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Economics of court performance: an empirical analysis

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Abstract This paper proposes an empirical analysis of Spanish court performance using the economic approach. An econometric model will be estimated in order to answer two basic questions: (1) why some courts' *output* it is greater than others? (2) Could courts produce a higher *output* using their actual resources? In addition it will be determine, by means of an analysis of variance (ANOVA), whether courts showing higher than average output have dictated resolutions with a higher reversal rate.

Keywords Court performance · Court output · Reversal rate · Judicial policy making

JEL Classifications K41 · H49 · H50

1 Introduction

Since the early 1990's a great effort has been done to evaluate the performance of judicial systems, in both industrialized and developing countries. Problems such as congestion, the high cost and delay of procedures had been weakening the access and citizens' equality before the law, as well as the enforcement of laws and the

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guarantee of property rights and contracts.[1] A process of judicial reform had begun, funded by international agencies like the World Bank and the governments of different countries.[2]

1.1 Background: the case of Spain

In 2001 the main political parties in Spain signed an agreement to reform the judicial system. That pact's main goal was achieving a quick, costless and efficient justice; as well as obtaining higher quality resolutions. One of the most relevant changes that occurred was the reform of the Statutory Law of the Judiciary—Ley Orgánica del Poder Judicial (LOPJ)—in 2003.[3]

In the past decade the public expending in justice as well the administrative and judicial staff have been growing substantially. There were improvements in technology and infrastructure. At the same time, there were changes in some court's organizational aspects. For example, the public expending in justice was a 100% greater in 2000 than in 1990. The number of first instance courts was increased from 2,713 (in 1999) to 2,800 (in 2001). In 2002 there were 6,603 administrative employees more than in 1999.[4]

Despite all these improvements, the congestion is still a problem in many Spanish courts, the number of resolutions did not increased at the same rate that the public expending did.[5] In addition, citizens perceived a slow, costly, uncertain and inaccessible justice.[6] However, it is important to mention that court's workload keeps growing. The problem of congestion may be due not only to court performance. Others sources of congestion might be looked at as well; and one of the most important is the frame of litigation's incentives.[7]

In this context it is indispensable to raise some questions about the allocation of public resources in the judiciary and its performance. How quick, accessible and effective is the Spanish justice? Is the Spanish Judicial System efficient?[8] Despite the LOPJ's text employs words as *effectiveness, efficiency, accountability,*

[1] Since the seminal work of North (1990), it is well known that markets functioning and economic development depend in a considerable extent, on the quality, effectiveness and efficiency of the legal and judicial institutions, their design and performance.

[2] See, among others, Buscaglia and Dakolias (1996), Dakolias (1996, 1999), Malik (1996), Dakolias and Said (1999), Messick (1999a, b, 2002), Rigo (1999), Baldwin (2000), Dietrich (2000), Harris (2000), Zuckerman (2000), World Bank (2001, 2002a, b, c, 2003a, b, 2004).

[3] See "Ley Orgánica 19/2003, de 23 de diciembre, de modificación de la Ley Orgánica 6/1985, de 1 de julio del Poder Judicial." It was published in the BOE No 309. December 26, 2003.

[4] For more details about the judicial data in Spain, see "Memoria del Consejo General del Poder Judicial (2004), Bendala (2003), Pastor and Vargas (2001).

[5] See Pastor (2003c), Cabrillo and Pastor (2001).

[6] See Toharia (2003). The rate of congestion in 2006 was 1.6 (in the civil jurisdiction, the one in we will focus in this paper).

[7] This problem is well explained by the Law and Economics approach. In section two a brief review of the relevant literature will be presented.

[8] In Spain, Pastor (1993, 2003b, c) and Pedraja and Salinas (1995), have raised similar questions, as well in other countries, Kittelsen and Forsund (1992), Buscaglia and Ulen (1997), Buscaglia and Dakolias (1999), Hammergren (1999), Djankov (2001), Vargas (2003), Fix-Fierro (2003), among others.

coordination and cooperation, it is not easy in practice to assess how effective, efficient and quick the Spanish courts are. On the one hand we have the difficulty to find the data; on the other hand, the judicial system is a very complex subject of study.[9] Finally, we can not overlook

> When discussing efficiency in the judicial sector the question of quality is particularly important (…) the judgments must be thoroughly prepared so as to be just. Kittelsen & Forsund (1992).

1.2 Work purpose

This paper focuses on the basic unit of the judicial system: the first instance courts (in Spain, "juzgados de primera instancia").[10] The main questions are (1) why some courts' output is greater than others'? (2) Could courts produce more *justice* using their actual resources? (3) Have courts showing higher than average output got more of their resolutions reversed? The purpose of this paper is, then, twofold:

(1) To analyze court performance using the economic approach.
(2) To determine whether achieving low reversal rates and a high level of output are incompatible goals in the judiciary.

