	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
	Mean	Mean	Mean	Mean	Mean	Mean
	(St.dev.)	(St.dev.)	(St.dev.)	(St.dev.)	(St.dev.)	(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%)

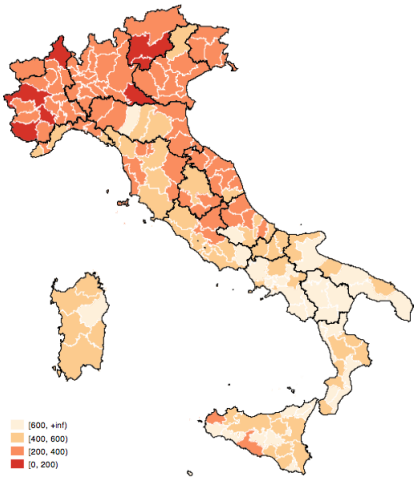
Table 3: Courts that Should be Splitted

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)

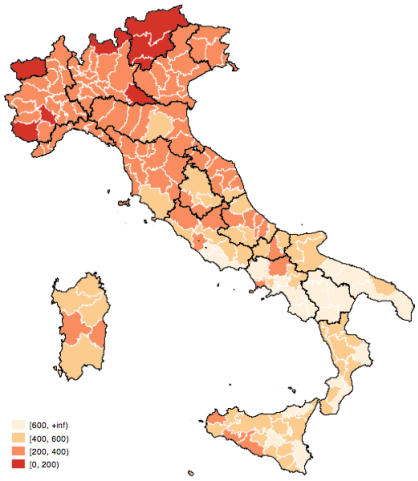
Table 4: Courts to be closed by the Monti's Government

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	Torino
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	–

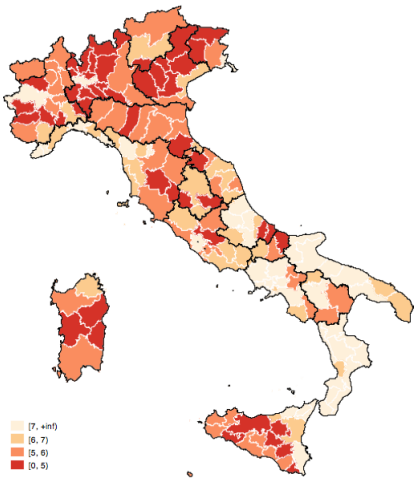
Legend: 1 = According to the first proposal, July 2012,
2 = According to the second proposal, August 2012.
3: If size inefficient, in brackets the n. of subunits it should be splitted into.



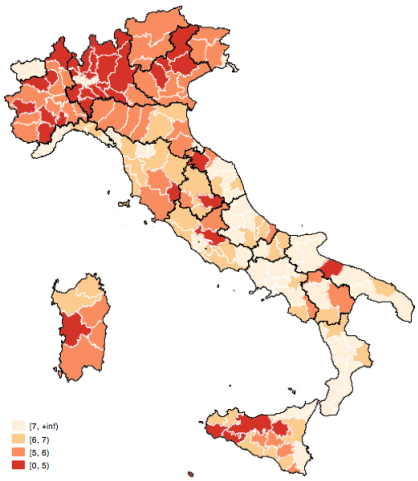
(a) Length of trials (days) - 2003



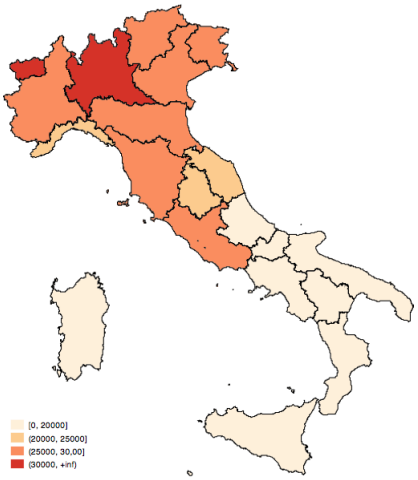
(b) Length of trials (days) - 2008 (Days)



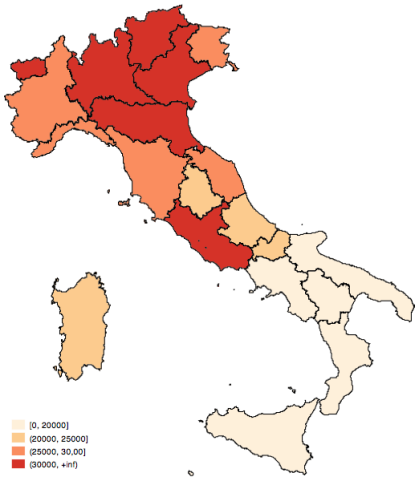
(c) Cases (x 100) per person - 2003



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

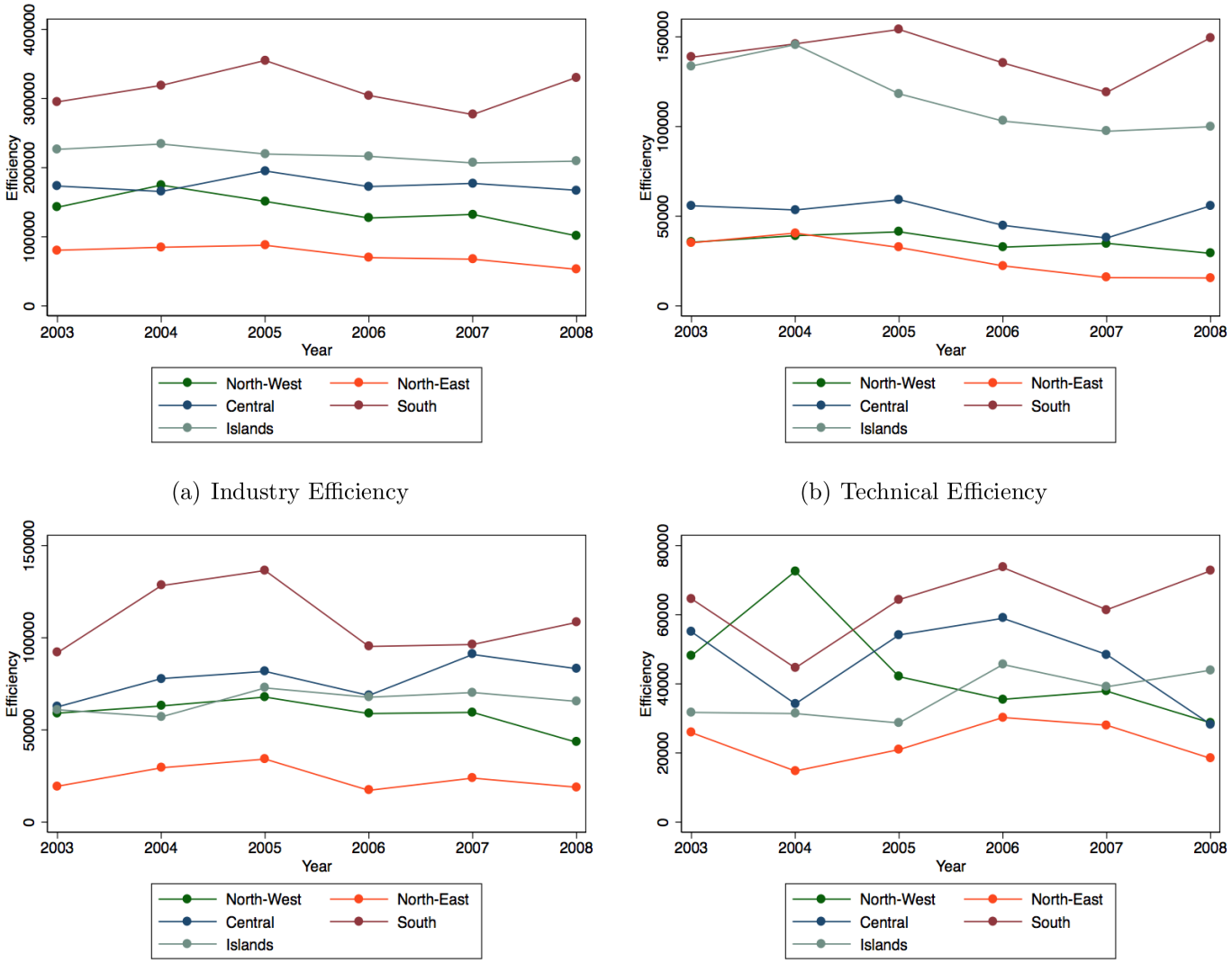


(e) GDP per person (Euro) - 2003



(f) GDP per person (Euro) - 2008

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



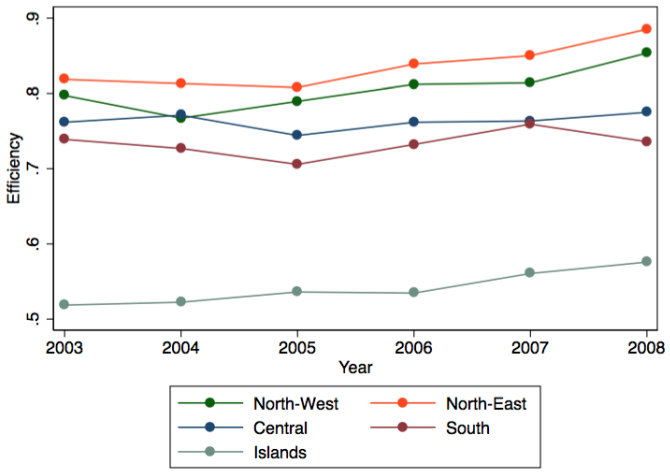
(a) Industry Efficiency

(b) Technical Efficiency

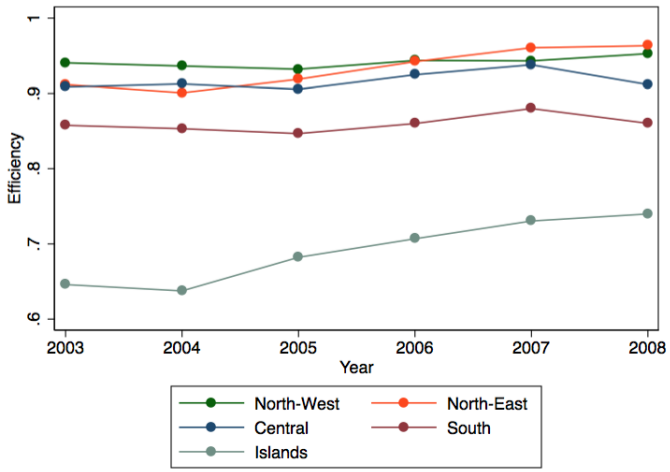
(c) Size Efficiency

(d) Merger & Reallocation Efficiency

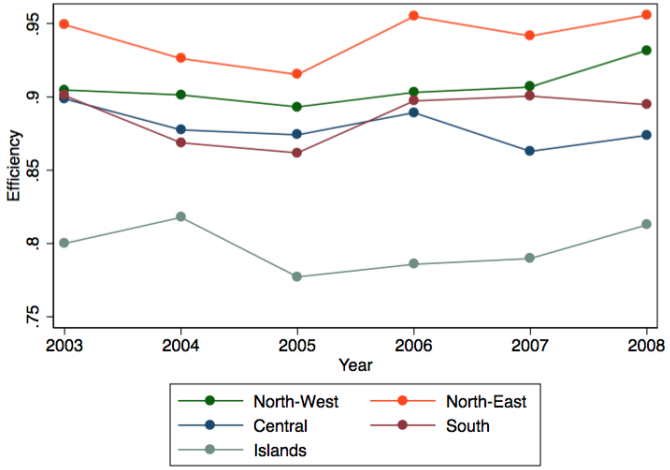
Figure 2: Industry Efficiency Decomposition by Area (Abs. values)



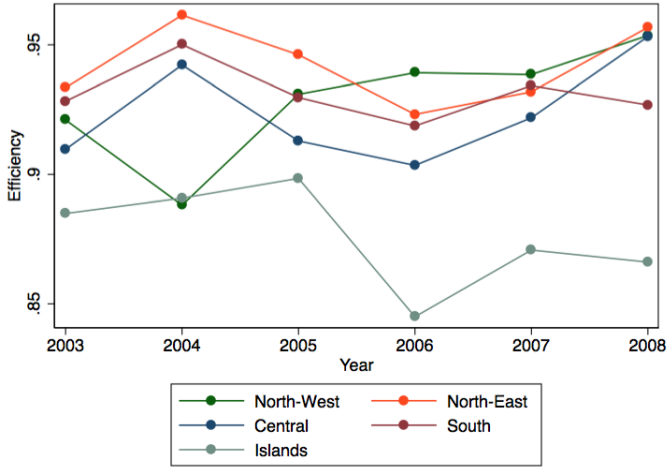
(a) Industry Efficiency



(b) Technical Efficiency

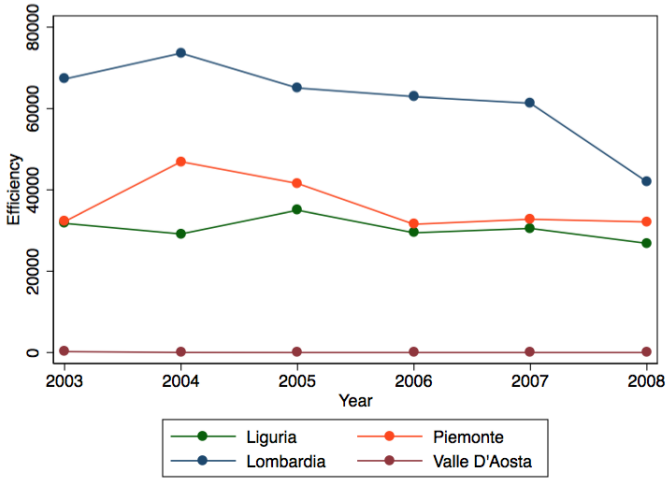


(c) Size Efficiency

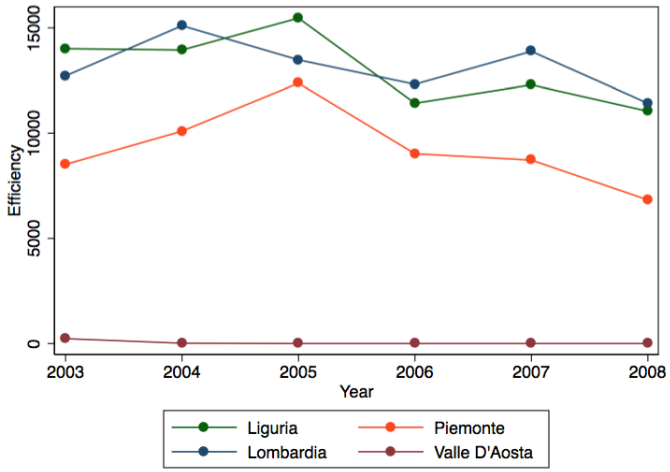


(d) Merger & Reallocation Efficiency

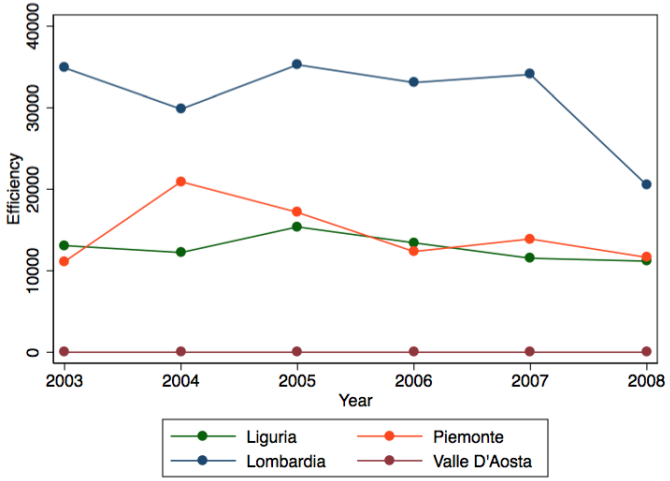
Figure 3: Industry Efficiency Decomposition by Area (%)



