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Efficiency of judicial systems: model definition and output estimation

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ABSTRACT

Focusing on the Italian judicial system as our case study, we use Data Envelopment Analysis to estimate technical efficiency scores and reference values for policy makers. In detail, this work presents a comparative analysis of different model definitions to identify the most appropriate one, emphasizing the key role of case matters in this production process. According to our results, the North of Italy emerges as more efficient than the other Italian macro areas, although the gap significantly decreases when case matters are considered in the output estimation. Concerning the collected reference values, which might be adopted by policy makers to reform the judicial system, we can observe significant differences able to affect the reorganization of courts. Taking the proposed case study into account, it seems that improvements in court performance could be achieved by reforming civil procedures, which are the technologies applied by judges in their production process.

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Institutional efficiency; model definition; output estimation; civil justice

1. Introduction

The judiciary serves important purposes not only in upholding social values, but also in determining economic performance (Falavigna et al., 2019; Ippoliti & Vatiero, 2014). Indeed, well-functioning judiciaries guarantee financial market development (Bae & Goyal, 2009; Bianco, Jappelli, & Pagano, 2002; Fabbri, 2010; Qian & Strahan, 2007), entrepreneurship (Ardagna & Lusardi, 2008;Falavigna et al., 2019; Ippoliti, Melcarne, & Ramello, 2015a, 2015b), and firm growth (Beck, Demirguc-Kunt, & Maksimovic, 2006; Kumar, Rajan, & Zingales, 2001; Laeven & Woodruff, 2007). Accordingly, scholars have recently sought to gain deeper insights into the workings of courts, to better understand and thereby improve the performance of judicial systems (e.g., Falavigna, Ippoliti, Manello, & Ramello, 2015; Finocchiaro Castro & Guccio, 2014; Peyrache & Zago, 2016). However, a number of aspects warrant further exploration, such as, for example, the identification of the most appropriate model definition in operational research aimed at estimating court efficiency.

According to international reports (e.g., CEPEJ, 2016; OECD, 2013), the Italian judicial system is among the most inefficient in Europe, providing the basis for an

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interesting case study.[1] Moreover, the judiciary is regularly mentioned in debates around the Italian economy, with a view to determining whether the nation's current economic difficulties are related to international trends or to structural problems in the institutions, such as, for example, the judiciary (Lanau, Esposito, & Pompe, 2014). Without entering into the Italian debate, this work tries to shed new light on the estimation of judicial efficiency, by identifying the most appropriate model definition and by offering policy makers some additional insights. On the one hand, we emphasize the need to analyze courts according to their different production lines (i.e., case matters) and the related technologies applied by judges (i.e., civil procedures). On the other hand, we try to understand whether the composition of the demand for justice can affect the benchmarking analysis and potential reference values to be used by policy makers in the reform process. These are precisely the goals of this study, that is to say, to identify the most appropriate model definition for the estimation of judicial efficiency and to establish whether an incorrect approach can have a significant impact on the policy makers' decision-making process. Moreover, focusing on the specific case study, our results might point to the need to reform the technologies applied to the production lines of this key sector (i.e., Italian civil procedures).

The paper is organized as follows. Section 2 offers a review of the current literature on judicial efficiency and court productivity, highlighting the model definitions proposed and inputs/outputs adopted. Section 3 introduces the implemented methodology (i.e., Data Envelopment Analysis) and some data regarding the case study (i.e., Italian civil justice in 2011). Section 4 illustrates the main results of the comparative analysis, presenting the estimated technical efficiency scores and potential reference values. Finally, some conclusions and policy implications are discussed in Section 5.

2. Literature review and theoretical background

Several methods have been proposed to measure judicial efficiency: the time needed to settle a case (e.g., Christensen & Szmer, 2012; Di Vita, 2010; Mitsopoulos & Pelagidis, 2007), the number of cases completed by a court (e.g., Beenstock & Haitovsky, 2004; Ramseyer, 2012); technical efficiency scores (e.g., Falavigna et al., 2015; Ippoliti, 2015; Santos & Amado, 2014), and clearance rates (e.g., Buscaglia & Ulen, 1997; Dakolias, 1999; Soares & Sviatschi, 2010). The methodologies applied in the benchmarking analysis range from simple econometric regression models (e.g., Beenstock & Haitovsky, 2004) to more sophisticated ones, like Free Disposal Hull (e.g., Tulkens, 1993), Directional Distance Function (e.g., Falavigna et al., 2015), Data Envelopment Analysis (e.g., Schneider, 2005), and Malmquist indexes (e.g., Falavigna et al., 2017a).

This work proposes Data Envelopment Analysis (DEA) to measure judicial efficiency, estimating a technical efficiency score for every judicial district. DEA has been successfully adopted in judicial analysis, both in its one-stage form (e.g., Kittelsen & Førsund, 1992; Pedraja Chaparro & Salinas-Jimenez, 1996; Santos & Amado, 2014) and in its two-

[1]As a reference, in Italy, the average trial length at the first instance level is equal to 564 days, rising to 1,113 days at the second instance level; conversely, in France the same figures are 274 and 343 days respectively, while in Germany the average length of trials is equal to 200 days at both levels (Palumbo et al., 2013).

stage form (Deyneli, 2012; Ippoliti, 2014; Schneider, 2005).[2] Even though this technique is widely accepted and used by academia to analyse the judiciary, a key open question remains: which are the most appropriate inputs and outputs of the justice production process?

This is a critical issue since, depending on the model definition, policy makers might use different reference values to implement structural reforms of the national judicial system. For example, the last main reform of the Italian judicial system, which was aimed at redefining the territorial competence of the courts (i.e., reform of Italy's judicial geography), was based on national reference values (Ippoliti, 2015). Obviously, if the model definition is incorrect, policy makers might be misled by the results obtained, adopt imprecise reference values, and ultimately introduce inappropriate reforms. For this reason, input selection and output definition are crucial and, considering the current heterogeneity in the literature, there is a great need to shed new light on this issue by identifying the most appropriate model definition.

Table 1 presents a review of the current literature, showing the inputs and outputs adopted, as well as the judicial systems analysed and the mathematical programming techniques used. As readers can observe in the table, the number of settled cases is identified as the main output, although it is presented as an aggregate measure. Only few studies have tried to adopt a more precise output measure by disaggregating the supply of justice according to case matters (i.e., Kittelsen & Førsund, 1992; Santos & Amado, 2014). At the same time, even greater heterogeneity can be observed when inputs are considered. Some authors have exclusively used judges and staff as inputs (e.g., Deyneli, 2012; Pedraja Chaparro & Salinas-Jimenez, 1996), while other researchers have also included pending and/or incoming cases (e.g., Falavigna et al., 2015; Finocchiaro Castro & Guccio, 2014; Ippoliti, 2015; Ippoliti & Vatiero, 2014; Schneider, 2005), suggesting that the demand for justice might affect court productivity. Therefore, there is no common and clear model definition to estimate judicial efficiency.

However, from a general point of view, we cannot treat in the same manner factors that can be regarded as actual inputs (e.g., judges or staff), and are therefore under the control of Decision Making Units (DMUs), and factors beyond the control of DMUs (e.g., demand for justice). The production function represents the technical relationship between chosen inputs and outputs, while the other factors can affect it parametrically or through non-parametric shifting factors. This is the main reason for adopting a two-stage analysis or other techniques aiming to bypass influences not directly depending on DMUs (i.e., environmental variables).[3] A first attempt to investigate this relevant issue is made by Finocchiaro Castro and Guccio (2015; 2016), who regard the caseload as a non-discretionary input related to the environment in which the courts operate. In this way, they distinguish between managerial inefficiency and inefficiency due to uncontrollable inputs (i.e., pending and incoming cases). Might backlog affect the production process?