An econometric model will be fitted to answer—at least partly—the two first questions. To respond the third question, it will be determine, by means of an analysis of variance (ANOVA), whether courts showing an output higher than average have dictated resolutions with a high reversal rate.

A brief review of the literature is presented in Sect. 2. The methodology is presented in Sect. 3, which includes a brief data description and the econometric model; in Sect. 4 the court's relative performance is analyzed; in Sect. 5 offers the Analysis of Variance; and finally, the concluding remarks, where are suggested some implications to judicial policy making that can be deduced from the empirical analysis presented in this paper.

2 The measurement of judicial performance

The reform of the judicial systems involved—for many countries—a major commitment of material, human and financial resources. Key issues emerged in that context. Among them, there are two basic questions: are resources being used

[9] This situation does not occur only in Spain, see among others, Lawson and Gletne (1980) and Derr (2001).

[10] "The courts are in many ways typical of public service production units. The courts are mainly organized in small units with 5–15 employees, although some city courts are substantially larger. The products are numerous and heterogeneous, and each unit has been assigned the task of satisfying demand for judicial services from a defined geographical area without the use of market prices." Kittelsen and Forsund (1992).

efficiently? How should societies spend in justice?[11] Answering each of these questions has not proved an easy task. On the one hand, the evaluation of judicial performance has encountered numerous obstacles, due to:

(1) The complexity of the organizational and institutional structure of the judicial system.[12]
(2) The scarcity and sometimes lack of data of the basic judicial activity.[13]
(3) The existence of prejudices on the part of key actors of the system in almost all matters concerning the evaluation and quantification of supposedly non-quantifiable aspects, such as dispensing justice or the quality of a sentence.[14]
(4) The Judicial Performance is also affected by external factors, such as incentives for the parties involved in the dispute and their lawyers.[15]

On the other hand, since the seminal work of Landes (1971), Gould (1973), Posner (1973) and Shavell (1982a), there has been a development of the models that explain the behaviour of the parties involved in a dispute. Theorists of economic analysis of the legal process have focused on the "demand side" of justice, that is, in the framework of incentives and constraints operating on the behaviour of the parties and their lawyers. However, the study of the "supply side" of justice is still scarce. Few works have modelled or analyzed the performance of courts and the conduct of judges and other judicial officers.[16] Therefore, the first empirical studies lacked the kind of sophisticated analytical framework already developed for the "demand side".

2.1 Judicial efficiency

Like the production in the private sector, the public sector can be seen as a process which combines certain inputs, such as the work of officials and physical capital, to get certain outputs that can be approached from indicators such as the infant mortality rate,

[11] See Pastor (1993, 2003b, c), Hammergren (1999, 2000, 2002), Cabrillo and Pastor (2001), Vargas (2003).

[12] See Pastor (2003a).

[13] In the absence of data produced by their own judicial systems of each country, researchers in many have had to develop surveys to key players (judges, lawyers, consumers of justice) to build indicators for assessing the performance in different court countries. See among others, Buscaglia and Ulen (1997), Buscaglia and Dakolias (1999), Dietrich (2000) and Djankov et al. (2001). For more detail on the importance of data in the evaluation of judicial performance, see. For a guide to build performance indicators, see Pastor and Maspons (2003, 2004).

[14] See Lawson and Gletne (1980), Derr (2001). It is also often argued that the assessing of judicial performance may run counter to the principle of judicial independence, see U.S Agency for International Development (2002).

[15] See Pastor (1993), Buscaglia and Ulen (1997), Zuckerman (2000), Cabrillo and Pastor (2001), Fix Fierro (2003). The literature on incentives to litigate is very broad. For a review of this literature see Kessler and Rubinfeld (2004) and Shavell (2004).

[16] Some exceptions are Posner (1972, 1993, 2000), Landes and Posner (1976, 1980), Cohen (1991), Pastor (1993), Macey (1994), Buscaglia and Ullen (1997), Allen et al. (1998), Buscaglia and Dakolias (1999), Figueiredo and Figueiredo (2002), Fix-Fierro (2003) and Levy (2005).

literacy rate, or the rate of violent crimes, among others.[17] In the case of justice, the courts can be seen as a production units, whose main product can be measured by the number of resolutions (to simplify, say sentences and warrants) dictated by year. As in any other production process, the production of resolutions requires a combination of factors such as work (judges, clerks, officers, assistants and agents), capital (buildings, offices…) and technology (computers, computer applications…).[18]

In the analysis of productive efficiency, economic theory distinguishes between technical efficiency and allocative efficiency.[19] A unit of production is technically efficient when it produces the maximum possible level of output from a particular combination of inputs, or to put it another way, it is impossible to reduce the volume of any input without reducing the volume of output. On the other hand, a production unit is allocatively efficient when it uses the combination of minimum cost of inputs to produce a given level of output, so that an input cannot be replaced for another without increasing the total cost. The analysis of productive efficiency allows us to assess the use of the "productive resources", that is, to determine, for example, whether the courts are producing the maximum amount of resolutions, given a specific combination of factors (technical efficiency), or whether they are working at the lowest possible cost, given a level of production (allocative efficiency).