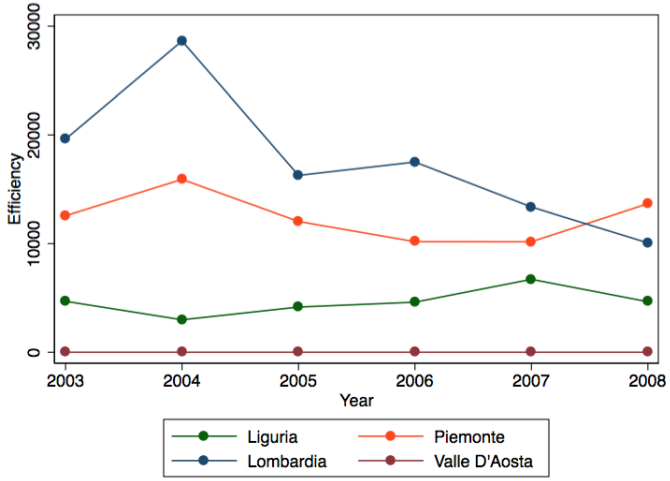
(a) Industry Efficiency



(b) Technical Efficiency

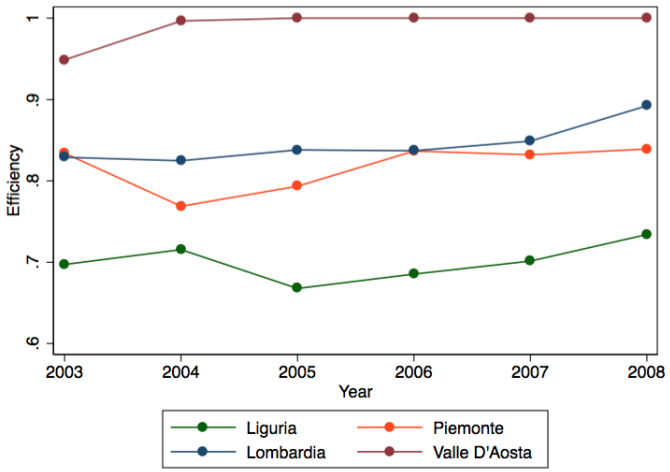


(c) Size Efficiency

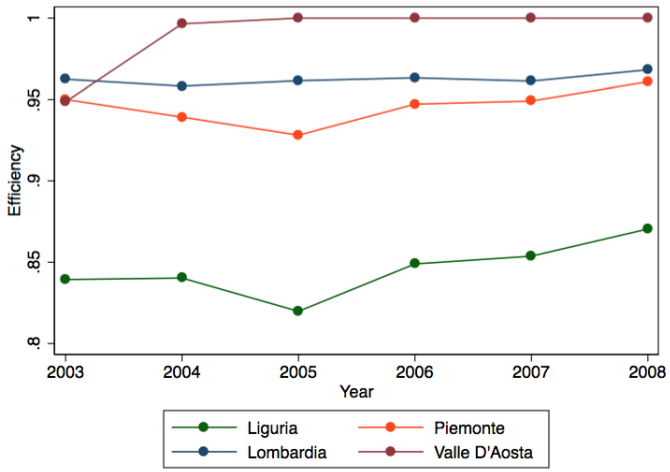


(d) Merger & Reallocation Efficiency

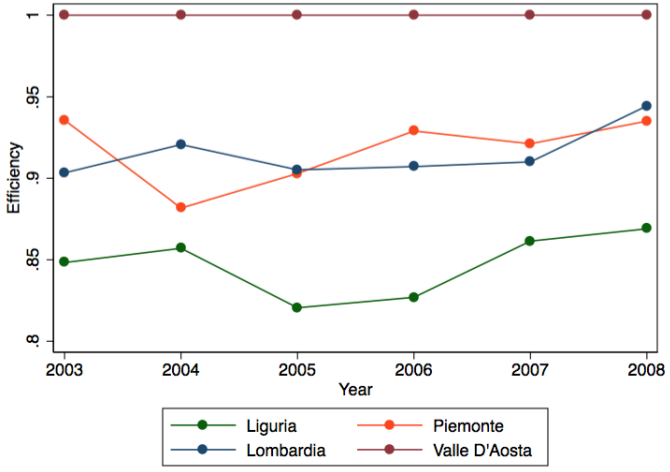
Figure 4: Industry Efficiency Decomposition, North-West (Abs. values)



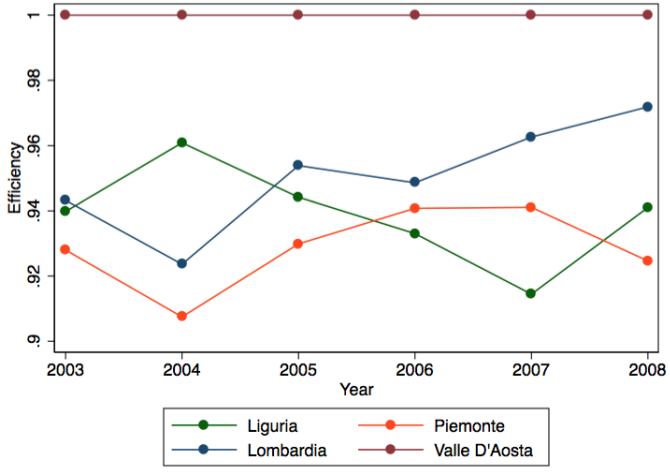
(a) Industry Efficiency



(b) Technical Efficiency

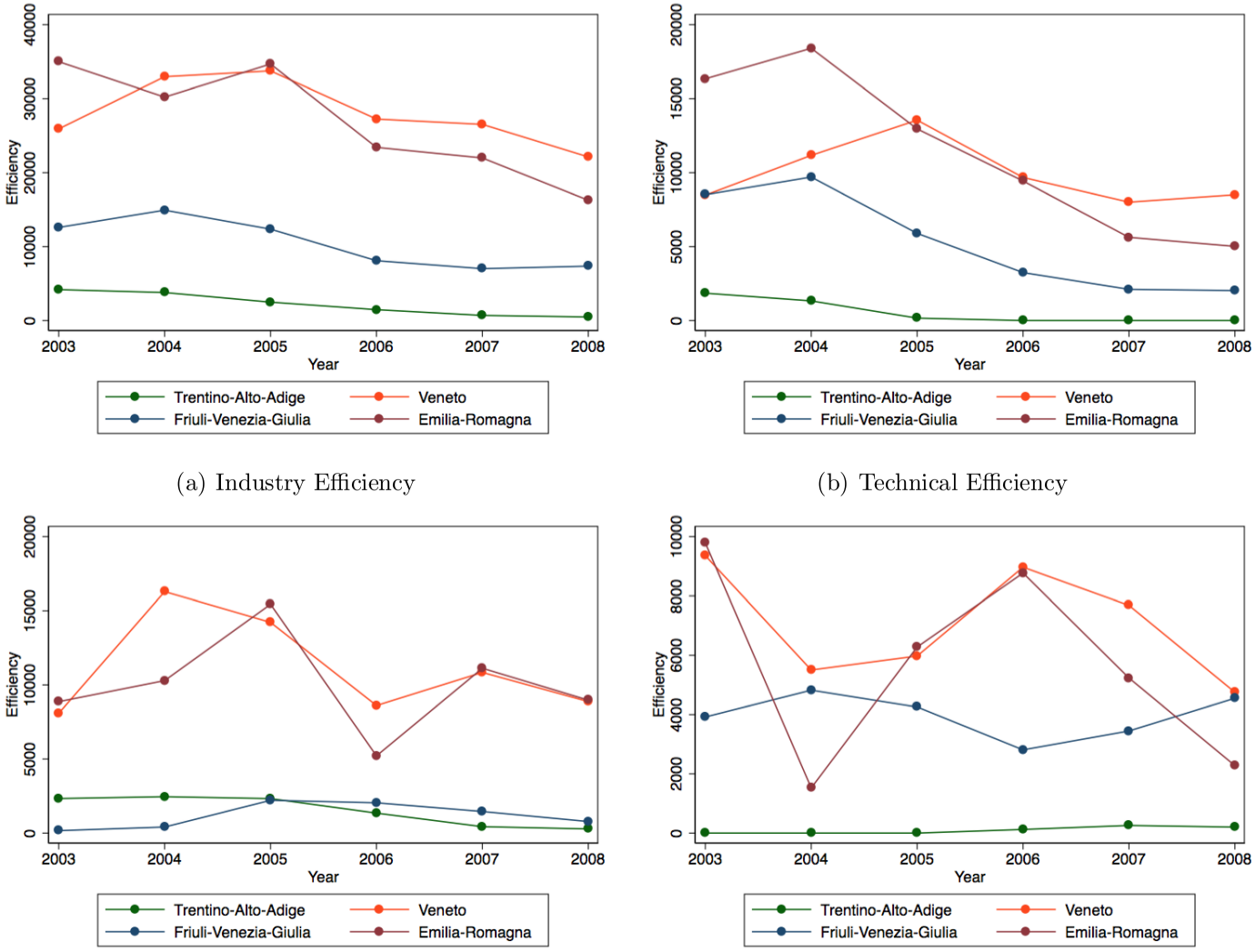


(c) Size Efficiency



(d) Merger & Reallocation Efficiency

Figure 5: Industry Efficiency Decomposition, North-West (%)



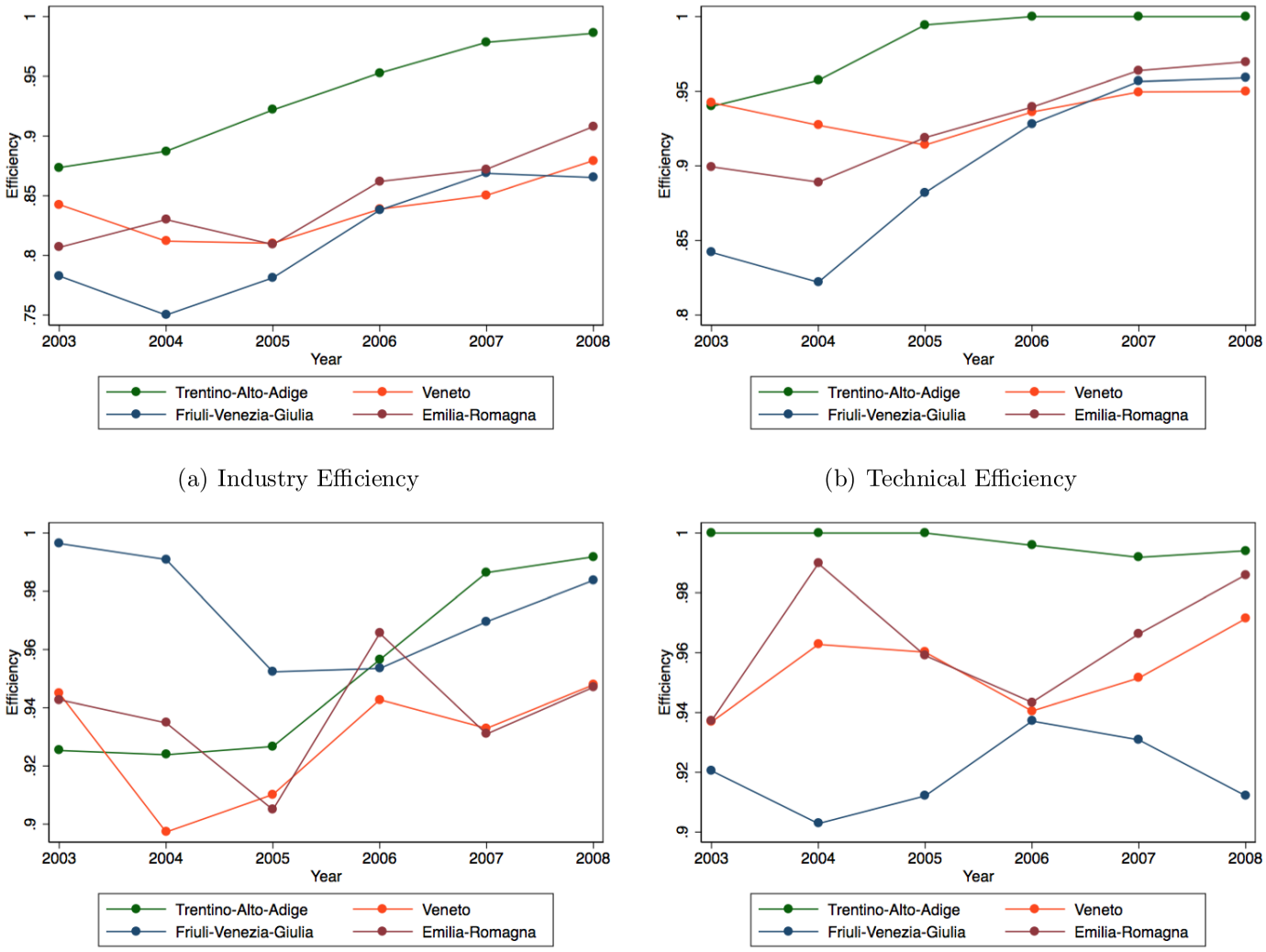
(a) Industry Efficiency

(b) Technical Efficiency

(c) Size Efficiency

(d) Merger & Reallocation Efficiency

Figure 6: Industry Efficiency Decomposition, North-East (Abs. values)