The work of the judiciary can be considered a case of service production (supply of justice), in which production transforms each of the items that enter the process (demand

[2]According to Simar and Wilson (2007), the one-stage DEA procedure aims to estimate and analyze efficiency, while the two-stage DEA procedure uses the estimated scores to study the determinants of inefficiency.
[3]For a survey, see Muniz (2002).

Table 1. Inputs and outputs adopted and mathematical programming techniques in the analysis of judicial efficiency: Data Envelopment Analysis (DEA), Free Disposal Hull (FDH), and Directional Distance Function (DDF).

Study	Analyzed judicial system	Output	Input	Technical notes
Lewin, Morey, and Cook (1982) a	USA (Criminal courts – North Carolina)	settled cases; pending cases (less than 90 days);	days of court held; number of district attorneys and assistants; size of the caseload; number of misdemeanours in the caseload and size of white population;	DEA model
Kittelsen and Førsund (1992) ‡	Norway (First instance courts)	settled cases (7 categories);	judges; staff;	DEA model
Tulkens (1993) ‡	Belgium (Justices of the Peace)	settled cases (civil and commercial); settled cases (juvenile offences); family arbitration sessions held;	staff;	FDH model
Pedraja Chaparro and Salinas-Jimenez (1996) ¥	Spain (Administrative Litigation Division of High Courts)	settled cases (with sentence); settled cases (in other ways, i.e. without sentence);	judges; staff;	DEA model
Schneider (2005) a	Germany (Labour Courts)	settled cases; published decisions;	judges; pending cases;	DEA model
Yeung and Azevedo (2011) a	Brazil (First and second instance courts)	settled cases at first level (over workload); settled cases at second level (over workload);	judges over workload; staff over workload;	DEA model
Ferrandino (2012) ‡	USA (Criminal, civil and family courts – Florida)	settled cases;	judges;	DEA model
Deyneli (2012) ‡	Europe (First instance courts)	settled cases (civil); settled cases (criminal); population;	judges; staff;	DEA model
Finocchiaro Castro and Guccio (2014) a	Italy (First and second instance courts)	aggregate settled cases (with sentence); aggregate settled cases (in other ways, i.e. without sentence);	judges; staff; pending cases;	DEA model
Ippoliti (2014) a	Italy (First instance courts)	settled cases;	judges; pending cases; incoming cases;	DEA model
Ippoliti et al. (2015a), (2015b)) a	Europe (First instance courts)	settled cases;	judges; staff; pending cases; incoming cases;	DEA model
Santos and Amado (2014) ‡	Portugal (First instance courts)	settled cases according to proceedings (43 outputs);	judges; staff;	DEA model

(*Continued*)

Table 1. (Continued).

Study	Analyzed judicial system	Output	Input	Technical notes
Finocchiaro Castro and Guccio (2015, 2018) ‡	Italy (First instance courts)	settled cases;	judges; staff; workload (i.e. pending plus incoming cases);	DEA model
Ippoliti (2015) a	Italy (First instance courts)	settled cases;	judges; staff; workload (i.e. pending plus incoming cases)	DEA model
Falavigna et al. (2015) δ	Italy (First instance courts)	settled cases (good output); delay (bad output);	judges; pending cases; incoming cases;	DDF model
Melcarne and Ramello (2015) a	Europe (First instance courts)	settled cases;	judges; staff; pending cases; incoming cases;	DEA model
Peyrache and Zago (2016) ‡	Italy (First instance courts)	settled cases;	judges; staff; pending cases;	DEA model
Falavigna, Ippoliti, and Ramello (2018) δ	Italy (First instance courts)	settled cases	judges; pending cases; incoming cases;	DEA model and Malmquist Index
Mattsson, Månsson, Andersson, and Bonander (2018) ‡	Sweden (First instance courts)	settled criminal cases; settled civil cases; settled matters;	judges; law clerks; other personnel; area of the court (square meters);	DEA model and Malmquist Index
Ferro, Romero, and Romero-Gómez (2018) ‡	Argentina (First instance federal courts)	settled cases	professional agents; non-professional agents; seniority; age; temporary personnel ratio; promotion, workload;	DEA model
Falavigna, Ippoliti, and Manello (2019) ‡	Italy (First instance courts)	settled cases (civil cases); settled cases (criminal cases);	judges; staff; pending cases; incoming cases;	DEA model
Mattsson and Tidanå (2019) ‡	Sweden (First instance courts)	settled criminal cases; settled civil cases; settled matters;	judges; law clerks; other personnel; area of the court (square meters);	DEA model
Agrell, Mattsson, and Månsson (2019) ‡	Sweden (First instance courts)	settled criminal cases; settled civil cases; settled matters;	judges; law clerks; other personnel; area of the court (square meters);	DEA model

aCivil justice; ‡Civil and criminal justice; ¥ Administrative justice; δ Tax justice
Note: workload is defined as incoming plus pending cases at the beginning of every year

for justice). Each client (i.e., a person or a firm, as well as their lawyers) starts with a case that requires a decision, and the number of clients entering the transformation process is exactly the same as the number of people leaving with a decision. Are clients (or their needs) an input? Can the number of clients and the potential waiting times affect this transformation process? If we assume that a court can deal with the same number of cases, even when new clients arrive and a long line of waiting people forms, the number of pending and/or incoming cases is not relevant to the transformation process.[4] Conversely, if we assume that the negative externality created by the backlog, i.e., the delay in receiving justice, might affect the judges' efforts and decisions, then the demand for justice should be included in the production process. This is the only way to accept the workload as an uncontrollable input of the courts' productive process, which leads to the assumption that pending and incoming cases put pressure on judges, driving them to increase their performance. This is exactly the hypothesis proposed by Beenstock and Haitovsky (2004), according to which, in order to reduce the negative externalities caused by delay, judges adapt their efforts proportionally to the workload. This proposition is coherent with the current literature, which suggests using environmental variables as potential inputs, whether or not they actually affect the production process. However, which might be the most appropriate way to handle these uncontrollable environmental variables?

An alternative approach might be the use of a resolution index as output, as put forward by Yeung and Azevedo (2011). Coherently with the hypothesis that the demand for justice (and the related long line of waiting people) might be a determinant of court productivity, they suggest including the workload within the output. In other words, they introduce a resolution index as output, normalizing the number of settled cases for the demand for justice. However, Yeung and Azevedo (2011) do not consider the judicial case matters, as suggested respectively by Santos and Amado (2014) and Kittelsen and Førsund (1992). How can we compare the performance of two courts with different amounts of demand for justice? In other words, assuming that each case matter is a production line with its own technology (i.e., a specific judicial procedure), how can we compare courts displaying significant differences on the demand side? In order to account for differences in demand, researchers should disaggregate the supply of justice according to its production lines. Doing so would provide a more realistic estimation of court performance. The key idea behind this approach is that every case matter has a different civil procedure, that is to say, a different technology to produce the expected output (i.e., justice). For example, there are very large differences in the procedures followed to settle a litigious divorce and a bankruptcy case. Without accounting for these differences, we cannot properly estimate the efficiency of courts and we might even identify incorrect reference values for a judicial reform. Indeed, following this line of reasoning, the interpretation of results might lead policy makers and/or public managers to the wrong conclusions and, ultimately, to the implementation of the wrong reforms.

Therefore, it is essential to properly define the output of this productive process, as well as the role played by case matters and caseload in the estimation of court efficiency. From a methodological point of view, these are exactly the goals of our research.