2.2 Explaining judicial output

Kittelsen and Fordsun (1992) and Pedraja and Salinas (1995), among others, have assessed judicial efficiency using the technique of Data Enveloped Analysis (DEA), including as input the labour factor, considering that the courts are "labour intensive" units of production. Other authors such as Pastor (1993), Buscaglia and Ulen (1997), Buscaglia and Dakolias (1999), Cabrillo and Pastor (2001) and Fix Fierro (2003) indicate that the public spending on justice; the increasing of the number of courts, judges and other judicial officers; the management of cases filed; the available technology; the amount of time dedicated by judges to administrative and jurisdictional tasks; and the complexity of cases filed, are all key variables to explain the offer of justice.[20] These authors also suggest that some variables from the "demand side" may be relevant to explain the judicial output. For example, incentives to litigation may cause congestion into the system.

[17] See Levitt and Joyce (1988).

[18] For goods produced by the public sector, there is what Levitt and Joyce (1988) have called "final outputs" that are nothing more than the "social consequences". According to the authors, in practice, the final output is difficult to measure; therefore it is necessary to take the "intermediate outputs". In this case, justice is the final output of the trial; however, it can be measured from intermediate outputs, such as number of sentences + number of warrants.

[19] Much of the literature on the measurement of efficiency in the public sector has its origins in the work of Farrell (1957) "The measurement of productive efficiency." To Färe et al. (1994), the first to develop a rigorous analytical approach for measuring the efficiency were Koopmans (1951) and Debreu (1951). For more details on the concept of productive efficiency see Schmidt (1985–1986).

[20] However, Buscaglia and Ulen (1997) found that the effect of a higher spending on Justice on judicial efficiency is not necessarily positive. This is because more resources could increase the demand of justice and thus the number of cases filed into the system. The same result was obtained by Rosales-López (2007) when assessing the effect of the New Code of Civil Procedure in Spain on the judicial output.

The tradition of the Economic Analysis of the Legal Process offers many explanations for the incentives to litigate; these include the direct and indirect costs of litigation, risk aversion of the parties, the asymmetry of information, strategic behaviour and the agency problem between lawyer-client.[21] In addition, the effect of other incentives on the parties' behaviour has been analyzed. Different studies have pointed to the legal system's performance;[22] procedural rules (litigation rules[23] or the discovery[24]); the role of insurers[25] or the existence of alternative methods of conflict resolution.[26] Therefore, the judicial output (Y) can describe as follows:

$$Y = f\ (K, L, S, T, O, H, N, M, A, J, C, I) \tag{1}$$

Where:	It might expect
K = capital	$\partial Y/\partial K = +$
L = judicial staff	? Depending on the effect that the "S" have on the litigation incentives (See Buscaglia and Ulen 1997)
S = public spending in justice	
T = available technology	$\partial Y/\partial T = +$
O = organizational aspects	?? It depends on the organizational aspects that are considering. For example it might expect the more flexible is the organizational structure higher level of output. (See Pastor 2003a)
H = judges' human capital: years of experience, education.	$\partial Y/\partial H = +$
N = Judges' incentives	? It depends on the kind of incentives. (See Posner 1993)
S = Judicial staff's incentives	? It depends on the kind of incentives. (See Cabrillo and Pastor 2001)
M = Case management	$\partial Y/\partial M = +$ effective management would tend to increase the judicial output. (See Buscaglia and Dakolias 1999)
A = the time that judges allocate to administrative tasks	$\partial Y/\partial A = -$
J = the time that judges allocate to jurisdictional tasks	$\partial Y/\partial J = +$
C = the complexity of cases filed	$\partial Y/\partial C = -$
I = litigation incentives	? It depends on the kind of incentives. (See Buscaglia and Ulen 1997)

[21] As we mention above, the seminal works in this field are Landes (1971), Gould (1973), Posner (1973) y Shavell (1982a). Also, see among others, Cooter and Rubinfeld (1989), Posner (1992), Cooter and Ullen (1997), Shavell (2004), Polinsky and Shavell (2005).

[22] See Png (1987) and Cooter and Ulen (1997).