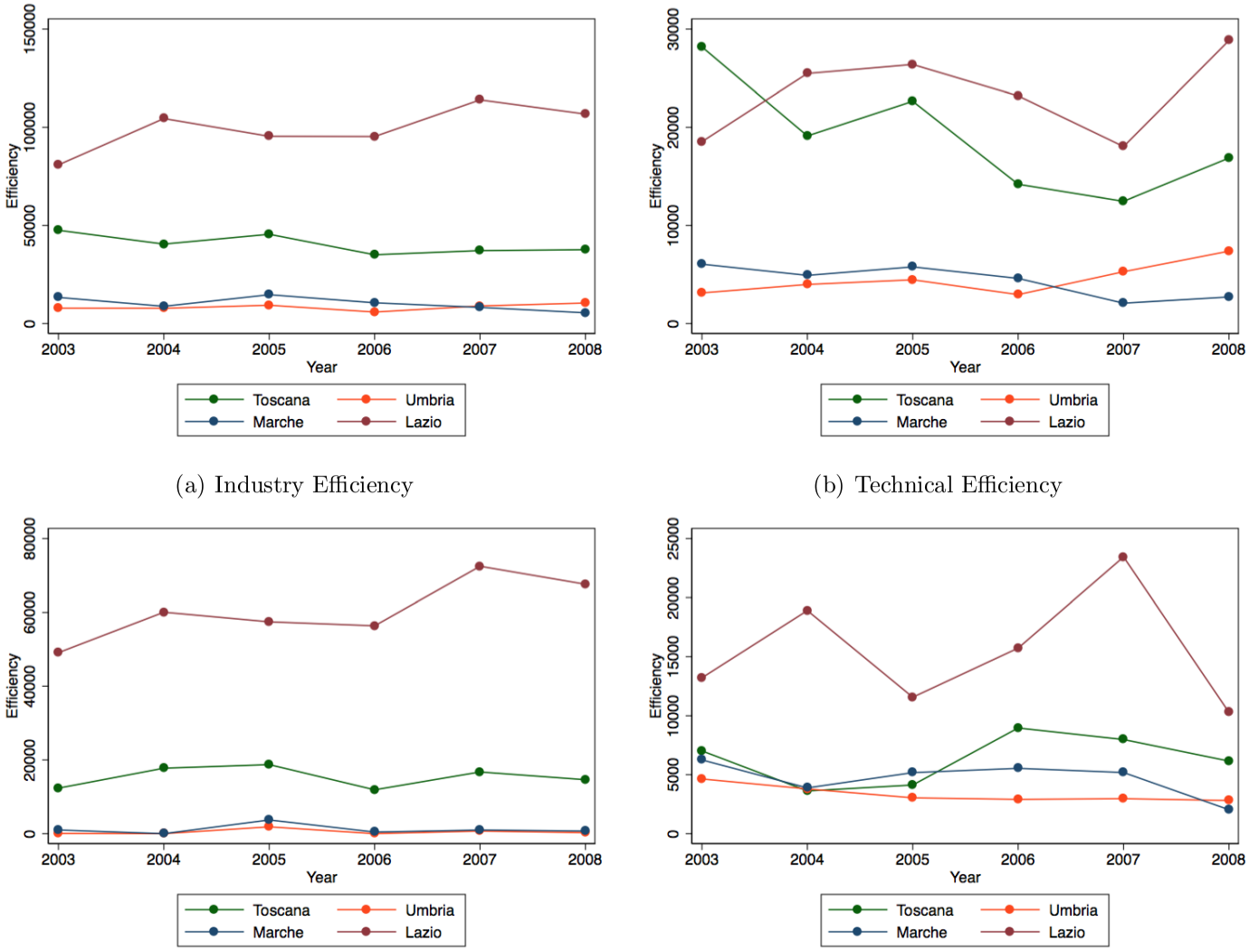
(a) Industry Efficiency

(b) Technical Efficiency

(c) Size Efficiency

(d) Merger & Reallocation Efficiency

Figure 7: Industry Efficiency Decomposition, North-East (%)



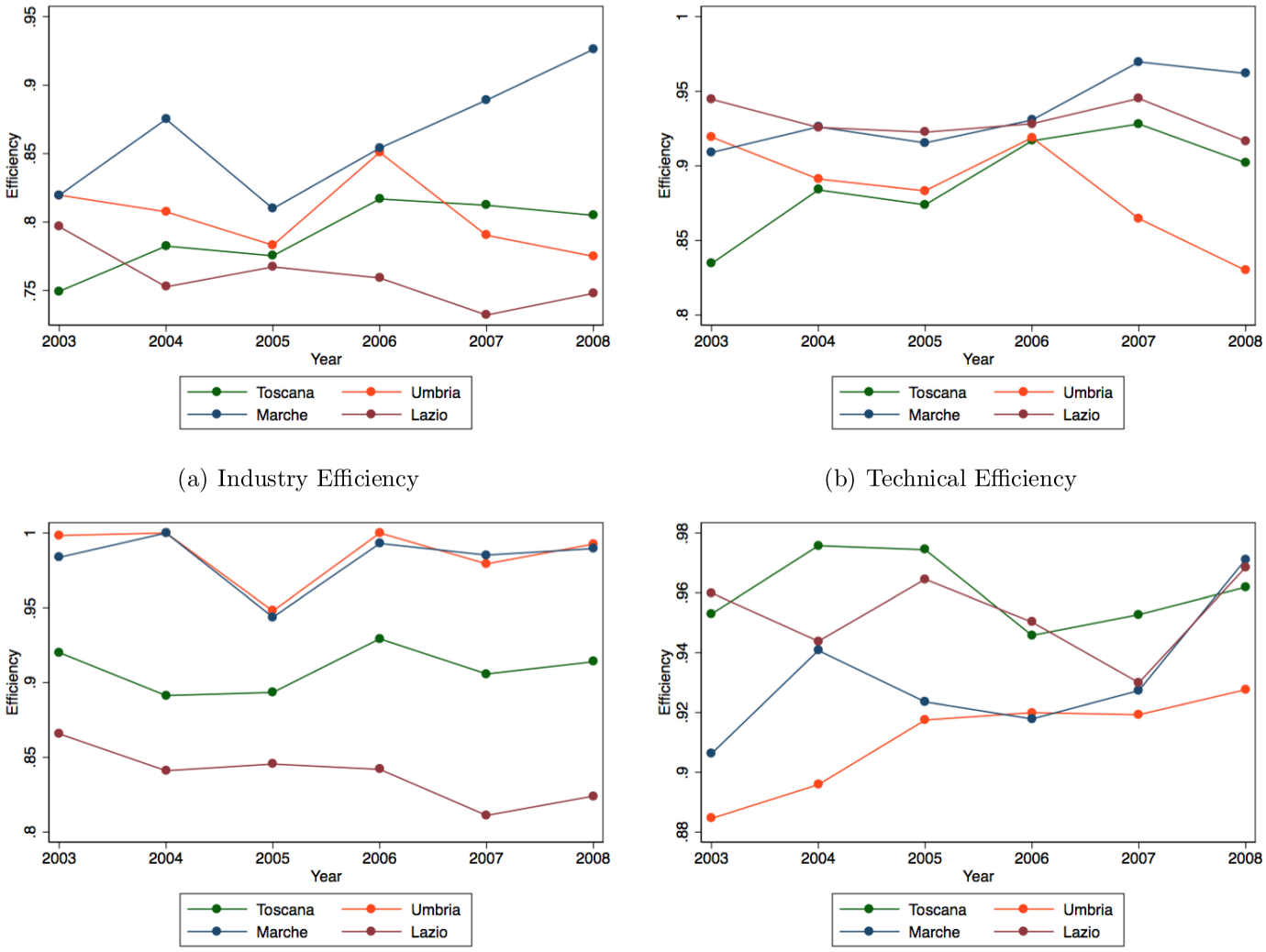
(a) Industry Efficiency

(b) Technical Efficiency

(c) Size Efficiency

(d) Merger & Reallocation Efficiency

Figure 8: Industry Efficiency Decomposition, Centre (Abs. values)



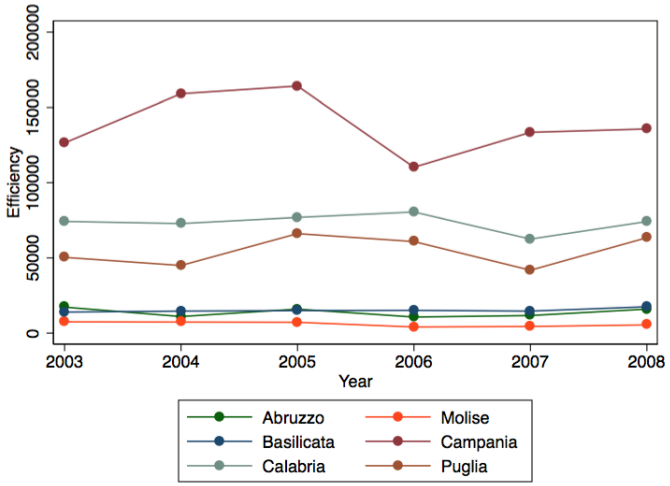
(a) Industry Efficiency

(b) Technical Efficiency

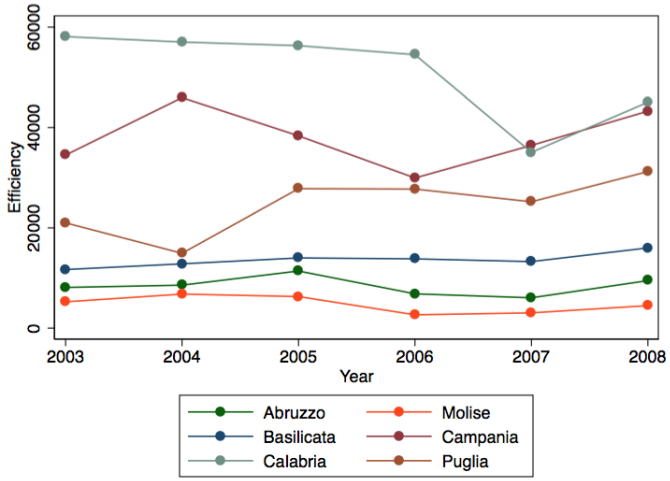
(c) Size Efficiency

(d) Merger & Reallocation Efficiency

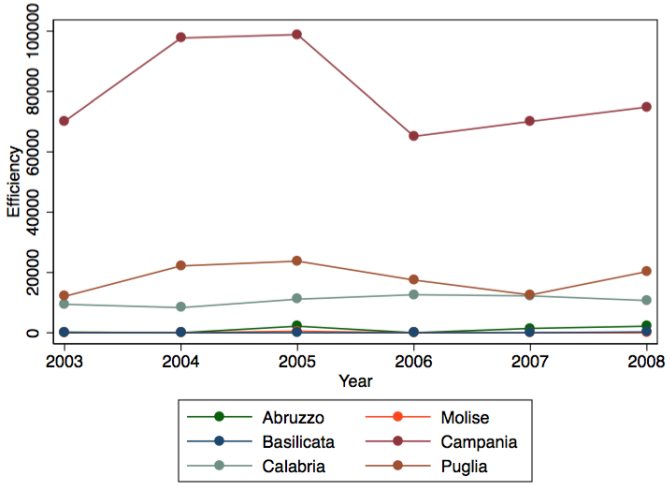
Figure 9: Industry Efficiency Decomposition, Centre (%)