[4]We can imagine two cases: a stable flow of demand, which means a short line (i.e., limited backlog and/or flow of incoming cases), or an anomalous flow, which means a long line (i.e., large backlog and/or flow of incoming cases).

3. Methodology and data

The methodology applied in this work to estimate court performance is Data Envelopment Analysis (DEA). This section presents a technical overview of this methodology, highlighting the inputs and outputs adopted, as well as the model definitions.

3.1. Data Envelopment Analysis (DEA)

DEA has been applied extensively in the last 40 years (Emrouznejad & Yang, 2017). It has been adopted to study the performance of public institutions such as, for example, health care (e.g., Mitropoulos, Talias, & Mitropoulos, 2015; Pulina, Detotto, & Paba, 2010), the police forces (e.g., Drake & Simper, 2004), universities (e.g., Fandel, 2007), as well as the judiciary (e.g., Peyrache & Zago, 2016; Santos & Amado, 2014). This is a non-parametric technique that allows efficiency performance to be measured as a score (Cook & Seiford, 2009), implementing a benchmark analysis. Indeed, the DEA approach lets researchers build a deterministic, non-parametric production frontier comparing the performance of several Decision Making Units (DMUs), which in our case are the courts of first instance. Technical efficiency scores are computed based on the radial distance of every DMU from the frontier (Charnes, Cooper, & Rhodes, 1978; Coelli, Rao Prasada, & Battese, 1998; Färe & Grosskopf, 1996). Here we use the output-oriented model, as proposed by Farrell (1957), assuming Variable Returns to Scale (VRS) (Banker et al., 1984).[5]

As explained in Ippoliti and Falavigna (2012), the technical efficiency scores (TE_i) referring to each first instance court (i.e., our DMUs) are computed as follows:

$$TE_i = z_i \quad i = 1, \cdots, n$$

where n is the number of DMUs and $1 \leq TE_i \leq +\infty$. TE_i scores are computed by solving the following linear programming duality problem, on the basis of the output-oriented DEA approach (Farrell, 1957):

$$\begin{aligned} & \mathrm{Max}_{z\lambda} z_i \\ & \text{subject to}: \\ & N1'\lambda = 1 \\ & z y_i - Y\lambda \leq 0 \\ & -x_i + X\lambda \leq 0 \\ & \lambda \geq 0 \end{aligned}$$

where z is a scalar > 1, λ is a vector of nx1 weights allowing for convex combination of inputs and outputs, Y is an sxn output matrix, X is an input matrix, and N1 is an Nx1 unitary vector. Furthermore, z-1 indicates the proportional output increment maintaining the input level constant.[6]

The results of the DEA methodology are technical efficiency scores referring to each court and representing its position in relation to the frontier (i.e., the benchmark). In

[5]The VRS assumption has been tested according to Simar and Wilson (2002).

[6]The output-oriented framework aims to maximize output levels while keeping the inputs constant, on the assumption that the inputs cannot be easily changed, at least in the short run. This orientation is also known as the "output-augmenting" approach (Daraio & Simar, 2007).

detail, the scores indicate the ability of each first instance court to maximize the proposed output, given the available resources. Inputs and outputs are defined based on our model definition (see Sections 3.2 and 3.3).

Note that, according to Simar and Wilson (2007), in order to compare the results of different model definitions, we calculate the reciprocal of the estimated scores (i.e., 1/technical efficiency score).

3.2. Output estimation

Our approach includes two outputs: the number of cases settled and a resolution index. In both situations, we estimate the outputs considering the aggregate supply of justice (all case matters together), as well as its disaggregate supply (1 output per case matter). As highlighted in Section 2, the number of settled cases is the most common output currently found in the literature (e.g., Finocchiaro Castro & Guccio, 2015; Peyrache & Zago, 2016); while the resolution index has been proposed only by Yeung and Azevedo (2011).

The resolution index is estimated as follows:

$$Resolution\ Index_i^t = \left[\frac{Settled\ cases_i^t}{Workload_i^t}\right]100$$

where i represents the *i-th* first instance judicial district considered at year(s) t, while the workload is given by pending cases (at the beginning of the year) and incoming cases (during the year), normalized by 100 (Yeung & Azevedo, 2011).

The resolution index is an evolution of the clearance rate since, in this case, the denominator is given by the workload, instead of the incoming cases.[7] Innovatively, this index can estimate court performance without considering the demand for justice an uncontrollable input.

3.3. Model definition

Coherently with the previous sub-section, we propose several model definitions (Table 2). On the one hand, models A and B are aimed at examining differences in regarding the number of settled cases either as a single aggregate output or as a disaggregated series of outputs (according to case matter), adopting the aggregate demand for justice as uncontrollable input. On the other hand, models C and D are aimed at examining differences in regarding the resolution index either as a single aggregate output or as a disaggregated series of outputs (according to case matter), including both demand and supply of justice in the estimated index. By following this approach, which relies on comparing two series of outputs, we can collect more robust results.

Focusing on the Italian case study, we have identified 13 civil case matters for our output estimation: pension, default application, default, regular execution, real estate execution, consensual separation, litigious separation, consensual divorce, litigious divorce, special procedure, private and public labour, ordinary jurisdiction, other. For

[7]Note that the current clearance rate adopted by the European Commission for the Efficiency of Justice (CEPEJ) focuses exclusively on the flow of justice (i.e., the incoming cases), without considering the backlog of the previous year, which might affect the judges' efforts.

Table 2. Model definitions with adopted inputs and outputs.

Model	Outputs	Inputs
A	aggregate number of settled cases (1 output)	judges, 3 administrative levels of staff, workload (aggregate demand for justice)
B	number of settled cases according to case matter (13 outputs)	judges, 3 administrative levels of staff, workload (aggregate demand for justice)
C	aggregate resolution index (1 output)	judges, 3 administrative levels of staff
D	resolution indexes according to case matter (13 outputs)	judges, 3 administrative levels of staff

what concerns the inputs, we have collected data about the judges and 3 administrative levels of staff, as well as the aggregated demand for justice (i.e., workload) for models A and B.

3.4. Data: the Italian judicial system

The Italian Ministry of Justice is in charge of administering civil and criminal justice, which is divided into two main tiers and one lowest level. At the lowest level are the so-called *Justices of the Peace* (i.e., *Giudici di Pace*), with specific civil and criminal competences. At a higher level, the first tier includes first instance courts (i.e., *Tribunali Ordinari*), which, gathering together the aforementioned justices of the peace, are part of the first instance districts (i.e., *Circondari Giudiziari*). In the period considered (i.e., 2011), there were 165 first instance districts, which represent the observations of our study.[8] The second tier comprises 26 second instance districts (i.e. *Distretti di Corte di Appello)*, each with a variable number of first instance districts and responsible for appeals against first instance judgments. Finally, there is also a court of last resort (i.e. *Corte Suprema di Cassazione*), with seat in Rome and acting as the highest appellate court in all civil and criminal cases. Considering 2011, Table 3 illustrates the heterogeneity of first instance courts, according to Italy's five macro areas (i.e., North-West, North-East, Centre, South, and Islands) and second instance districts. More precisely, the table highlights both the demand and supply of justice, as well as the human resources involved in the production process.

Looking at the numbers, we can observe the extent of the phenomena under investigation. On the one hand, pending civil cases amount to more than 3 million, while, on the other hand, the number of incoming cases is also close to 3 million. These figures are even more significant if we consider that there are only 20 thousand workers tasked with processing the whole caseload (i.e., around 4 thousand judges and 16 thousand staff).