[23] American and British rules have been analyzed more frequently by the literature. For a formal demonstration on the effects of other litigation rules on the parties' behaviour, see Baye et al. 2005). See also Reinganum and Wilde (1986), Hause (1989) and Hughes and Snyder (1995, 1998).

[24] See Shavell (1989:183), Cooter and Rubinfeld (1994), Mackenna and Wiggins (1997–1998) Shepherd (1999).

[25] See Shavell (1982b, 2004).

[26] See Shavell (2004) and Buscaglia and Stephan (2005).

As Fix Fierro (2003: 25) wrote "Of course there is much more to court performance and judicial reform than just 'efficiency'. There are reasons to thing that efficiency is just a component of a border concept that indicates the social adequacy of courts. One could call this broader concept 'effectiveness', meaning (…) the capacity to achieve the goals for which courts have been established."

A model of relative court performance is proposed in this paper. Courts are chosen as unit of analysis—unlike other research works where the unit of analysis were the countries, looking for international comparisons.[27] The model allows a comparison of the courts' output in the same region. An important difference between this study and others is that much of the data comes from the judicial system itself, not from surveys applied to key players. This has conditioned the number of explanatory variables in our empirical analysis.[28] The following section presents the methodology used to evaluate the relative performance of 61 courts of the region of Andalusia.[29]

3 The method

3.1 Sample selection

The empirical analysis presented in this section will focus on the civil jurisdiction; specifically we selected 61 civil first instance courts (without family cases) from the Region of Andalusia.[30] Those courts were selected firstly because more data were available from this Region than from any other in Spain; and secondly because the entire judicial first instance in this region have similar workload (respect to quantity and type of cases filed). The Region of Andalusia is the most populated in Spain with a total of 7,478,432 inhabitants, this is roughly the 18% of the total population

[27] See Buscaglia and Ulen (1997), Buscaglia and Dakolias (1999).

[28] Unfortunately the system does not produce data such as the duration of the court proceedings, the cost of each procedure, the judge's years of experience and education, the time he or she spends in administrative and jurisdictional tasks and the technology available by court -to mention just some variables that might have explanatory power-. To obtain these data was out of the reach of this research.

[29] We will not get into the controversy between the use of econometric techniques and no parametric techniques (such Data Enveloped Analysis—DEA) to evaluate the efficiency of productive units. Following Levitt and Joyce (1988) we decided to evaluate the *relative performance* of courts (that implies we will not evaluate the court's *productive efficiency*.) We will evaluate the court's performance based on the expected performance and not on the best observed performance. In this case there is no controversy for the use of econometric models. For more details, see among others, Schmidt (1985–1986), Lovell and Schmidt (1988), Smith (1990). Another methodology recently applied to compare the costs of justice organizations is the panel data; see for example Stephen (2005).

[30] There are a total of 65 civil first instance court without family cases "juzgados de primera instancia de lo civil" in the Region of Andalusia. We dropped four of them because they are functioning at the same time as a Civil Register Office.

of Spain. At the same time, the Andalusia's GNP represents the 13.40% of the total GNP in Spain, only the regions of Catalunya and Madrid have a higher GNP. Finally, the public spend in justice in the Region of Andalusia represent the 11.50% of the total public spend in Justice, only Catalunya has a higher public spending in justice—roughly a 13.50% of the total public spend in Spain.

3.2 Data description

The data used in the model estimation comes from two different sources. The first one is the Annual Report of Spain's General Council of the Judiciary (Memoria del Consejo General del Poder Judicial). The second one is the office for Justice and Public Administration of the "*Junta de Andalusia*" (Regional Government of Andalusia).

3.2.1 Court's workload and output[31]

During 2002, the court's workload was in average 2,969 cases.[32] Court # 41 supported the higher workload (5,877 cases) while court # 21 had the lower workload (1,241 cases). The court's average output in the same year was 825 *resolutions* (in average 286 sentences and 536 warrants). Where court # 51 produced the higher level of resolutions, 1,322 (307 sentences and 1,015 warrants) and court # 24 produced the lower level of resolutions, 344, (189 sentences and 155 warrants). Table 1 shows the basic statistics.

3.2.2 Judicial organization in Spain

The *judicial office* plays an essential role in judicial performance, because it is the organization that supports the jurisdictional activity of judges and courts. In Spain, the judicial office basic structure is homogeneous in the whole nation. It is based in principles of hierarchy, functions division and coordination.

There are two kinds of judicial office units (it depends on the type of functions that judicial office performs): Direct Support Procedural Units (DSPU) and Common Procedural Services (CPS). The first of them has the function of assisting directly to judges and magistrates. There are one DSPU for every single court. Courts of Andalusia are mainly organized in units of between 8 and 11 employees (among them we can count: clerk, judicial officers, judicial ancillaries and bailiffs).