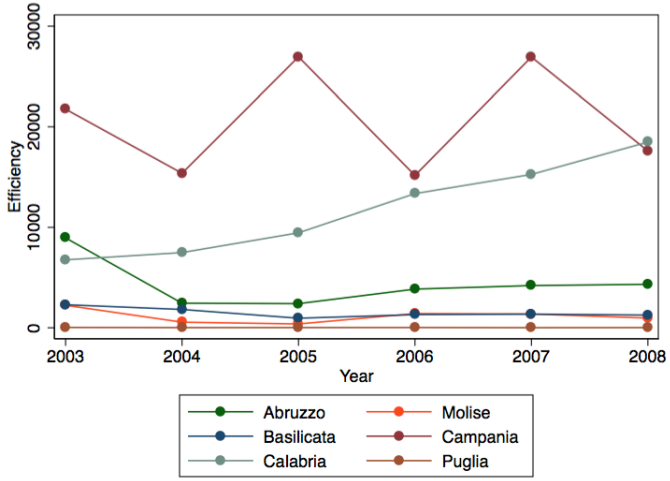
(a) Industry Efficiency



(b) Technical Efficiency

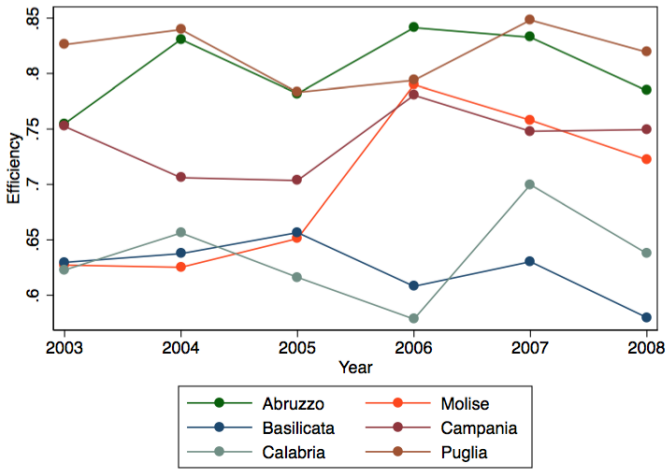


(c) Size Efficiency

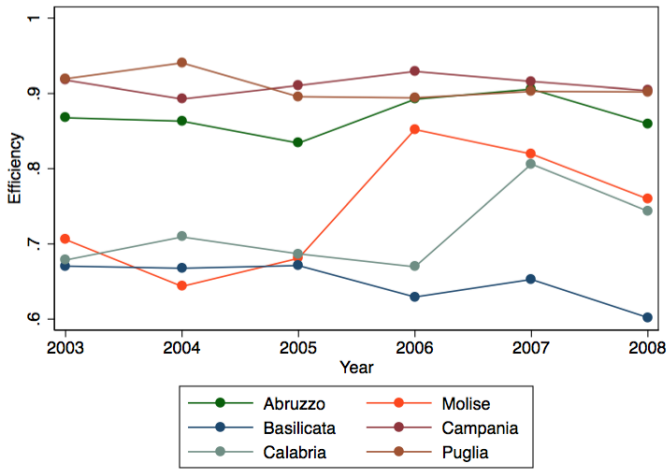


(d) Merger & Reallocation Efficiency

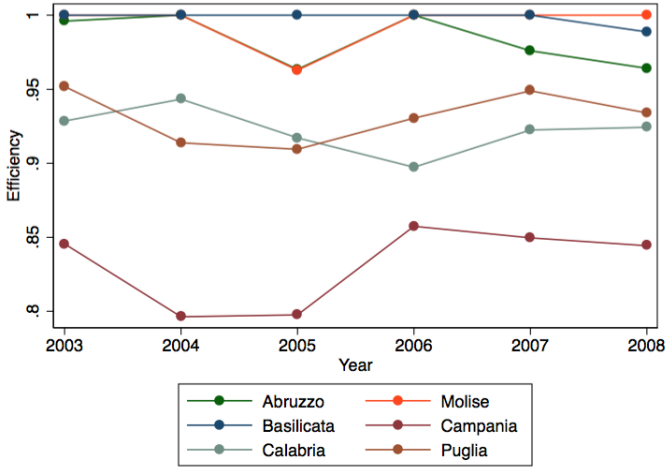
Figure 10: Industry Efficiency Decomposition, South (Abs. values)



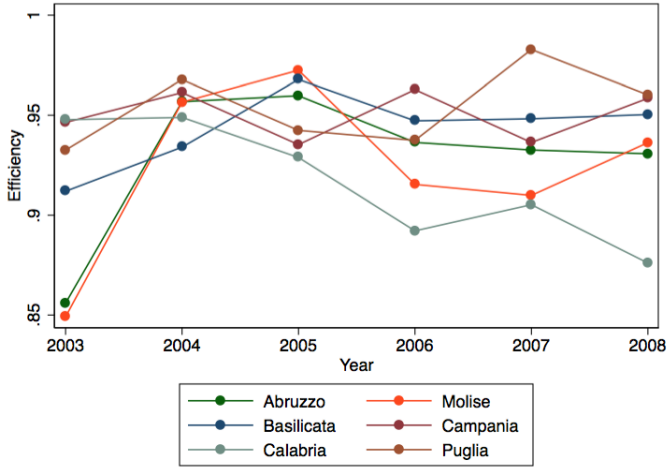
(a) Industry Efficiency



(b) Technical Efficiency

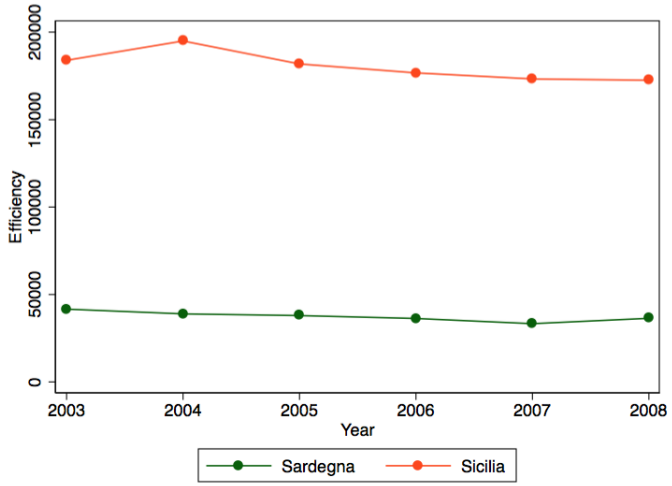


(c) Size Efficiency

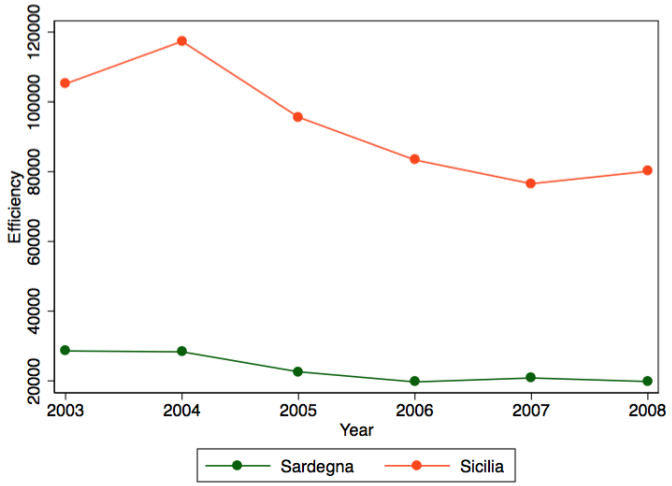


(d) Merger & Reallocation Efficiency

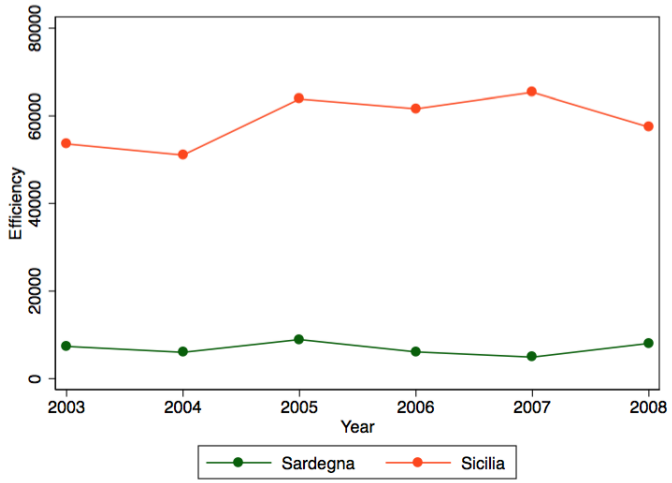
Figure 11: Industry Efficiency Decomposition, South (%)



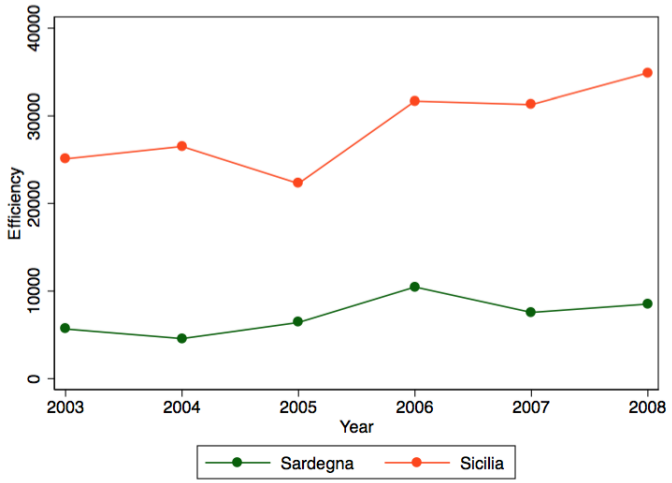
(a) Industry Efficiency



(b) Technical Efficiency

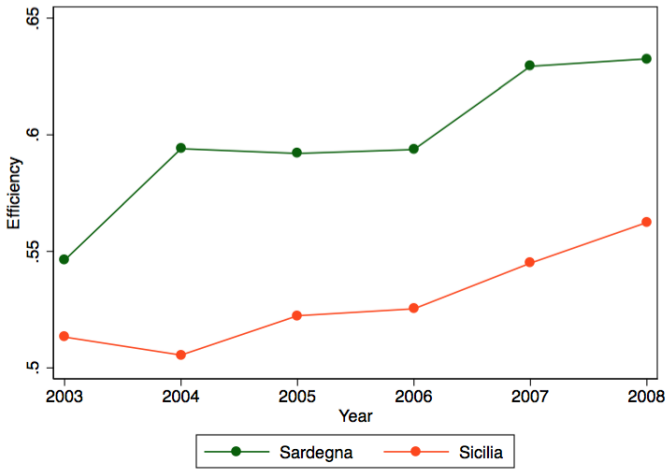


(c) Size Efficiency

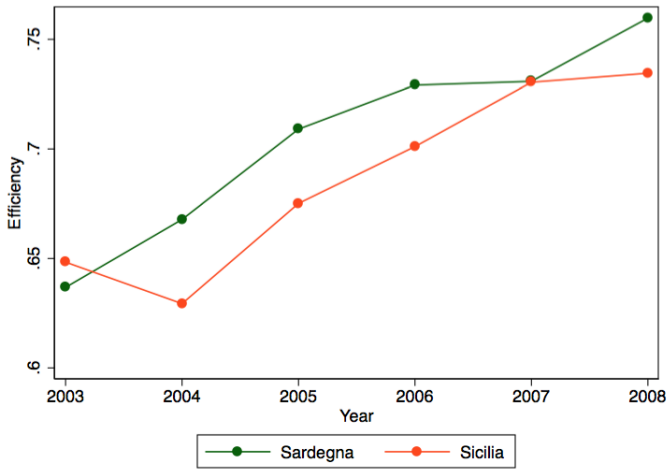


(d) Merger & Reallocation Efficiency

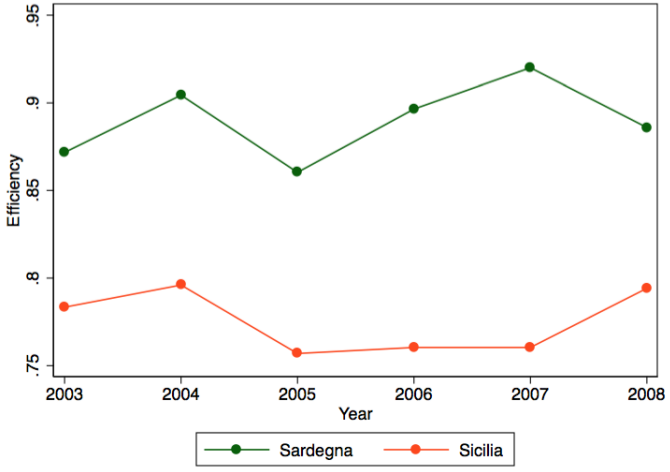
Figure 12: Industry Efficiency Decomposition, Islands (Abs. values)