Tables 4 and 5 present some other descriptive statistics about inputs and outputs based on the selected case study (i.e., Italian judicial system), and the four model definitions proposed. In detail, the data refer to the Italian civil justice in 2011, considering 164 first instance courts (see Figure A.1 in the Annex for the judicial geography and the competence of the DMUs analysed).[9] The staff is disaggregated into three levels, depending on professional position: the third level comprises executives with the highest responsibilities, the second level includes the

[8]A reform of Italy's judicial geography, implemented in 2013 by Legislative Decrees 155 and 156, reduced the overall number of first instance districts (see Ippoliti, 2014, 2015).

[9]Data about one observation were not available, and this is why the sample includes 164 courts instead of the expected 165.

Table 3. Descriptive statistics: demand and supply of justice and human resources – Italy (2011).

District (II instance)	Pending cases (01.01)	Incoming cases	Defined cases	Pending cases (31.12)	Judges	Staff (third level)	Staff (second level)	Staff (first level)
Brescia	83,760	98,258	95,767	86,251	138	113	252	43
Genova	77,247	76,090	76,834	76,503	158	203	367	52
Milan	213,417	271,347	269,344	215,420	452	408	829	140
Turin	122,159	167,358	167,464	122,053	287	305	609	107
North-West	**496,583**	**613,053**	**609,409**	**500,227**	**1,035**	**1,029**	**2,057**	**342**
Bologna	145,081	156,663	160,395	141,349	229	274	489	80
Trento	20,402	32,631	32,756	20,277	53	88	150	37
Trieste	33,012	44,224	45,146	32,090	87	95	176	33
Venice	155,995	154,011	152,716	157,290	215	266	491	78
North-East	**354,490**	**387,529**	**391,013**	**351,006**	**584**	**723**	**1,306**	**228**
Ancona	66,286	64,700	67,461	63,525	90	113	245	38
Florence	156,428	153,657	149,883	160,202	235	300	495	85
Perugia	43,137	35,366	35,784	42,719	53	72	127	27
Roma	390,585	326,277	333,126	383,736	525	620	1,105	160
Center	**656,436**	**580,000**	**586,254**	**650,182**	**903**	**1,105**	**1,972**	**310**
Bari	361,189	118,167	136,422	342,934	166	228	358	65
Campobasso	17,321	14,788	13,222	18,887	23	45	71	20
Catanzaro	168,769	81,242	79,272	170,739	158	132	356	82
L'Aquila	70,290	59,517	58,754	71,053	95	129	241	51
Lecce	182,777	85,966	106,938	161,805	145	175	286	59
Naples	452,288	300,582	306,224	446,646	551	532	1,043	166
Potenza	52,993	22,565	22,757	52,801	51	51	130	19
Reggio Calabria	68,009	36,174	37,341	66,842	95	85	216	38
Salerno	134,629	68,378	63,120	139,887	106	118	227	46
South	**1,508,265**	**787,379**	**824,050**	**1,471,594**	**1,390**	**1,495**	**2,928**	**546**
Cagliari	74,363	53,382	50,543	77,202	95	104	234	48
Caltanissetta	24,659	15,609	14,896	25,372	57	50	138	20
Catania	131,927	88,348	81,985	138,290	167	194	338	72
Messina	99,037	36,215	37,324	97,928	72	77	169	37
Palermo	110,803	93,841	89,104	115,540	210	226	496	100
Islands	**440,789**	**287,395**	**273,852**	**454,332**	**601**	**651**	**1,375**	**277**
Italy	**3,456,563**	**2,655,356**	**2,684,578**	**3,427,341**	**4,513**	**5,003**	**9,638**	**1,703**

clerks of the court (i.e., *cancellieri*), while the first level is made up of the lowest workers, who perform very simple tasks. The data are extracted from the databases of the Ministry of Justice and of the High Council of the Judiciary (i.e., *Consiglio Superiore della Magistratura*, or *CSM*).

λ model A; δ model B;

Considering the judicial districts of second instance and Italy's geographical macro areas, Table 6 shows the time needed to settle a case according to case matter in 2011, which is a good proxy for the technologies used by judges along their production lines. For example, considering litigious and non-litigious household dissolutions, significant differences clearly emerge among case matters. On average, focusing on litigious dissolutions in 2011, 663 days were necessary for the first step (i.e., litigious separation) and another 702 days for the second step (i.e., litigious divorce), which adds up to a total

Table 4. Inputs and outputs according to models A and B – Italy (2011).

Type	Variable	Mean	St. Dev.
Inputs	Staff (third level) $^{\lambda\ \delta}$	16.6551	20.6036
	Staff (second level) $^{\lambda\ \delta}$	32.1515	36.1936
	Staff (first level) $^{\lambda\ \delta}$	5.8580	4.8555
	Judges $^{\lambda\ \delta}$	14.7774	19.7978
	Workload $^{\lambda\ \delta}$	37,267.7988	53,884.8918
Outputs	Aggregate settled cases $^{\lambda}$	16,369.3780	24,772.8412
	Pension (settled) $^{\delta}$	1,673.9878	3722.9381
	Default Application (settled) $^{\delta}$	217.9329	350.0136
	Default (settled) $^{\delta}$	73.7988	130.5955
	Regular Execution (settled) $^{\delta}$	2,698.7256	4915.1809
	Real Estate Execution (settled) $^{\delta}$	368.2988	399.3974
	Consensual Separation (settled) $^{\delta}$	414.6159	579.9197
	Litigious Separation (settled) $^{\delta}$	222.7012	371.8662
	Consensual Divorce (settled) $^{\delta}$	234.1037	334.3913
	Litigious Divorce (settled) $^{\delta}$	123.6037	190.3198
	Special Procedure (settled) $^{\delta}$	4,156.6037	7281.5726
	Private and Public Labour (settled) $^{\delta}$	994.3232	2174.6596
	Ordinary Jurisdiction (settled) $^{\delta}$	2,733.3720	4223.6637
	Other (settled) $^{\delta}$	2,457.3110	2672.1067

Table 5. Inputs and outputs according to models C and D – Italy (2011).

Type	Variable	Mean	St. Dev.
Inputs	Staff (third level) $^{\lambda\ \delta}$	16.6551	20.6036
	Staff (second level) $^{\lambda\ \delta}$	32.1515	36.1936
	Staff (first level) $^{\lambda\ \delta}$	5.8580	4.8555
	Judges $^{\lambda\ \delta}$	14.7774	19.7978
Outputs	Aggregated resolution index $^{\lambda}$	45.9767	10.2093
	Pension (resolution index) $^{\delta}$	41.1527	12.9405
	Default Application (resolution index) $^{\delta}$	67.8885	15.2423
	Default (resolution index) $^{\delta}$	11.3865	5.7376
	Regular Execution (resolution index) $^{\delta}$	61.0592	13.8404
	Real Estate Execution (resolution index) $^{\delta}$	21.4781	7.9148
	Consensual Separation (resolution index) $^{\delta}$	79.7983	10.2648
	Litigious Separation (resolution index) $^{\delta}$	39.3252	12.0440
	Consensual Divorce (resolution index) $^{\delta}$	77.7853	11.3361
	Litigious Divorce (resolution index) $^{\delta}$	38.3429	12.2527
	Special Procedure (resolution index) $^{\delta}$	83.8193	8.8150
	Private and Public Labour (resolution index) $^{\delta}$	35.2739	13.3086
	Ordinary Jurisdiction (resolution index) $^{\delta}$	28.4719	8.5131
	Other (resolution index) $^{\delta}$	54.3220	9.4589

λ model C; δ model D;

period of almost 4 years. As for non-litigious household dissolutions in the same year, on average, only 218 days were necessary. These long settlement times can be ascribed to litigiousness between parties and/or the lawyers' opportunistic behaviour (Felli, Londoñ-Bedoya, Solferino, & Tria, 2007), but the current procedures undoubtedly play a key role.