[31] Where "court's output" = sentences + warrants. And this paper refers to *level of product, output* or *resolutions* indifferently.

[32] Where workload = filled cases + pending cases.

Table 1 Court's workload and level of production

Variable	N	CV	Mean	Min	1° Q	Median	3° Q	Max
Workload	61	31	2,969	1,241	2,392	2,873	3,459	5,877
Filed cases	61	46	1,500	939	1,245	1,322	1,569	5,013
Pending cases	61	43	1,469	36	982	1,452	1,833	3,101
Resolutions	61	23	825	344	725	848	930	1,322
Sentences	61	20	286	155	262	299	314	458
Warrants	61	31	539	155	445	571	617	1,015

Basic statistics

Court's *productive process* can be considered *labour intensive*. Sometimes courts receive reinforcement—that means more employees working in the DSPU. In 2002 about a 16% of the civil first instance courts received reinforcement. It is evident that the main *input* in judicial production process is the judge. Changes in the judge's activities might have a significant effect in judicial output. For this reason the effect of "*judge's turnover*" in the level of product has been tested.[33] In 2002 there was judge's turnover in 11.5% of the Courts of Andalusia.

As we mentioned above, there is another type of judicial unit: the Common Procedural Services (CPS). The CPS provides service to several courts in a single judicial first instance. The main functions of the CPS are to register, deliver and enforce judicial resolutions. Both the Nation's Ministry of Justice and Regional Governments, have powers to create, design and organize the CPS. The Spanish General Council of Judiciary consider that CPS plays a key role in the process of judicial reform. This is because CPS allows courts to avoid the task duplication and to maximize their resources. The creation of CPS units *"is one of the substantial improvements in judicial organization that have been occurred in the last ten years*." Pastor (2003a). For all these reasons a dummy variable controlling the availability of CPS was included in our model.

3.3 The model

As we mention in Sect. 3.2 the existing differences in courts' judicial output could be explained by a number of reasons. In the specific case of the Spanish courts we can mention for example, the performance of judicial staff (including vacancies, work stoppage and permission), judges and staff's years of experience and education; court's size, workload, cost of production, infrastructure, technology, availability of CPS, reinforcement, the complexity of the cases filed, the judicial district's GDP and the litigation incentives, among others. It was too difficult in practice to find the data that might allow us to include all these variables in our model. However, we propose the estimation of a model that explains—at least in

[33] For details about this variable see Table 2 in the next section.

Table 2 Variables: description and source

Category	Variable	Description	Source
Judicial output	RESOL	Resolutions = sentences + warrants by court	Annual Judicial Report of the General Council of Judiciary, 2003. (Memoria del Consejo General del Poder Judicial, 2003.) Judicial Statistics for 2002
Judicial staff	JUDSTAFF	It is the sum of judicial employees who work in the court. By court	Department of Justice and Public Administration of Andalusia's Regional Government. 2002 (Consejería de Justicia y Administración Pública de la Junta de Andalusia. 2002)
Workload	WORKLOAD	Filed cases + pending cases. By court.	Annual Judicial Report of the General Council of Judiciary, 2003. (Memoria del Consejo General del Poder Judicial, 2003.) Judicial Statistics for 2002
Common procedural services	CPS	Binary variable = 0 if court does not have CPS = 1 if court have CPS	Department of Justice and Public Administration of Andalusia's Regional Government. 2002 (Consejería de Justicia y Administración Pública de la Junta de Andalusia. 2002)
Judicial reinforcement	REINF	Binary variable = 0 if court had not reinforcement = 1 if court had reinforcement	Department of Justice and Public Administration of Andalusia's Regional Government, 2002 (Consejería de Justicia y Administración Pública de la Junta de Andalusia, 2002)
Judge turnover	JUDTURN	Binary variable = 0 if court did not have judged's vacancy or work stoppage. = 1 if court did have judged's vacancy or work stoppage	Annual Judicial Report of the General Council of Judiciary, 2003. (Memoria del Consejo General del Poder Judicial, 2003.) Judicial Statistics for 2002

part—the observed differences in judicial output. The results of this kind of model allow us to acquire useful information for the judicial policy making.