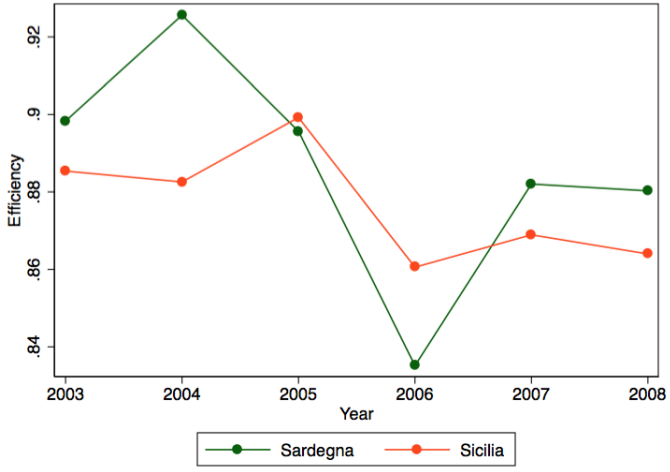
(a) Industry Efficiency



(b) Technical Efficiency

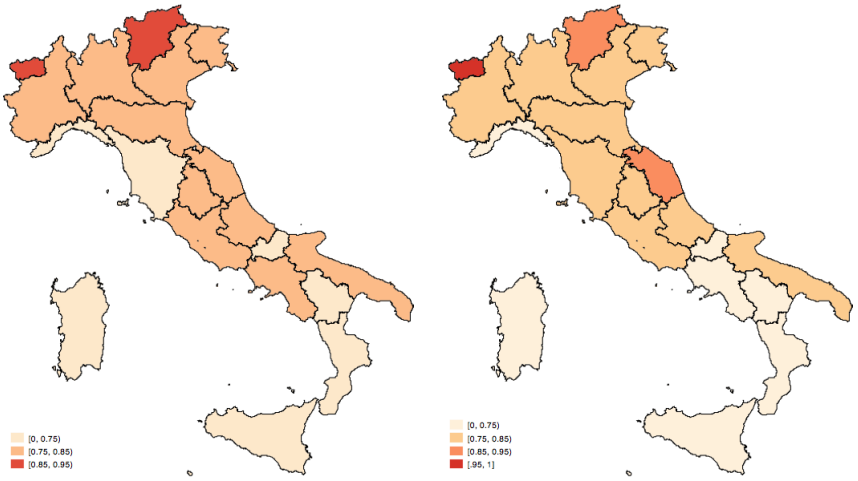


(c) Size Efficiency

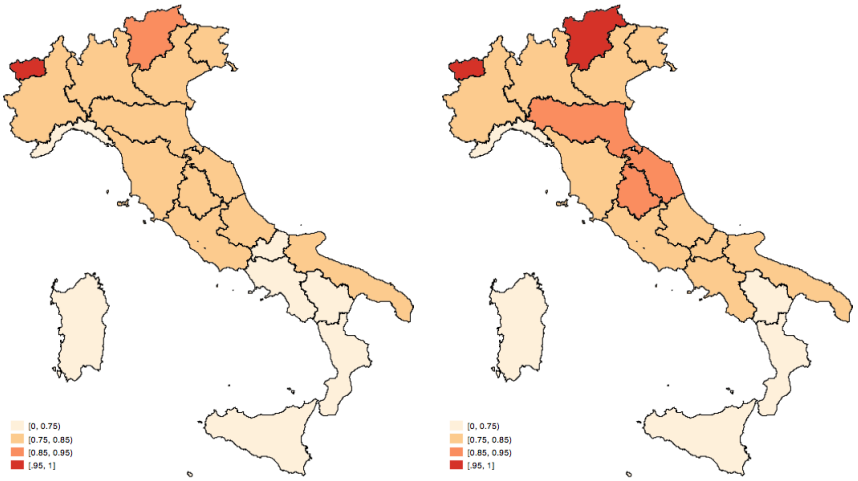


(d) Merger & Reallocation Efficiency

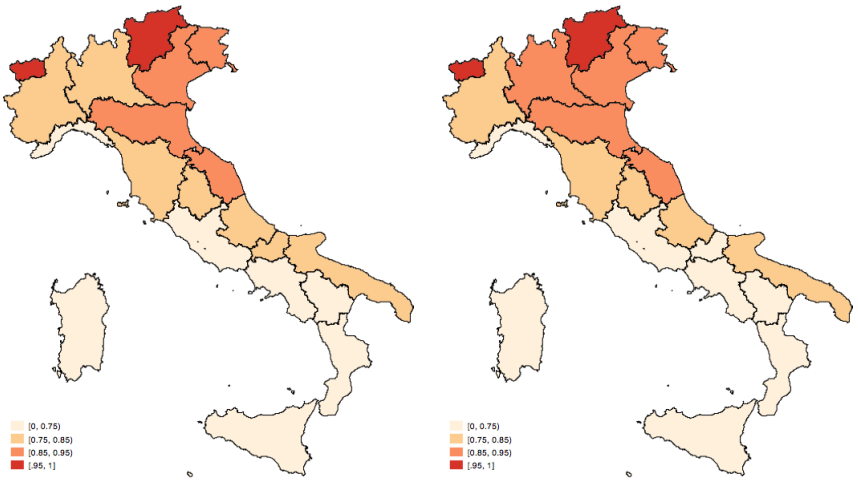
Figure 13: Industry Efficiency Decomposition, Islands (%)



(a) 2003 (b) 2004

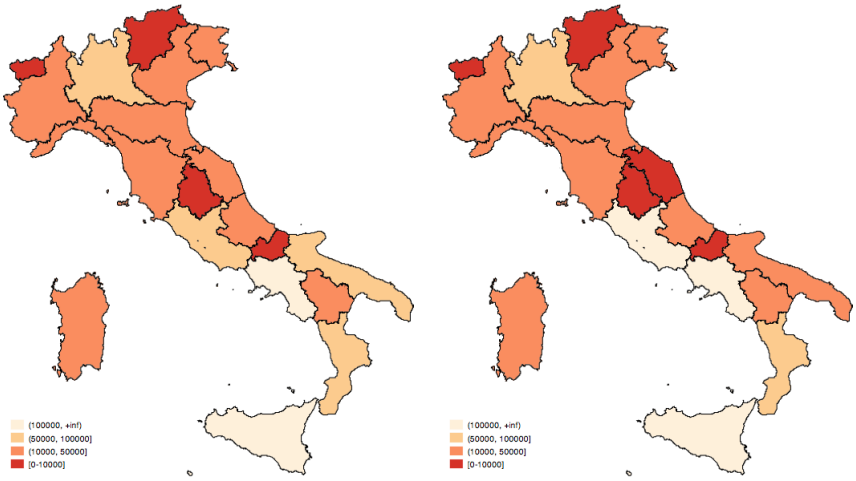


(c) 2005 (d) 2006

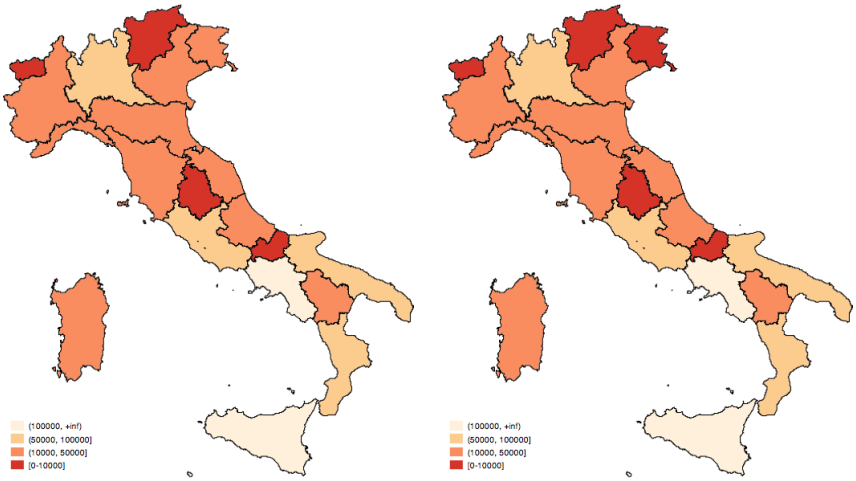


(e) 2007 (f) 2008

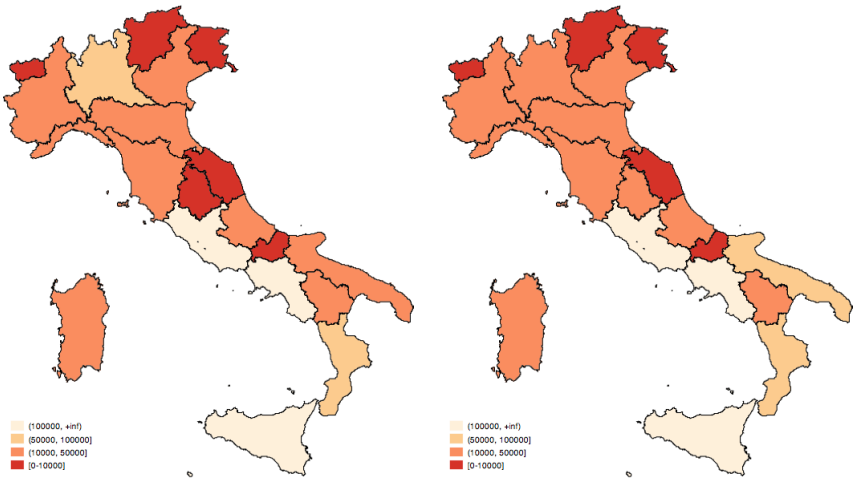
Figure 14: Industry Efficiency by Regions (%)



(a) 2003 (b) 2004

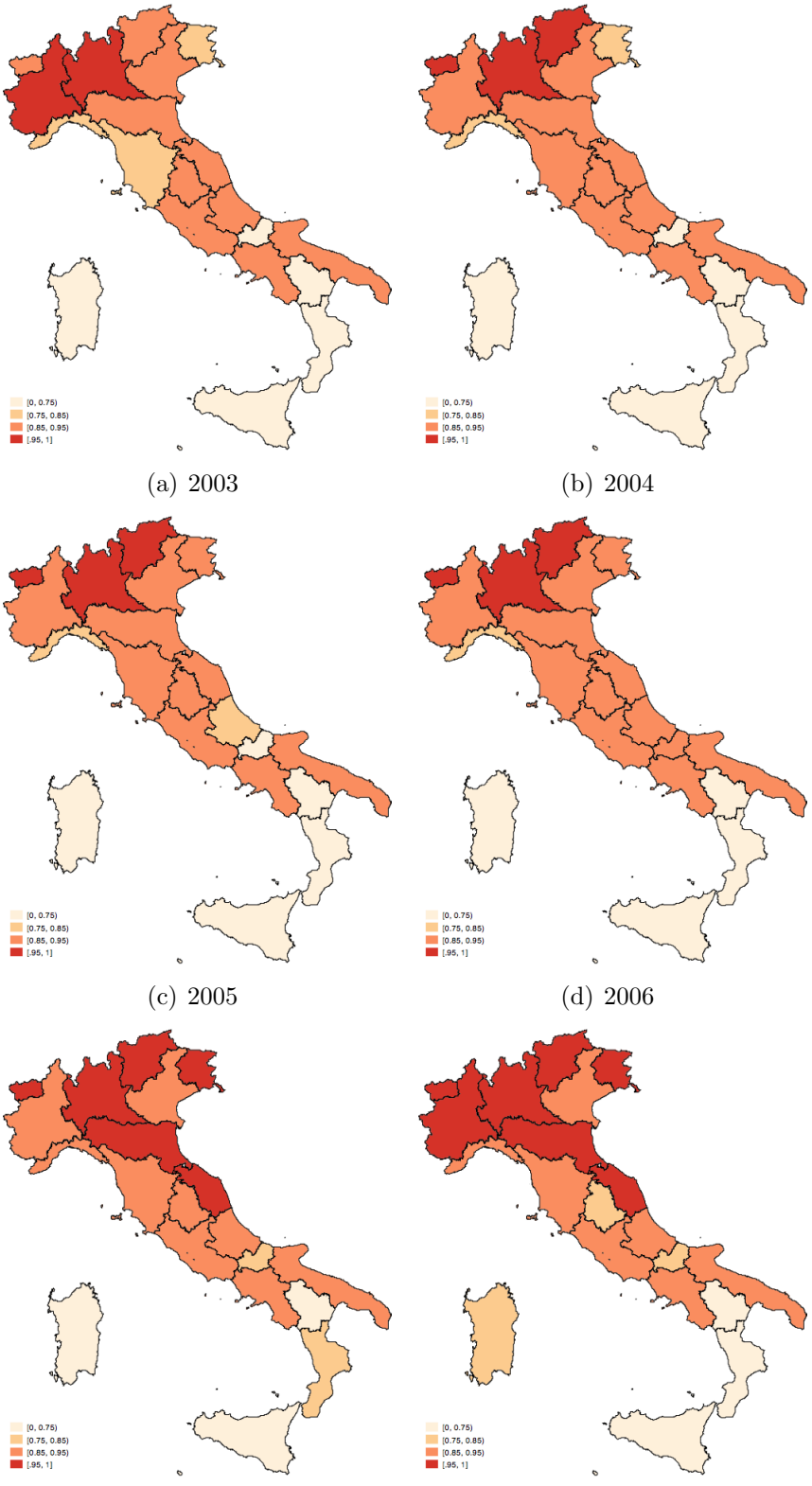


(c) 2005 (d) 2006



(e) 2007 (f) 2008

Figure 15: Industry Efficiency by Regions (Abs. values)

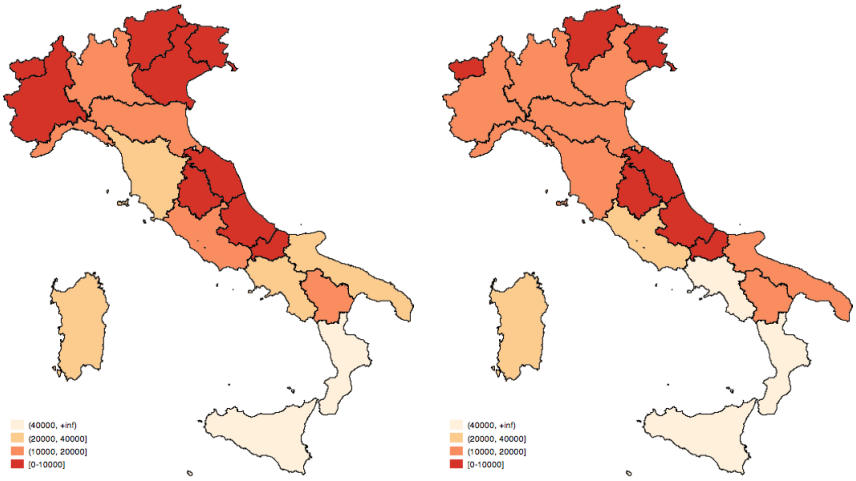


(a) 2003 (b) 2004

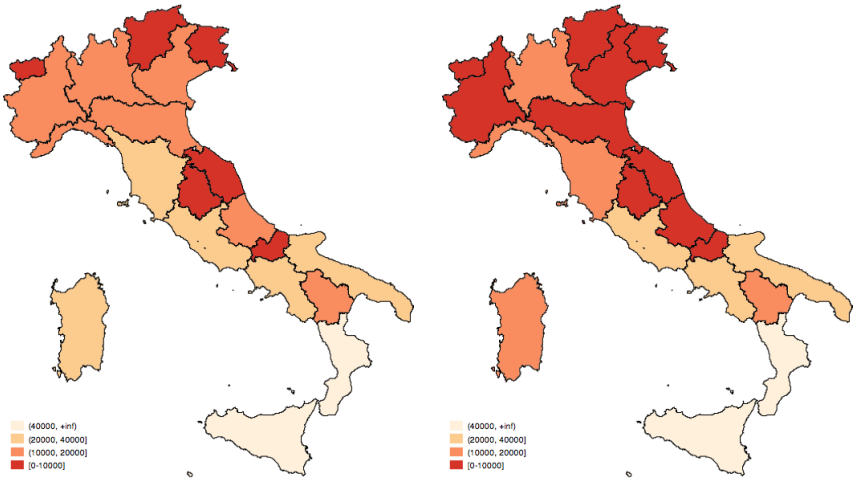
(c) 2005 (d) 2006

(e) 2007 (f) 2008

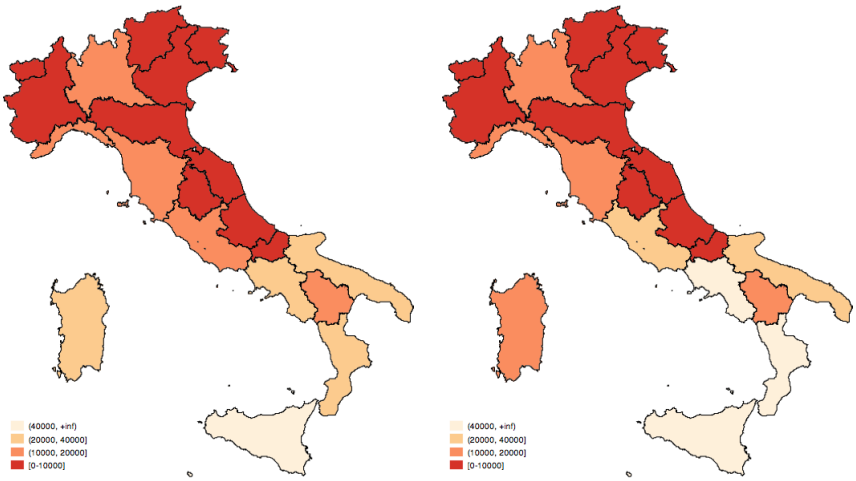
Figure 16: Technical Efficiency by Regions (%)