Table 6. Average number of days needed to settle a case by civil case mattera, according to second instance districts and macro areas – Italy (2011).

District (II instance)	Other	Private Labour	Public Labour	Ordinary Jurisdiction	Pension	Default (Application)	Default	Regular Execution	Real Estate Execution	Consensual Separation	Litigious Separation	Consensual Divorce	Litigious Divorce	Special Procedure
Brescia	295	504	1,103	759	448	129	2,820	496	2,337	76	413	120	364	66
Genova	375	514	2,515	803	469	156	3,144	155	1,152	73	494	96	552	104
Milan	292	455	1,131	738	388	142	3,527	197	1,490	83	458	101	455	52
Turin	279	397	956	558	387	130	2,554	244	1,204	86	457	118	500	36
North-West	**302**	**447**	**1,304**	**675**	**410**	**138**	**2,958**	**247**	**1,415**	**82**	**458**	**110**	**480**	**56**
Bologna	306	579	1,207	904	464	114	2,807	141	1,201	81	622	112	815	58
Trento	202	363	627	621	254	303	7,105	96	848	44	426	74	584	45
Trieste	314	639	848	603	479	97	2,347	110	681	69	450	154	381	41
Venice	484	619	1,054	871	466	243	3,212	137	1,564	107	522	118	611	59
North-East	**352**	**578**	**1,017**	**799**	**442**	**175**	**3,360**	**128**	**1,171**	**83**	**532**	**118**	**635**	**53**
Ancona	263	666	1,404	882	412	167	3,221	127	1,826	53	702	65	653	40
Florence	299	801	1,950	972	512	251	3,853	256	1,381	94	706	82	563	60
Perugia	265	945	1,268	1,165	629	179	2,647	222	1,547	88	778	110	916	53
Roma	269	861	1,435	1,099	557	219	4,952	314	1,389	100	574	129	821	134
Center	**277**	**805**	**1,577**	**1,015**	**518**	**212**	**3,874**	**239**	**1,509**	**85**	**675**	**96**	**708**	**76**
Bari	392	1,334	1,387	1,279	1,322	162	3,100	311	1,814	96	887	75	944	203
Campobasso	175	892	1,287	1,432	977	259	4,720	302	1,567	127	884	90	771	58
Catanzaro	341	1,532	3,174	1,798	1,580	472	8,357	273	2,338	103	895	160	704	106
L'Aquila	213	929	1,328	957	503	257	3,064	293	1,342	102	568	88	679	54
Lecce	493	889	684	1,154	652	186	2,431	396	1,430	195	739	160	676	62
Naples	342	899	903	1,132	641	152	3,509	246	1,905	107	969	79	1,118	103
Potenza	366	1,336	2,046	1,647	828	153	6,355	534	2,156	182	799	143	737	113
Reggio Calabria	604	834	493	1,116	762	284	12,084	524	2,821	196	690	83	1,521	149
Salerno	327	722	914	1,922	723	165	3,542	362	1,816	262	1,108	241	1,251	118
South	**341**	**1,073**	**1,512**	**1,369**	**899**	**248**	**5,092**	**333**	**1,895**	**138**	**835**	**121**	**903**	**103**
Cagliari	335	1,271	2,344	1,313	1,188	282	2,524	375	1,712	77	776	132	686	90
Caltanissetta	624	685	690	1,342	624	1,999	11,130	496	1,479	75	549	136	497	78

(*Continued*)

Table 6. (Continued).

District (II instance)	Other	Private Labour	Public Labour	Ordinary Jurisdiction	Pension	Default (Application)	Default	Regular Execution	Real Estate Execution	Consensual Separation	Litigious Separation	Consensual Divorce	Litigious Divorce	Special Procedure
Catania	366	1,413	2,310	1,354	1,025	223	5,103	371	2,081	164	869	111	873	76
Messina	362	2,006	1,851	1,976	1,661	542	10,074	506	1,615	112	975	127	913	128
Palermo	295	679	774	961	635	190	3,879	291	2,044	109	820	175	781	61
Islands	**384**	**1,178**	**1,587**	**1,349**	**1,001**	**576**	**6,093**	**395**	**1,817**	**108**	**802**	**138**	**755**	**84**
Italy	**328**	**811**	**1,409**	**1,045**	**655**	**251**	**4,231**	**273**	**1,586**	**102**	**663**	**116**	**702**	**76**

*aEstimation according to the disposition time formula (i.e., [pending cases at the end of the year/settled cases] * 365).*
See CEPEJ Report, European commission for the efficiency of Justice (2016) *for further considerations*.

Table A.1 and A.2 in the Annex further illustrate the heterogeneity of first instance courts, looking at both the average time needed to settle cases and the disaggregated demand for justice. Table A.1 presents the average time needed to settle cases and its trend over time (between 2005 and 2010), while Table A.2 shows the percentage of workload by case matter in 2011, highlighting the different amounts of demand for justice dealt with by our DMUs, according to case matters and judicial districts of second instance, as well as geographical macro areas. Finally, further information is presented in Figure A.2 in the Annex, which includes maps regarding justice demand and supply with respect to the available human resources.

4. Results

Table 7 shows the technical efficiency scores according to Italy's five macro areas (i.e., North-West, North-East, Centre, South, and Islands) and second instance districts. On average, the technical efficiency score in model A is equal to 0.7417, with the North of Italy as the most efficient area (i.e., 0.8351 for the North-West and 0.8500 for the North-East). However, the gap between the North and the South of Italy decreases if we consider the disaggregated supply of justice. On average, the technical efficiency score rises by 17.16% adopting model B. These improvements are greater in the South of Italy (i.e., 25.56%) and Islands (i.e., 21.22%), while they are significantly smaller in the North of Italy (i.e., 10.06% in the North-West and 10.08% in the North-East).

Looking at models C and D, a similar scenario emerges. On average, the technical efficiency score in model C is equal to 0.6611, with the North of Italy as the most efficient area (i.e., 0.7840 for the North-West and 0.7741 for the North-East). Again, the gap between the North and the South of Italy decreases if we consider the disaggregated supply of justice. Adopting model D, the average technical efficiency score rises by 26.69%. These improvements are greater in the South (i.e., 36.89%) and Islands (i.e., 35.87%), while they are significantly smaller in the North of Italy (i.e., 15.93% and 18.21%, respectively in the North-West and North-East).

What about models B and D? Analyzing the results presented in Table 7, we can identify a significant difference between the specifications of models B and D only in one case. On average, the technical efficiency score rises by 1.47% adopting model D, with a considerable improvement only in the Islands macro area (i.e., 7.73%). In the other macro areas, the average scores collected using the two model specifications are almost the same (i.e., differences equal to 0.76% in the North-West, 0.54% in the North-East, 0.04% in the Centre and 0.24% in the South). Accordingly, only the gap between the North of Italy and the Islands decreases if we include the workload in the resolution indexes.

These results become even more important if we compare the DMUs in relation to potential reference values that policy makers may use to reorganize the judicial system, based on the technical efficiency of the courts.

Using the national average value of model D (i.e., 0.9280) as vertical axis and the national average value of model C (i.e., 0.6611) as horizontal axis, Figure 1 highlights the efficiency gap between the reference values and the TE scores of DMUs located in the South and in the North of Italy (i.e., North-West and North-East). Two cases appear to be particularly interesting: the quadrant with DMUs having TE scores that are under the national average

Table 7. Average technical efficiency scores according to second instance districts and macro areas – Italy (2011).