The dependent variable of our model could be reasonably measured by the number of court's resolutions (sentences + warrants). Since, as we mentioned in Sect. 3.2.2, court's *productive process* is *labour intensive* the judicial staff (the sum of employees who works in the court) was introduced as an independent variable. This variable also offers information about the court's size. The workload was

included as a proxy variable of the litigation incentives. In addition, some binary variables to proxy the judge's and judicial staff performance were included. Those measure whether it has been vacancy, work stoppage and permission. At the same time we were interested in testing the effect of the availability of CPS and reinforcement in court's output. We run a stepwise regression model, to finally obtain the best model with our data base:

$$\begin{aligned} \text{LOGRESOL} = {} & \beta_0 + \beta_1 \,\text{LOG}\mathit{JUDSTAFF} + \beta_2 \mathit{REINF} + \beta_3 \mathit{CPS} + \beta_4 \mathit{JUDTURN} \\ & + \beta_5 \,\text{LOG}\mathit{WORKLOAD} + \text{u}_\text{i} \end{aligned} \tag{2}$$

The model (2) describes the relationship between judicial output, measured by the log of court's resolution LOG*RESOL*, and the court's size proxy by the total judicial staff who works in the court; the workload, measured by the log of the sum of filed cases + pending cases LOG*JUDSTAFF*; and three binary variables: *REINF* that measure if court had reinforcement, *CPS* that measured if court had available CPS units and *JUDTURN* that measure if court had judge turnover during the year of the sample (the 2002). Details about the variables are summed up in Table 2.

It can be expected that judicial output will be greater as court's size and workload increases. In addition, those courts that did have available CPS would be expected to have a greater output than those that did not have it. The same goes with those courts which received reinforcement and those ones which did not. Finally, those courts which have judge's turnover would be expected to dictate fewer resolutions than those courts without judge's turnover.

3.4 Results

The results obtained bring useful information for judicial policy making. The empirical evidence shows that the effects of the workload, the court's size, the judicial reinforcement, the availability of CPS and the judge's turnover are as expected.

As shown in Table 3, the fitted model explains a 54.11% of the variation on judicial output (LOG*RESOL*). Court's size and workload have significant effects on judicial output, indicating that after holding all other variable constant, a 10% increase in court size produces a 6.2% increase in judicial output and a 10% increase in workload produces a 3% increase in judicial output. Availability of reinforcement and CPS have significant effects on judicial output, indicating that after holding all other variable constant, courts with reinforcement have higher judicial output than courts without (roughly 13% on average). At the same time, courts with available CPS have higher judicial output than courts without (roughly 54% on average). Finally, judge's turnover has a significant and negative effect on judicial output: courts which have judge turnover have lower judicial output than those with no turnover (roughly 17% on average). The residuals plot does not show any pattern that could suggest violations of the linear regression assumptions.[34]

[34] We find consistent results for a sample of 202 first instance and instruction courts from the Region of Andalusia.

Table 3 Judicial output in civil first instance courts, 2002

Variables	LOG*(RESOL)*
CONSTANT	2.28(3.17)****
LOG (*JUDSTAFF*)	0.62(1.95)*
LOG (WORKLOAD)	0.30(2.50)***
REINF	0.13(2.15)**
CPS	0.54(4.18)****
JUDTURN	−0.17(−2.37)***
Adjusted R^2	54.11
Number of observations	61

Dependent variable: Judicial output (LOGRESOL)[35]

t-Statistics in parenthesis. **** Significant at 1%; *** significant at 2%; ** significant at 5%; * significant at 10%; ordinary least squares regression (OLS)

4 Courts relative performance

4.1 Residual analysis

Residual analysis is useful in identifying outliers. In this paper, outliers correspond to courts that are far from the regression line. This contributes to determine which courts show an unexpected output. The fitted model explains roughly 54% of the variability of judicial output. However,

> (…) the results comparison between actual and expected outputs (…) do not necessarily indicate good or bad performance; the regression model might be misspecified, measurement errors might be present, chance alone can account for at least part of the residuals. But they do provide managers with useful information, and an inducement, to help them to examine the performance of the units they manage, especially outliers, and to identified areas for improvement. Levitt and Joyce (1988, pp. 99).

Table 4 shows the studentized residuals for the fitted model. Based on the fitted model, court # 6 shows higher output, whereas court # 24 shows lower performance.

5 Judicial output versus reversal rate

Have courts showing higher than average output got more of their resolutions reversed? In the judiciary there is a generalized idea that judges must be concerned mainly about the quality of their resolutions, because an excessive interest on the quantity might cause worse resolutions. The aim of this section is to test whether the

[35] For details see Appendix 1.