(a) 2003 (b) 2004

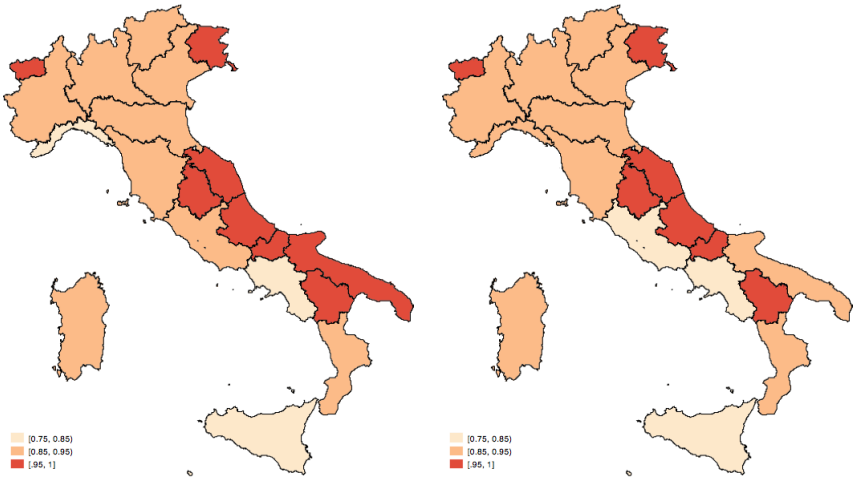


(c) 2005 (d) 2006



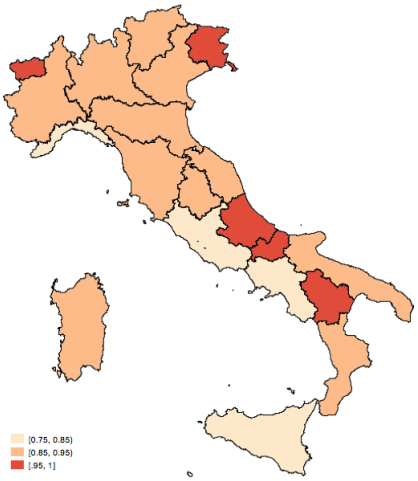
(e) 2007 (f) 2008

Figure 17: Technical Efficiency by Regions (Abs. values)

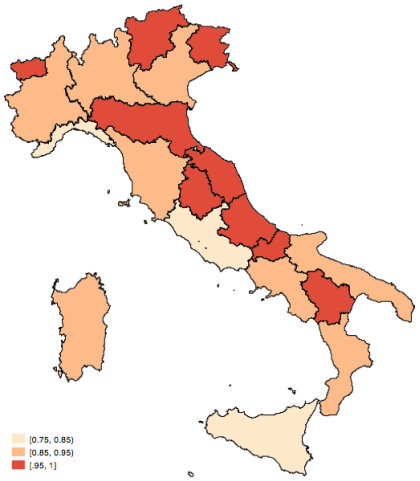


(a) 2003

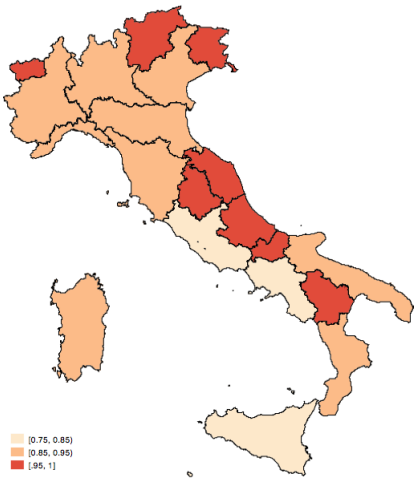
(b) 2004



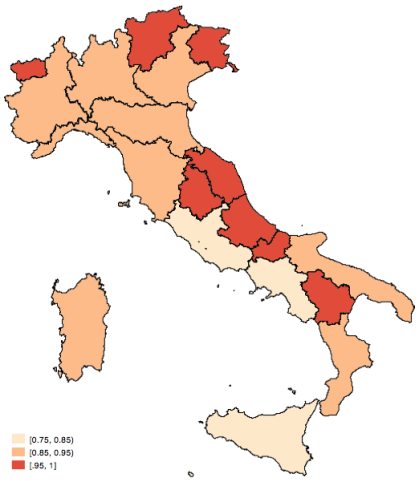
(c) 2005



(d) 2006

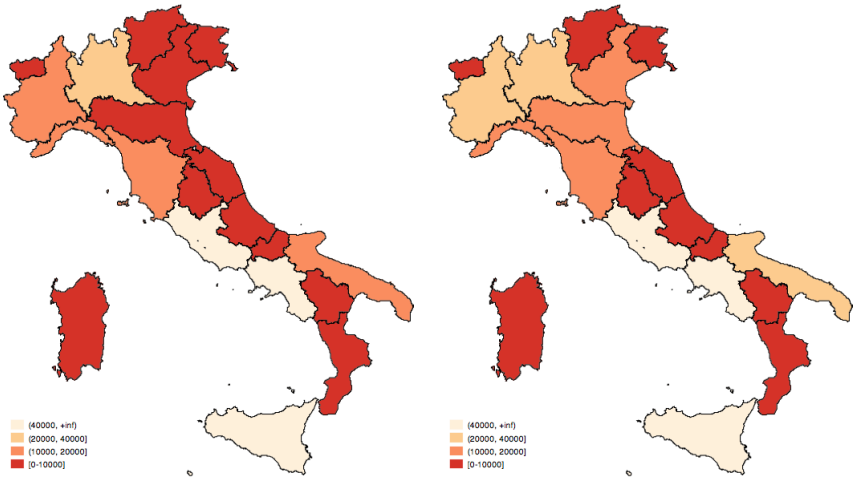


(e) 2007



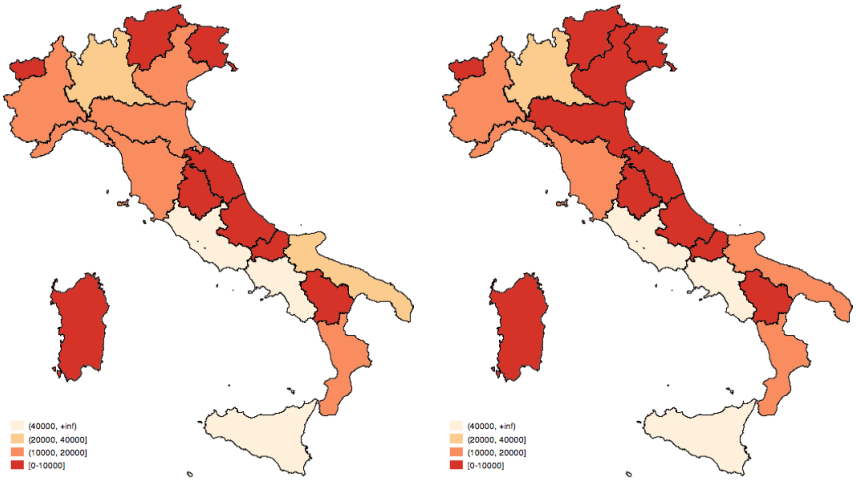
(f) 2008

Figure 18: Size Efficiency by Regions (%)



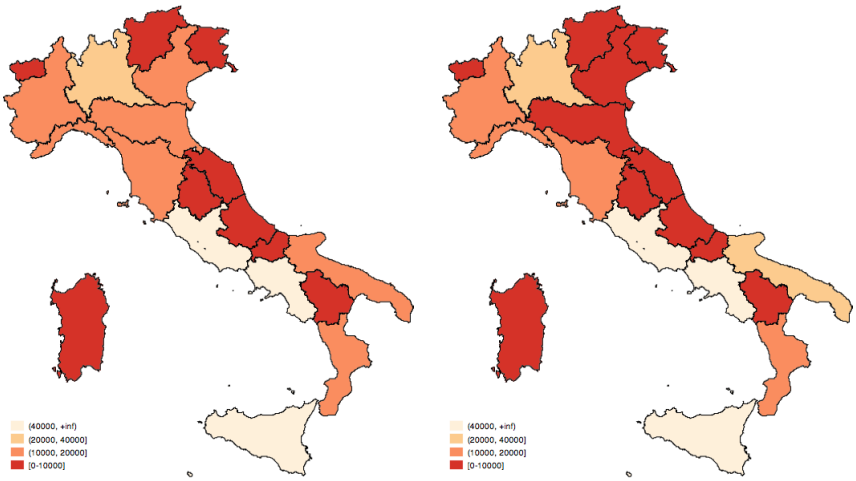
(a) 2003

(b) 2004



(c) 2005

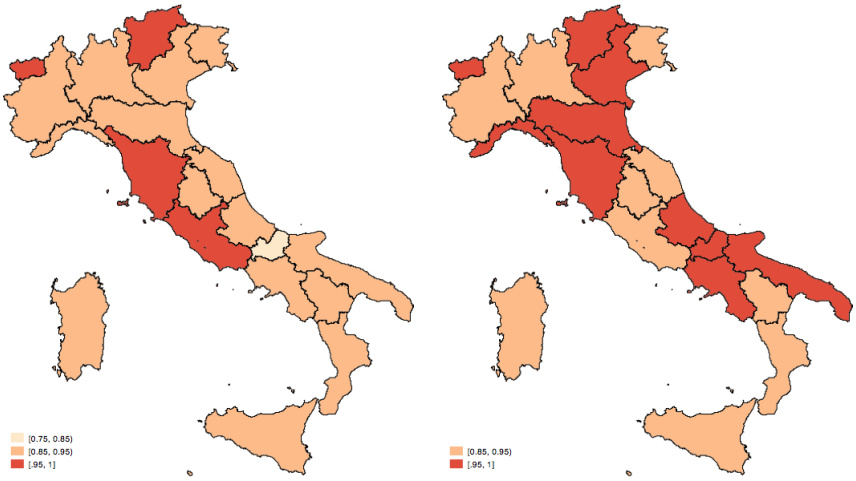
(d) 2006



(e) 2007

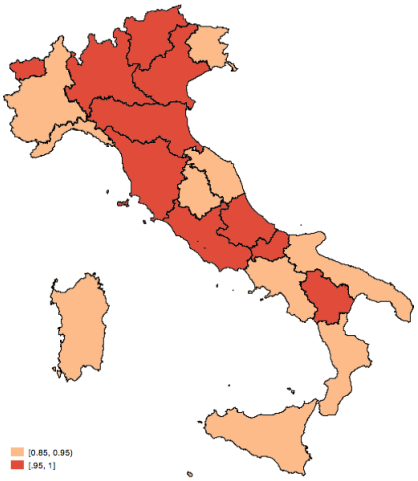
(f) 2008

Figure 19: Size Efficiency by Regions (Abs. values)