District (II instance)	Mod. A	Mod. B	Δ TE |B-A|	Mod. C	Mod. D	Δ TE |D-C|	Δ TE |D-B|
Brescia	0.8587	0.9427	8.40%	0.7577	0.9405	18.27%	0,22%
Genoa	0.7763	0.9095	13.32%	0.7218	0.9474	22.57%	3,79%
Milan	0.8329	0.9440	11.11%	0.7866	0.9400	15.34%	0,40%
Turin	0.8537	0.9390	8.53%	0.8156	0.9444	12.88%	0,55%
North-West	**0.8351**	**0.9357**	**10.06%**	**0.7840**	**0.9432**	**15.93%**	**0,76%**
Bologna	0.8743	0.9493	7.51%	0.7741	0.9554	18.13%	0,61%
Trento	0.9233	0.9527	2.94%	0.8910	0.9516	6.05%	0,11%
Trieste	0.8462	0.9531	10.69%	0.8054	0.9644	15.90%	1,13%
Venice	0.7975	0.9502	15.27%	0.7106	0.9536	24.30%	0,34%
North-East	**0.8500**	**0.9508**	**10.08%**	**0.7741**	**0.9562**	**18.21%**	**0,54%**
Ancona	0.7996	0.9484	14.87%	0.7303	0.9502	21.98%	0,18%
Florence	0.7949	0.9310	13.61%	0.7057	0.9431	23.74%	1,21%
Perugia	0.7171	0.9523	23.53%	0.6681	0.9188	25.07%	3,35%
Rome	0.7346	0.9196	18.49%	0.6175	0.9208	30.33%	0,12%
Centre	**0.7675**	**0.9345**	**16.69%**	**0.6800**	**0.9348**	**25.48%**	**0,04%**
Bari	0.6805	0.9510	27.05%	0.4482	0.8940	44.58%	5,70%
Campobasso	0.6048	0.7852	18.04%	0.5843	0.9661	38.18%	18,10%
Catanzaro	0.5828	0.8645	28.17%	0.4403	0.8933	45.31%	2,88%
L'Aquila	0.6944	0.9066	21.21%	0.6592	0.9383	27.91%	3,17%
Lecce	0.8079	0.9463	13.84%	0.5783	0.8861	30.78%	6,02%
Naples	0.6709	0.9392	26.83%	0.5650	0.9059	34.09%	3,34%
Potenza	0.5053	0.8397	33.44%	0.4508	0.8563	40.55%	1,66%
Reggio Calabria	0.6013	0.8981	29.69%	0.5163	0.8755	35.91%	2,26%
Salerno	0.6246	0.9092	28.45%	0.4824	0.8484	36.59%	6,08%
South	**0.6415**	**0.8971**	**25.56%**	**0.5306**	**0.8995**	**36.89%**	**0,24%**
Cagliari	0.6330	0.8586	22.57%	0.5745	0.9270	35.24%	6,84%
Caltanissetta	0.6337	0.8269	19.31%	0.6003	0.9305	33.02%	10,36%
Catania	0.6054	0.8044	19.90%	0.5235	0.9135	39.00%	10,91%
Messina	0.5763	0.7671	19.09%	0.4278	0.8683	44.05%	10,12%
Palermo	0.6762	0.9151	23.88%	0.6377	0.9399	30.21%	2,48%
Islands	**0.6287**	**0.8409**	**21.22%**	**0.5595**	**0.9182**	**35.87%**	**7,73%**
Italy	**0.7417**	**0.9133**	**17.16%**	**0.6611**	**0.9280**	**26.69%**	**1,47%**

in model C but over the reference value in model D, as well as the quadrant with DMUs having TE scores that are over the average in model C but under the average in model D. Readers can observe the prevalence of DMUs located in the South of Italy in the former quadrant (e.g., courts of Ariano Arpino and Avellino) and the prevalence of DMUs located in the North of Italy in the latter quadrant (e.g., courts of Parma and Varese). The second instance district of Campobasso is an even more significant example since, according to model C, it is among the worst performing second instance districts in Italy, while, adopting model D, this district is on the efficiency frontier (i.e., 0.9661).

Finally, several t-tests are performed to reject the hypothesis (H0) that there are no statistically significant differences among the models and the technical efficiency scores collected. Based on our results, we can reject H0 both considering model A versus model B (t equal to 16.279) and model C versus model D (t equal to 15.5208). These results are robust since the same conclusions are reached when performing t-tests by macro area. What about model B versus model D? Looking at the macro areas, we cannot reject H0 in

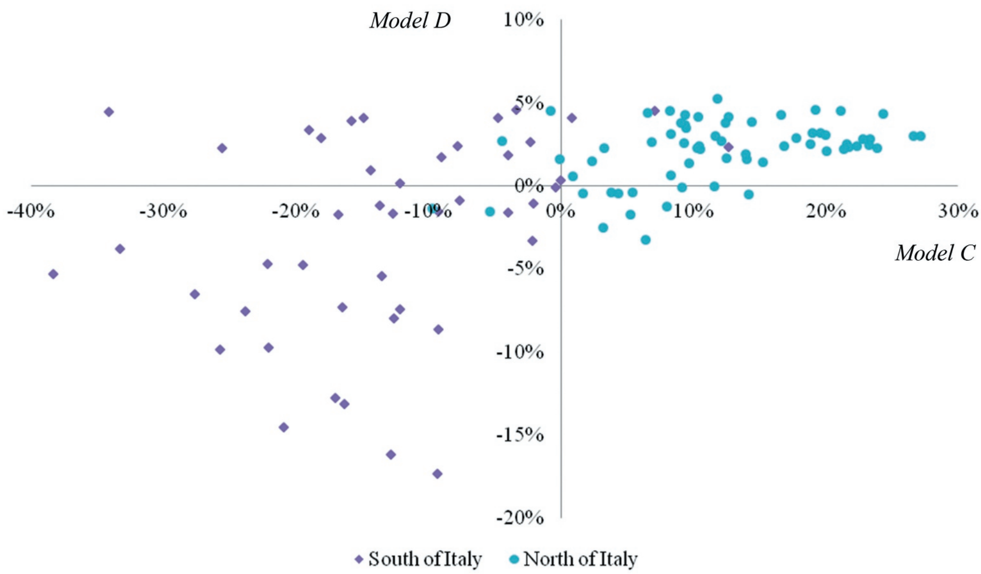

Figure 1. Models C and D: TE scores with respect to national average values (Italy, 2011). Note: 0 % represents the national average value (i.e., 0.6611 in model C and 0.9280 in model D)

the North-East, Centre, and South. This means that there are statistically significant differences between model B and model D only in the North-West and Islands (*t* equal to 1.7374 and 2.7040, respectively), while in the other three macro areas (i.e., North-East, Centre, and South) there are no statistically significant differences between these two model definitions.

4.1. Discussion

The last major reform of the Italian judicial system, aimed at reorganizing the competence of first instance courts, was based on reference values identified by technical commissions (Ippoliti, 2015). As a consequence of that reform, more than 30 courts were suppressed in 2013. What would have happened if the decision-making process followed by policy makers to design that reform had been based on our models? More precisely, adopting the average technical efficiency scores of models C and D as reference values, which might be the sensitivity and specificity levels of our stratification rule? Based on these questions, we can explore the policy implications of our work.