Table 4 Relative performance of Andalusia's first instance courts

Court	Residuals	Court	Residuals
24	−3.67	17	0.01
36	−2.42	7	0.04
30	−1.85	33	0.20
27	−1.67	13	0.21
26	−1.49	28	0.33
61	−1.35	19	0.40
23	−1.11	29	0.50
53	−1.07	18	0.60
46	−0.96	2	0.64
15	−0.87	22	0.64
52	−0.82	45	0.75
12	−0.75	31	0.75
49	−0.71	44	0.76
32	−0.63	42	0.80
40	−0.61	58	0.82
38	−0.60	14	0.90
50	−0.58	48	0.91
16	−0.57	4	0.98
34	−0.47	43	0.99
57	−0.43	39	1.00
10	−0.39	55	1.03
54	−0.28	60	1.16
11	−0.28	1	1.25
47	−0.28	3	1.28
35	−0.21	9	1.31
21	−0.21	8	1.40
41	−0.18	51	1.49
59	−0.15	5	1.56
56	−0.13	6	1.66
25	−0.11		
37	−0.10		
20	−0.02		

Studentized residuals

reversal rates of court's resolutions at first instance vary according to the court's output.[36] We decided to use an Analysis of Variance (ANOVA).

In general, the purpose of the Analysis of Variance is to search for significant differences between means. Courts were divided into two groups according to their *performance*: the first group includes courts with positive residuals (*Higher performance courts* (H)); and the second one includes courts with negative residuals

[36] Where reversal rate it is a variable that measures the percentage of resolutions (only sentence + warrants dictated in the first instance) totally reversed by the second instance. For more details on the reversal rate use in this analysis see Appendix 2.

Table 5 Reversal rate in (%) by performance

Court	*N*	CV (%)	Min	Average	Median	Max
Lower performance	31	52.91	0.00	3.42	3.00	7.00
Higher performance	29	55.71	1.00	3.06	3.00	7.00

Basic statistics[38]

(*lower performance courts* (L)).[37] Then, the following hypothesis was tested: H_0: $\mu_H = \mu_L$ versus H_a: $\mu_H \neq \mu_L$ where: H_0: average reversal rate of higher performance courts = average reversal rate of lower performance courts; H_a: average reversal rate of higher performance courts $\neq$ average reversal rate of lower performance courts.

At 95% of confidence the alternative hypothesis is rejected. Then there is not significant difference between the average reversal rate of higher performance courts and the average reversal rate of lower performance courts. A relevant implication of this result it is that achieving a high level of output and a low reversal rate are not incompatible goals in the judiciary.[39]

6 Concluding remarks

The purpose of this paper was to answer—at least partly—some questions about court performance. The first one was why some court's output it is greater than others? The second one was could courts produce more *justice* using their actual resources? And finally, have courts showing higher than average output got more of their resolutions reversed?

To answer the first and the second question an econometric model was fitted. 61 civil first instance courts placed in the Region of Andalusia were sampled. Based on the fitted model, it is suggested that courts can produce more resolutions with their actual resources. Important differences were found in court's output: those courts which have negatives residuals less than -1 have dictated in average 566 resolutions, whereas those courts with positives residuals greater than +1 have dictated in average 975 resolutions. The fitted model confirms that the court's size, workload, availability of Common Procedural Services (CPS) and reinforcement, have a significant and positive effect on the court's output. At the same time, the judge's turnover has a significant and negative effect on the court's output. This result must be taken with caution, because two reasons (1) the fitted model explained a 54% of the variance of court's output. (2) We could not include all the variables that might have an effect on the courts' output, such as the cost of each procedure, the judge's years of experience and education, the time he or she spends

[37] Table 5 shows the basic statistics for both groups.

[38] We decided to eliminate of the sample court # 54 because it was an outlier.

[39] For details see Appendix 3.

in administrative and jurisdictional tasks, and the technology available by court—to mention some of them. To obtain these data was out of the reach of this research.

Nevertheless, the obtained results have relevant implications for the judicial policy making. Even when the institutional and organizational rigidity leads to create new courts to solve common problems in the judiciary such as congestion, it might be better to design reinforcement plans; to create Common Procedural Services, or to devise other policies on these lines. Summarizing, we think it would be necessary:

- To create CPS instead of a new court whenever it is possible.
- To design reinforcement plans to support courts activities.
- To design incentives mechanism to avoid judge and staff turnover.
- To study other sources of congestion (i.e. litigation incentives).

On the third question, the ANOVA test confirms that achieving high output and a low reversal rate are not incompatible objectives in the judiciary. Even when efficiency is a controversial goal in the judiciary, judges should probably internalize the efficiency in the use of resources as a goal of the profession, just as other principles—for example the professional ethics. This would make possible the production of more and better justice, with the actual resources. While this occurs we think that the transparency of the judicial process it is very important, in order to evaluate court's performance.

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Appendix 1[40]

Multiple regression analysis

Dependent variable: log(resol)				
Parameter	Estimate	Standard error	*t*-Statistic	*p*-Value
Constant	2.2771	0.717461	3.17382	0.0025
log(perjud)	0.625681	0.321179	1.94807	0.0565
log(carga)	0.308864	0.123584	2.49922	0.0155
refzo	0.132708	0.0615228	2.15706	0.0354
servcom	0.542555	0.129795	4.18009	0.0001
rotjuez	−0.171155	0.0721363	−2.37266	0.0212

[40] Originally the model was fitted with the variables named in spanish, for this paper we traduced then as follow: resol = resol; perjud = judstaff; carga = workload; rfzo = reinf; servcom = cps; rotjuez = judturn.