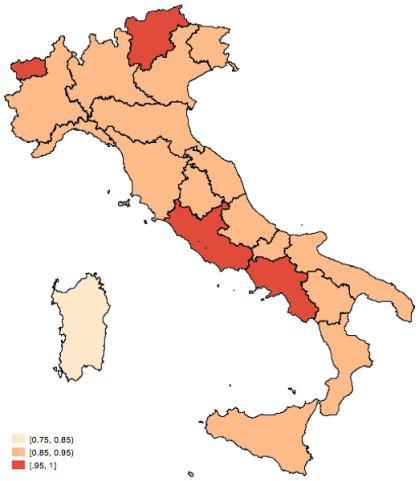


(a) 2003

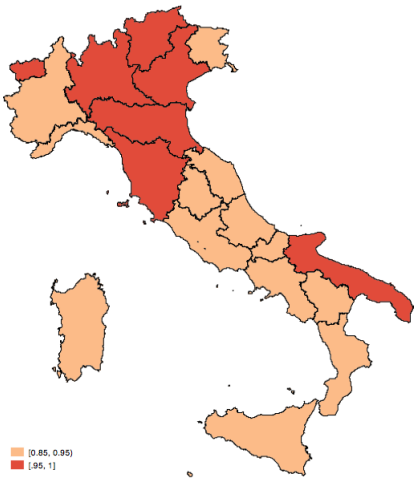
(b) 2004



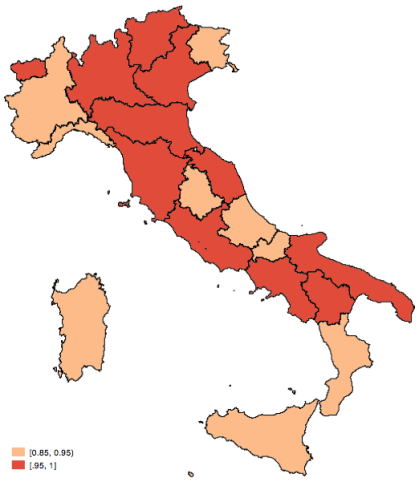
(c) 2005



(d) 2006

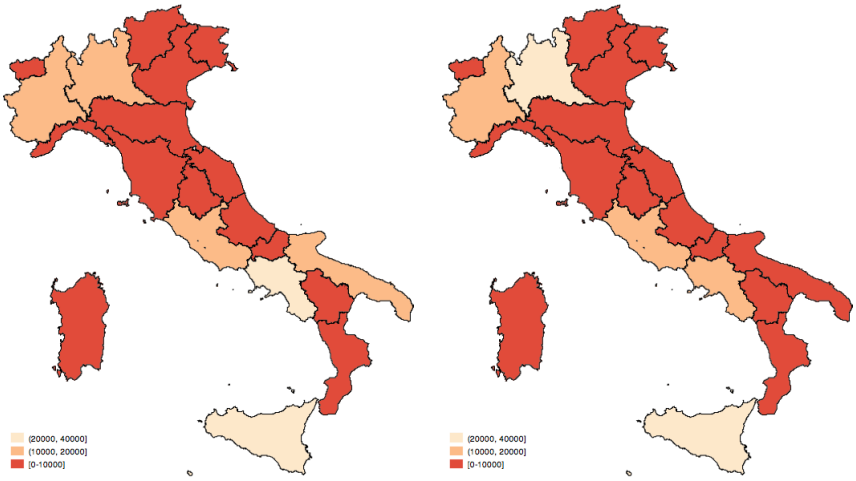


(e) 2007

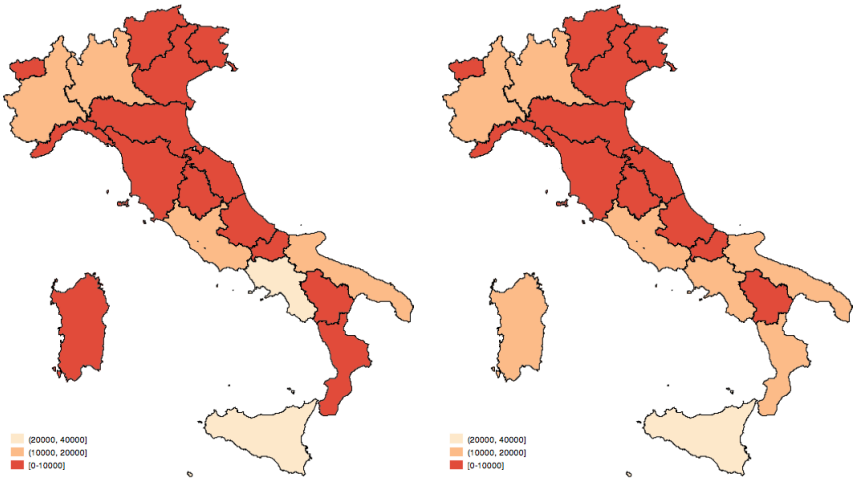


(f) 2008

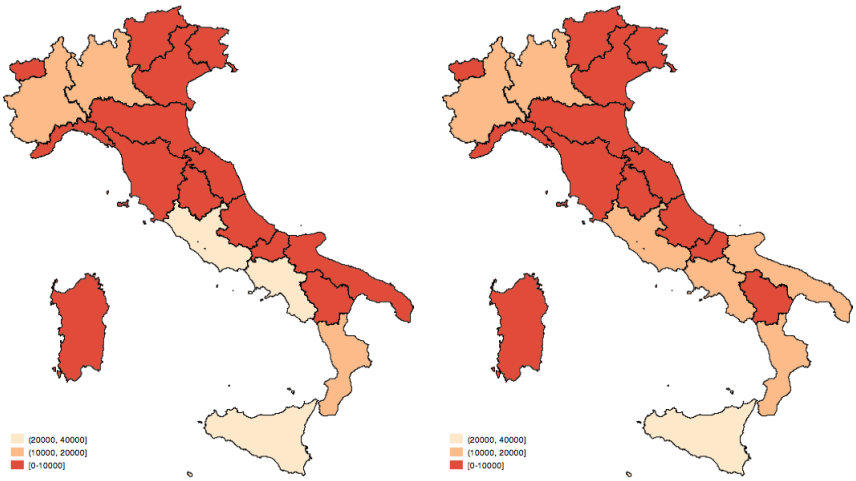
Figure 20: Merger and Reallocation Efficiency by Regions (%)



(a) 2003 (b) 2004

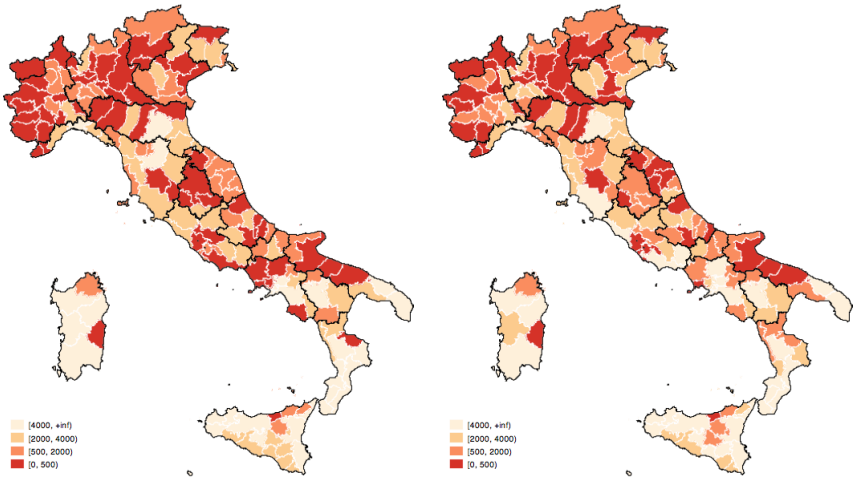


(c) 2005 (d) 2006

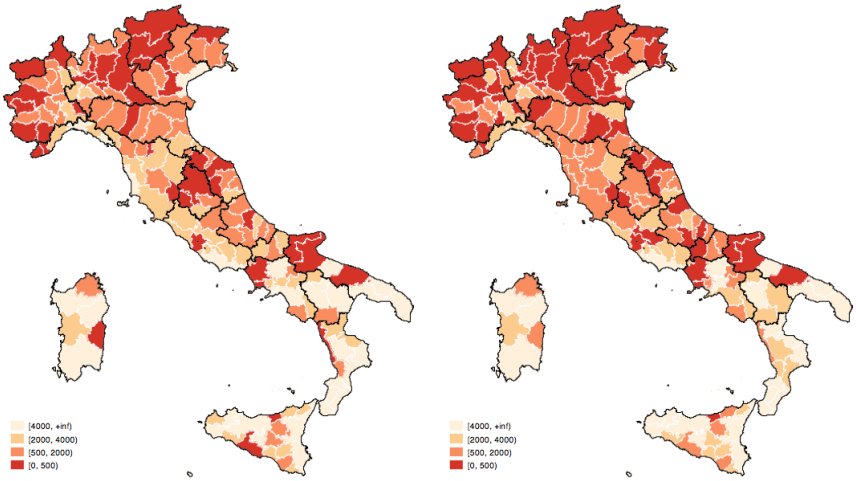


(e) 2007 (f) 2008

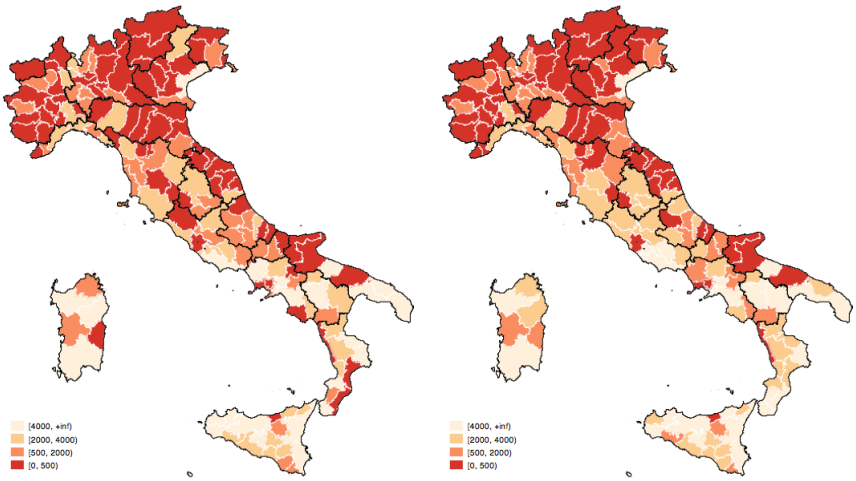
Figure 21: Merger and Reallocation Efficiency by Regions (Abs. values)



(a) 2003 (b) 2004

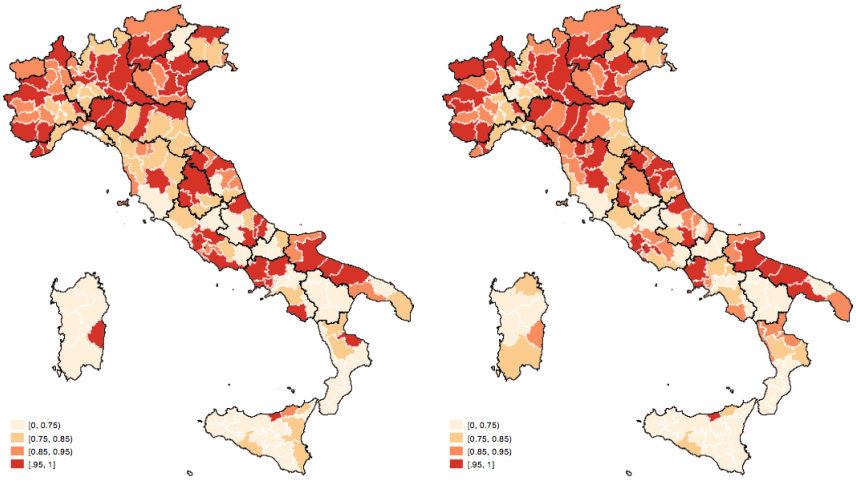


(c) 2005 (d) 2006



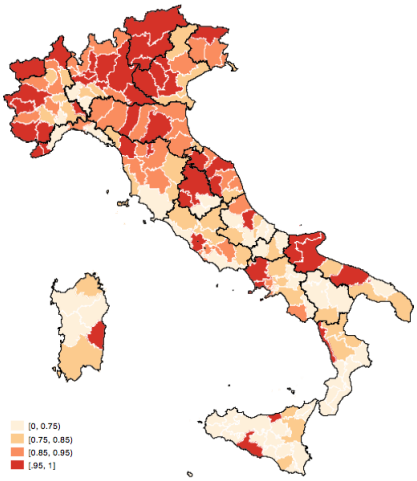
(e) 2007 (f) 2008

Figure 22: Technical Efficiency (Abs. values)