Using model D as real efficiency value of our DMUs and the average national technical efficiency score of model C as reference value, as highlighted in Figure 1, we collect 11 false positives (i.e., courts which are incorrectly classified as more efficient than the average) and 18 false negatives (i.e., courts which are incorrectly classified as less efficient than the average), with expected sensitivity equal to 74.29% and specificity equal to 72.50%. Referring to the last judicial reform in Italy, based on average reference values, the false negatives would represent all the courts that were incorrectly suppressed, while the false positives would represent all the courts that were incorrectly preserved. According to our results, the predicted negative value would be equal to 61.70%, which translates into a false omission rate of 38.30%. This means that we cannot reject the hypothesis that either considering or disregarding the disaggregated supply of justice in the models affects the policy makers' decision-making process based on evidence and reference values. Obviously, the policy implications of these classifications would be significant, since 38.30% of the DMUs would have been incorrectly suppressed. Note that these results might hint at the presence of data aggregation bias, that is to say, a model specification with aggregated cases as output might bias the collected results and the consequent benchmark analysis. Accordingly, it is paramount to work at the highest level of detail whenever possible (i.e., with disaggregated cases as output), so that the results are not affected by this type of bias, which could mislead policy makers in developing a reform process of the judicial system through benchmarks.

Focusing on our specific case study, the most relevant result lies in the gap between the North and the South of Italy, that is to say, differences among courts in terms of efficiency. Indeed, all the models suggest that the courts located in the North of Italy perform better than those located in the South. However, taking the supply of justice into account (models B and D), this gap decreases dramatically, as illustrated in Table 6. Moreover, by contrasting the models with and without case matters, policy makers can estimate the inefficiency linked to the adopted technologies (i.e., civil procedures). This means that, by working on these civil procedures, the Italian government would be able implement appropriate interventions to reduce the judiciary gap among macro areas. There is only one final open issue: which might be the most appropriate model?

Both models B and D are major improvements on the current approaches, since they consider the various technologies applied in the production process, which are characterized by a high degree of diversity. However, there are different assumptions behind the proposed models. On the one hand, we can regard the demand for justice as a non-discretionary input related to the environment in which the DMUs operate (i.e., uncontrollable input), assuming a general pressure effect due to caseload. On the other hand, we can incorporate the demand for justice into the supply to ensure a more precise estimation of court efficiency. Obviously, the second approach is more sophisticated, as it has to do with the ability of judges and staff to satisfy the demand for justice with respect to the case matters. Based on the assumptions behind the models (i.e., whether or not a pressure effect on judges does actually exist), either model definition can be adopted (i.e., B or D).

5. Conclusions

An appropriate policy decision-making process based on evidence requires correct model definition in order to implement a successful reform aimed at increasing court efficiency. Unless the model is suitably defined in the benchmark analysis, policy makers may be misled by false evidence into carrying out a wrong reorganization of the courts. These policy implications are even more relevant if the reform is based on reference values, as seen in the recent overhaul of Italy's judicial geography (Ippoliti, 2015).

The results of the case study analysed here highlight the need to reform the current civil procedures, which represent the technologies adopted by judges and staff in producing the expected output (i.e., justice). Our results are also coherent with demands for procedural reform put forth by scholars (Lanau et al., 2014), and the Italian government is indeed working in that direction by discussing whether to update some civil procedures (e.g., household dissolutions). The advantages of a progressive increase in court performance, by restyling the Italian civil procedures, are even more significant if we consider the current age of austerity, since policy makers would have the opportunity to improve the performance of this key sector without spending public resources.

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ANNEX

Table A1. Disaggregated descriptive statistics on average number of days needed to settle a case by civil case matter[a] (Italy, 2005–2010).

Case matter	North-West	North-East	Centre	South	Island	Italy
Insolvency application	177	130	151	276	286	209
Insolvency	2,778	2,127	3,460	6,395	4,427	4,045
Regular Execution	233	141	286	328	405	281
Real Estate Execution	1,083	832	1,322	1,793	1,898	1,406
Consensual Separation	97	78	108	141	95	108
Litigious Separation	571	668	1,373	867	722	835
Consensual Divorce	127	115	286	130	96	150
Litigious Divorce	560	644	1,562	743	820	844
Private labour	427	607	721	894	954	714
Public labour	649	813	930	820	933	816
Pension	457	537	541	887	699	637
Ordinary jurisdiction	686	824	991	1,207	1,136	973
Special Procedure	54	37	76	95	75	70
Other	268	259	232	302	372	285

[a]*Estimation according to the disposition time formula (i.e., [pending cases at the end of the year/settled cases] * 365). See* CEPEJ Report, European Commission for the Efficiency of Justice (2016) *for further considerations.*

Table A2. Disaggregated workload according to case mattera, taking second instance districts and Italian geographical macro areas into account (Italy, 2011).

Row Labels	Other	Private Labour	Public Labour	Ordinary Jurisdiction	Pension	Default (Application)	Default	Regular Execution	Real Estate Execution	Consensual Separation	Litigious Separation	Consensual Divorce	Litigious Divorce	Special Procedure
Brescia	23.22%	3.47%	0.85%	20.49%	1.39%	1.29%	2.19%	13.06%	8.21%	2.30%	1.71%	1.48%	1.09%	19.13%
Genova	22.15%	5.25%	2.08%	26.95%	4.02%	0.70%	1.74%	11.81%	4.82%	2.10%	1.61%	1.47%	1.26%	14.00%
Milano	19.66%	4.17%	0.86%	22.42%	1.43%	1.12%	2.21%	11.66%	9.28%	2.70%	1.85%	1.77%	1.18%	19.53%
Torino	21.95%	4.69%	0.80%	20.11%	2.33%	1.08%	2.17%	13.81%	7.81%	2.79%	1.91%	1.84%	1.24%	17.29%
North West	**21.51%**	**4.49%**	**1.05%**	**21.99%**	**2.26%**	**1.05%**	**2.11%**	**12.77%**	**7.74%**	**2.58%**	**1.81%**	**1.71%**	**1.21%**	**17.56%**
Bologna	18.01%	3.15%	0.68%	28.39%	3.31%	1.20%	1.92%	11.83%	5.54%	2.21%	1.65%	1.64%	1.11%	19.25%
Trento	35.27%	2.63%	0.35%	21.03%	0.80%	0.82%	1.63%	11.02%	4.32%	2.13%	1.37%	1.69%	0.95%	15.87%
Trieste	29.17%	4.77%	1.14%	21.90%	2.26%	1.06%	2.18%	11.52%	5.15%	2.07%	1.55%	1.60%	1.12%	14.45%
Venezia	18.82%	4.31%	0.96%	29.24%	2.18%	1.35%	2.34%	11.95%	5.92%	1.93%	1.53%	1.39%	1.07%	16.85%
North East	**22.57%**	**3.78%**	**0.82%**	**26.48%**	**2.44%**	**1.17%**	**2.07%**	**11.71%**	**5.44%**	**2.08%**	**1.56%**	**1.56%**	**1.08%**	**17.12%**
Ancona	16.23%	3.94%	1.27%	30.68%	6.44%	1.54%	2.57%	10.55%	7.39%	1.55%	1.59%	0.86%	1.03%	14.11%
Firenze	17.38%	3.99%	1.35%	29.35%	3.75%	1.23%	1.98%	14.03%	5.32%	1.86%	1.38%	1.27%	0.95%	16.06%
Perugia	14.86%	4.67%	1.73%	30.21%	4.72%	1.04%	2.01%	15.82%	6.28%	1.65%	1.39%	0.80%	0.91%	13.86%
Roma	10.42%	6.64%	3.08%	29.21%	11.77%	0.80%	1.48%	11.49%	6.76%	1.75%	2.07%	0.90%	1.10%	12.51%
Center	**14.69%**	**4.86%**	**1.90%**	**29.73%**	**6.91%**	**1.15%**	**1.97%**	**12.70%**	**6.36%**	**1.73%**	**1.64%**	**1.00%**	**1.01%**	**14.25%**
Bari	5.57%	4.97%	2.50%	20.97%	44.06%	0.30%	0.90%	7.76%	3.28%	0.52%	1.21%	0.23%	0.52%	7.21%
Campobasso	10.80%	4.72%	3.04%	35.51%	7.53%	0.81%	1.67%	15.15%	6.36%	0.99%	1.21%	0.40%	0.61%	11.16%
Catanzaro	6.27%	4.81%	3.18%	35.99%	21.93%	0.58%	0.93%	12.64%	4.40%	0.48%	1.18%	0.23%	0.47%	6.87%
L'Aquila	11.36%	6.33%	2.91%	31.69%	8.88%	0.92%	1.99%	12.30%	6.52%	1.41%	1.52%	0.59%	0.90%	12.61%
Lecce	8.90%	5.37%	2.55%	24.35%	29.60%	0.48%	1.13%	12.58%	3.85%	0.99%	1.49%	0.37%	0.78%	7.53%
Napoli	7.60%	5.11%	2.91%	32.22%	25.54%	0.57%	1.36%	10.45%	3.53%	0.73%	1.31%	0.24%	0.55%	7.85%
Potenza	6.93%	5.90%	2.28%	31.95%	27.28%	0.42%	1.33%	9.58%	6.29%	0.57%	1.29%	0.29%	0.54%	5.32%
Reggio Calabria	9.82%	2.79%	6.52%	25.60%	28.19%	0.30%	0.80%	14.62%	3.50%	0.56%	0.74%	0.18%	0.36%	6.01%
Salerno	5.97%	4.34%	1.24%	38.78%	20.41%	0.57%	1.27%	11.52%	4.62%	0.72%	1.31%	0.28%	0.56%	8.40%
South	**8.10%**	**5.10%**	**2.94%**	**31.61%**	**22.53%**	**0.59%**	**1.31%**	**11.68%**	**4.74%**	**0.80%**	**1.28%**	**0.32%**	**0.60%**	**8.37%**
Cagliari	20.30%	4.98%	1.89%	30.25%	6.27%	0.70%	1.29%	12.68%	6.48%	1.13%	1.94%	0.52%	1.09%	10.48%
Caltanissetta	15.01%	5.85%	3.51%	29.69%	14.04%	0.72%	1.75%	10.42%	6.13%	0.82%	1.93%	0.26%	0.96%	8.89%

(*Continued*)

Table A2. (Continued).

Row Labels	Other	Private Labour	Public Labour	Ordinary Jurisdiction	Pension	Default (Application)	Default	Regular Execution	Real Estate Execution	Consensual Separation	Litigious Separation	Consensual Divorce	Litigious Divorce	Special Procedure
Catania	12.21%	6.35%	2.74%	28.26%	12.23%	0.56%	1.74%	10.85%	8.63%	1.22%	2.16%	0.52%	1.04%	11.47%
Messina	6.73%	3.91%	2.15%	26.23%	40.63%	0.39%	0.90%	7.34%	3.74%	0.53%	0.88%	0.23%	0.48%	5.84%
Palermo	16.07%	4.44%	1.99%	24.49%	16.28%	0.55%	2.04%	11.77%	7.59%	1.21%	2.10%	0.50%	0.98%	9.98%
Islands	**14.41%**	**5.10%**	**2.41%**	**27.63%**	**17.03%**	**0.59%**	**1.58%**	**10.81%**	**6.69%**	**1.02%**	**1.85%**	**0.42%**	**0.93%**	**9.52%**
Italy	**15.71%**	**4.71%**	**1.89%**	**27.56%**	**10.86%**	**0.89%**	**1.78%**	**12.01%**	**6.16%**	**1.63%**	**1.60%**	**0.99%**	**0.95%**	**13.19%**

[a]*Estimation as follows: incoming and pending cases by case matter over total workload*

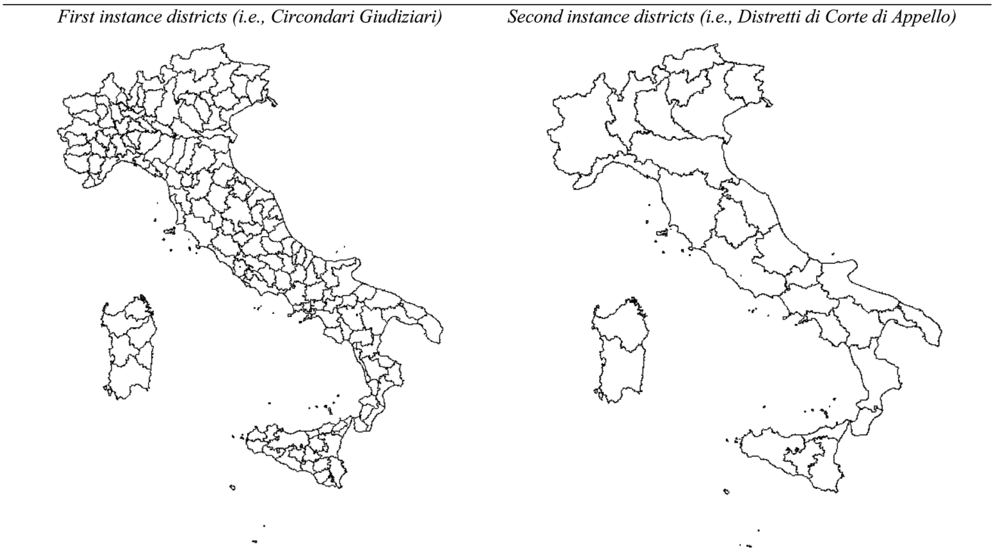

Figure A1. Italian judicial geography of first and second instance (Italy, 2011). First instance districts (i.e., Circondari Giudiziari). Second instance districts (i.e., Distretti di Corte di Appello).

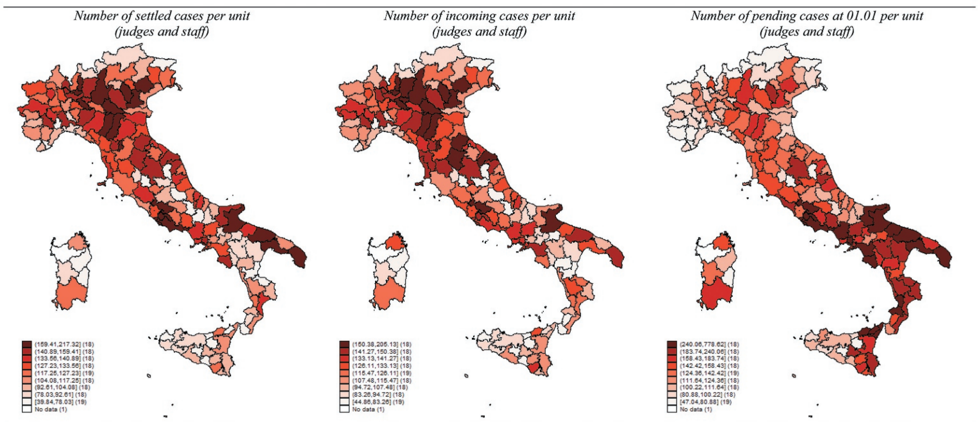

Figure A2. Demand and supply of justice at first instance level (Italy, 2011). Number of settled cases per unit. (judges and staff). Number of incoming cases per unit (judges and staff). Number of pending cases at 01.01 per unit. (judges and staff).