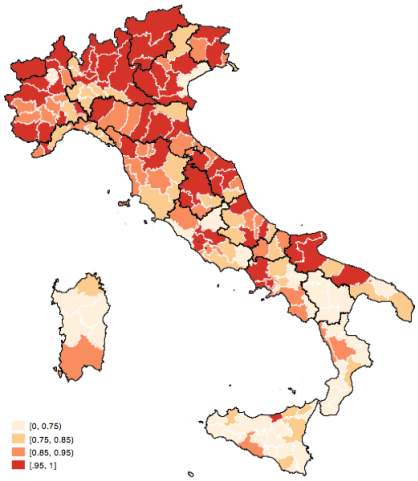


(a) 2003

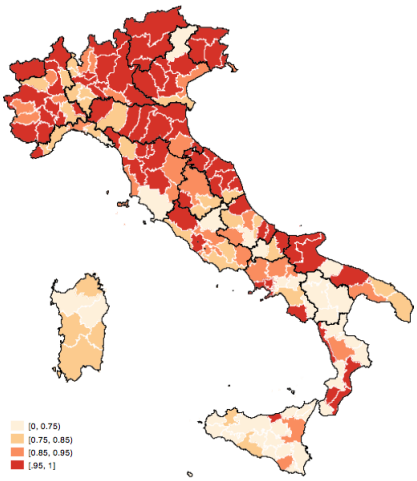
(b) 2004



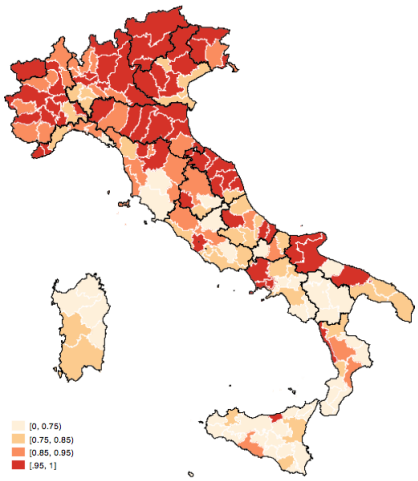
(c) 2005



(d) 2006

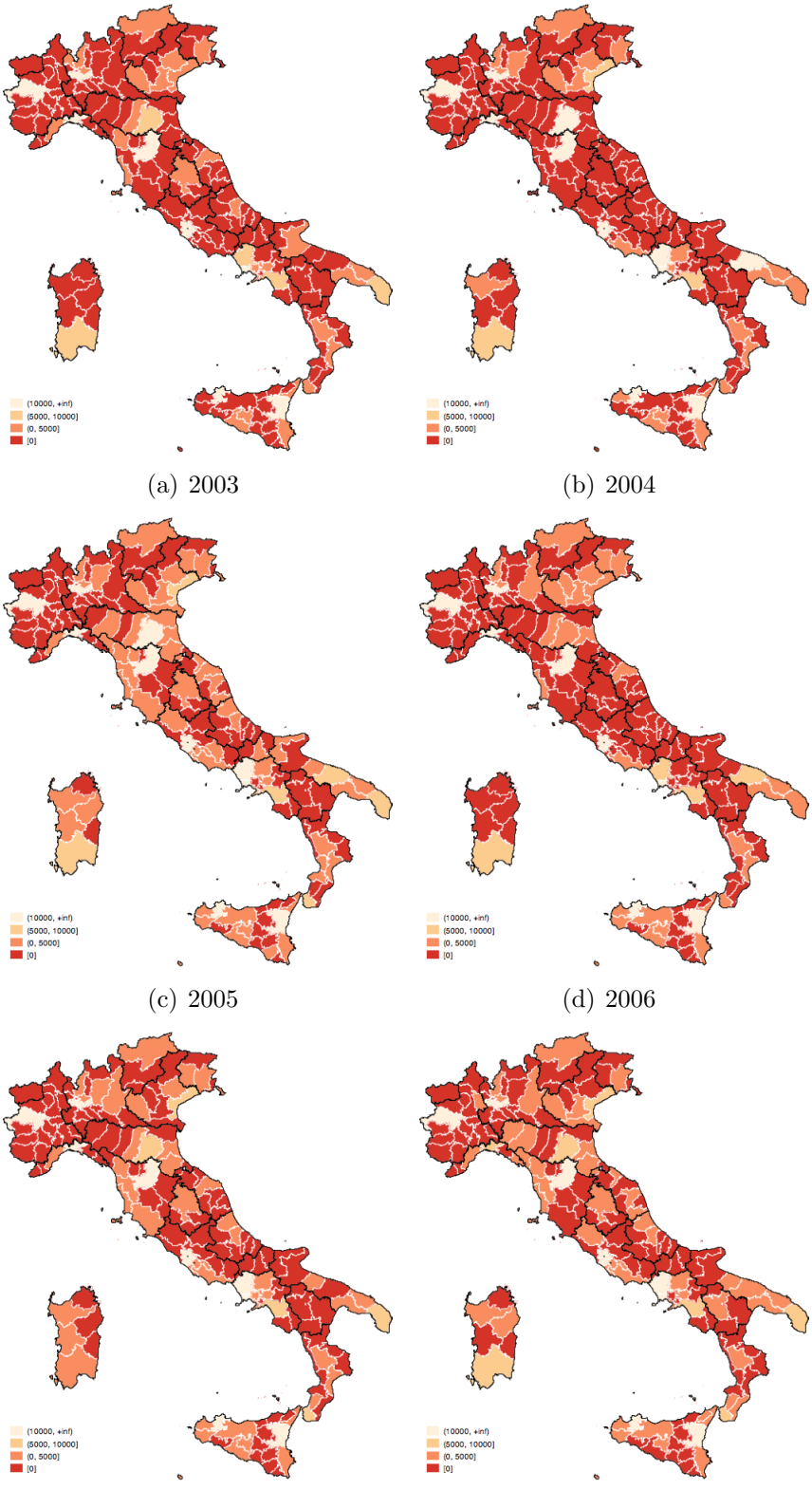


(e) 2007



(f) 2008

Figure 23: Technical Efficiency (%)

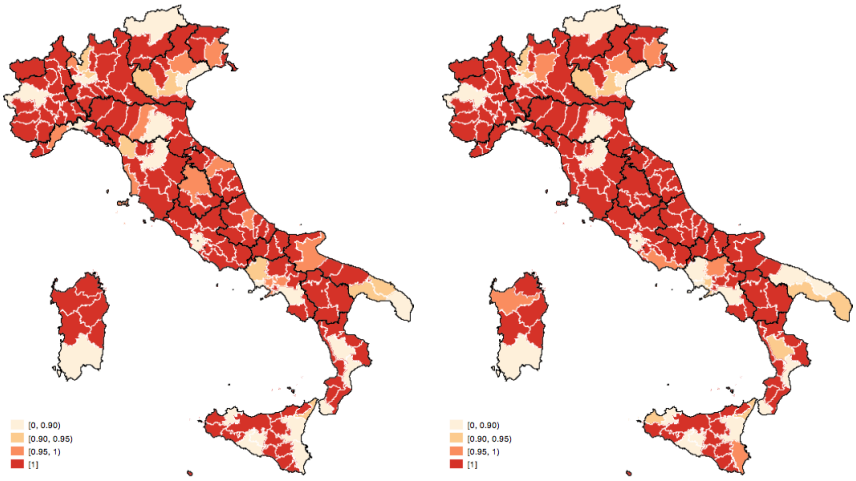


(a) 2003 (b) 2004

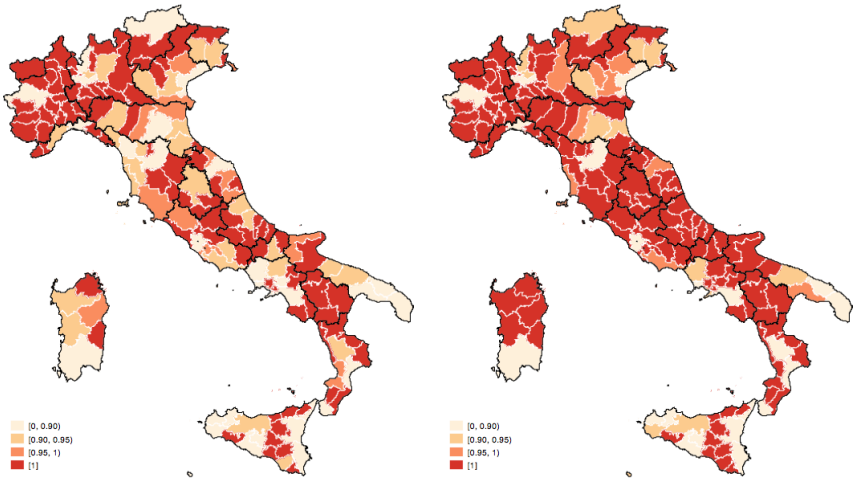
(c) 2005 (d) 2006

(e) 2007 (f) 2008

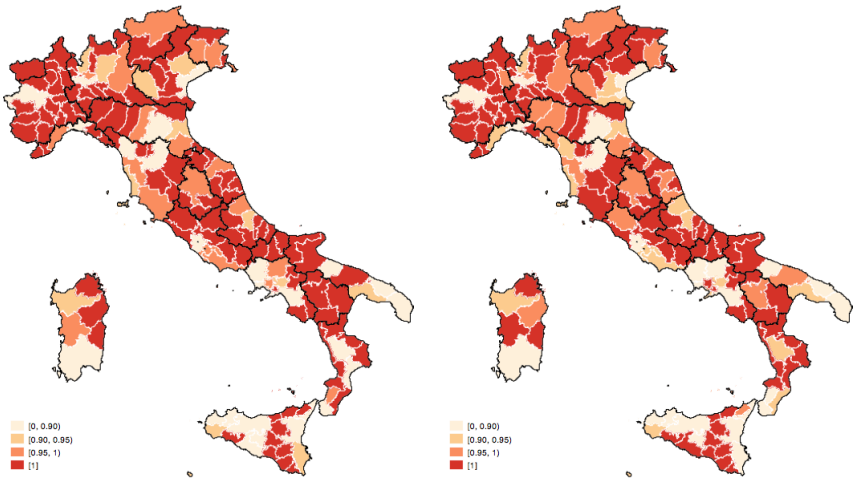
Figure 24: Size Efficiency (Abs. values)



(a) 2003 (b) 2004

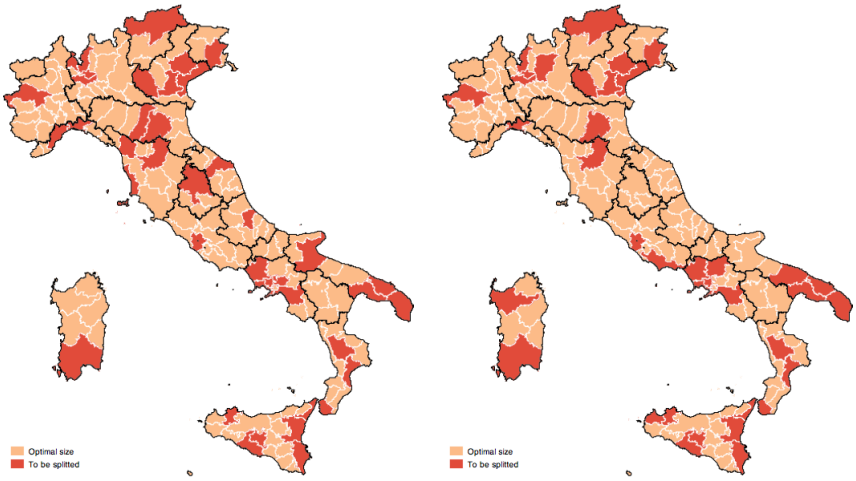


(c) 2005 (d) 2006



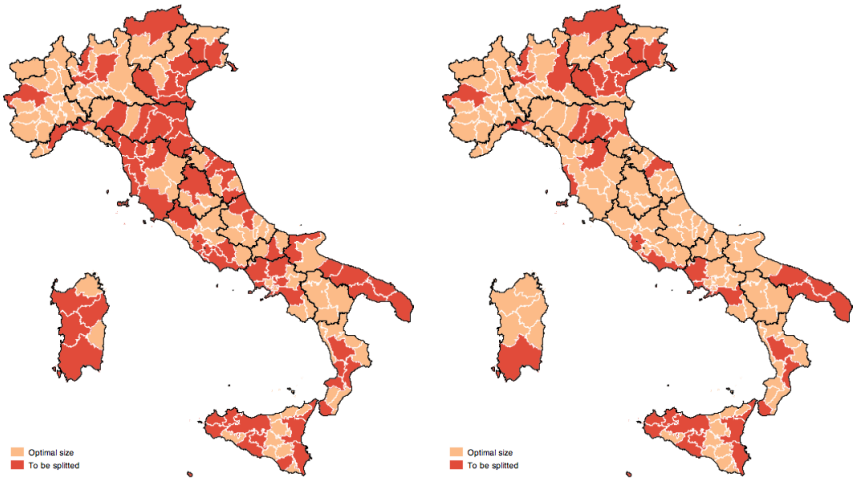
(e) 2007 (f) 2008

Figure 25: Size Efficiency (%)



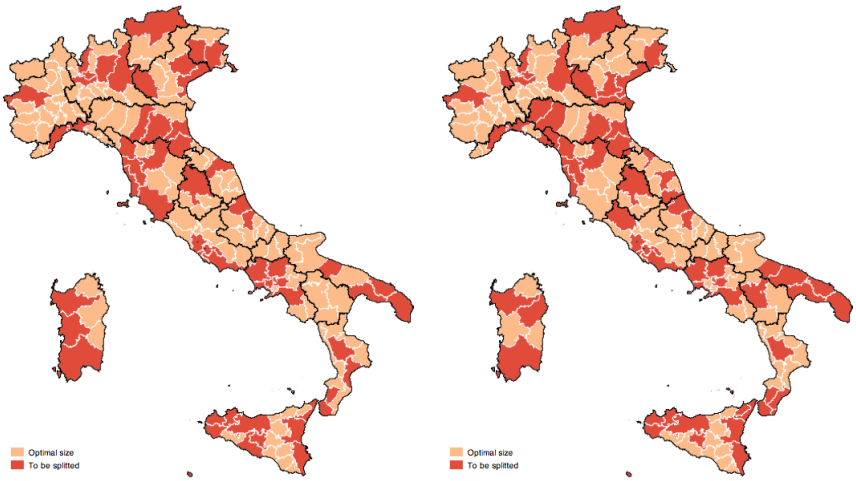
(a) 2003

(b) 2004



(c) 2005

(d) 2006



(e) 2007

(f) 2008

Figure 26: Size Efficiency (Courts to be Splitted)

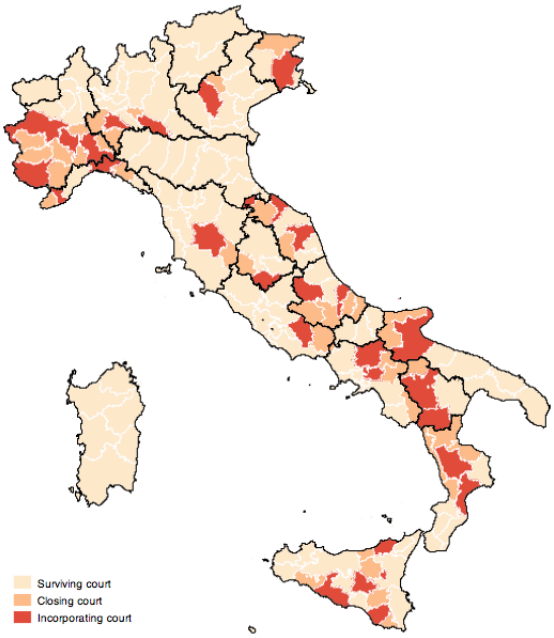


Figure 27: First Proposal - July 2012 (37 closing courts)

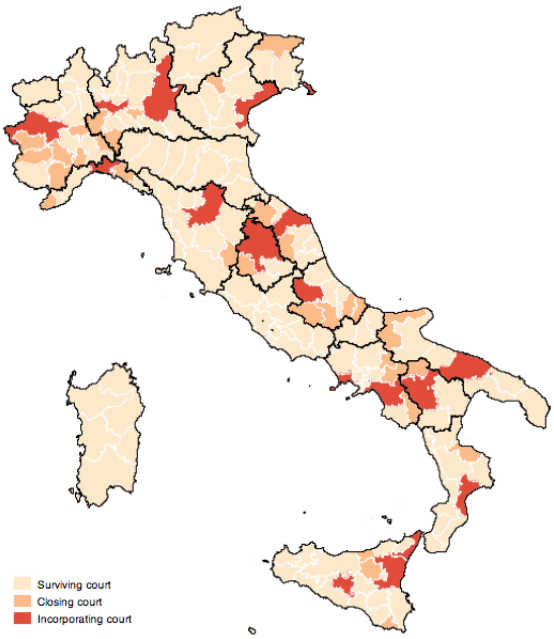


Figure 28: Second Proposal - August 2012 (31 closing courts)