Appendix continued

Analysis of variance

Source	Sum of squares	df	Mean square	*F*-ratio	*p*-Value
Model	2.20507	5	0.441014	15.15	0.0000
Residual	1.60113	55	0.0291115		
Total (Corr.)	3.8062	60			

R-squared = 57.9337%

R-squared (adjusted for df) = 54.1095%

Standard Error of Est. = 0.170621

Mean absolute error = 0.129588

Appendix 2: Reversal rate

It is a variable that measures the percentage of resolutions (only sentence + warrants dictated in the first instance) totally reversed by the second instance.[41] The data used in this section comes from the General Council of the Judiciary of Spain. Table 6 shows the basic statistics for the reversal rate by court.

During the 2002, an average of 3.44% of court's resolutions was reversed. 3.44 stands low in the sample distribution. Table 7 shows the rate of reversal by court.

Appendix 3: Analysis of variance[42]

Before testing the Hypothesis in section 5, we must know if the variable "reversal rate" is normal and has a constant variance. Table 8 shows the summary statistics, and as while the "standard skewness" than "standard kurtosis" was between −2 and +2, the reversal rate's distribution is normal. Table 9 shows a test based on the F distribution Fischer-Snedecor (where the Ho: "the standard deviation it is equal in both groups") we obtain a p value > 0.05 and there is not significant difference between the standard deviation of the two groups. Table 10 shows the Analysis of Variance (ANOVA).

[41] Reversal rate = [warrants + sentences totally reversed by the second instance) ÷ total of sentence + warrants dictated in the first instance] by court.

[42] Where desempenho = performance and tasarevoc = reversal rate.

Table 6 Reversal rate (%)

Courts	*N*	Variance	Min	Average	Median	Max
JPI	61	5.65	0.00	3.44	3.00	16.10

Basics statistics

Table 7 Reversal rate of Andalusia's civil first instance courts, 2002

Court	Reversal rate (%)	Court	Reversal rate (%)
21	0.00	56	2.90
6	0.57	3	2.95
43	0.58	57	2.98
5	1.04	45	3.31
35	1.07	34	3.34
4	1.21	22	3.36
19	1.22	39	3.62
37	1.43	33	3.62
10	1.43	36	3.80
52	1.44	13	3.99
20	1.51	1	4.07
59	1.57	46	4.08
31	1.57	12	4.21
55	1.74	15	4.26
40	1.86	60	4.52
14	2.03	27	4.63
9	2.08	61	4.71
51	2.12	47	5.11
2	2.21	24	5.23
23	2.33	17	5.28
42	2.37	29	5.48
50	2.46	49	5.49
32	2.48	7	5.83
41	2.56	28	5.96
44	2.57	26	6.03
18	2.62	38	6.28
16	2.71	58	6.61
11	2.76	48	6.71
53	2.82	30	7.05
8	2.83	54	16.10
25	2.87		

Table 8 Basic statistics. Summary statistics for tasarevoc * 100

	Desempenho = 0	Desempenho = 1
Count	31	29
Average	3.22581	3.24138
Median	3.0	3.0
Variance	2.91398	3.26108
Standard deviation	1.70704	1.80585
Minimum	0.0	1.0
Maximum	7.0	7.0
Lower quartile	2.0	2.0
Upper quartile	5.0	4.0
Stnd. skewness	0.609344	1.38151
Stnd. kurtosis	−0.550318	−0.53606
Coeff. of variation	52.9182%	55.7123%

Table 9 Comparison of standard deviations for tasarevoc * 100

	Desempenho = 0	Desempenho = 1
Standard deviation	1.70704	1.80585
Variance	2.91398	3.26108
Df	30	28

Ratio of Variances = 0.893561
95.0% Confidence Intervals
Standard deviation of desempenho = 0: [1.36411;2.28175]
Standard deviation of desempenho = 1: [1.43308;2.44232]
Ratio of Variances: [0.42307;1.86927]
F-test to Compare Standard Deviations
Null hypothesis: sigma1 = sigma2
Alt. hypothesis: sigma1 NE sigma2
F = 0,893561 *p*-value = 0,760632

Table 10 Analysis of variance

Dependent variable	Reversal rate * 100
Factor:	Performance
Level:	2 (0 = lower; 1 = higher)
N	60

ANOVA table for tasarevoc * 100 by desempenho

Source	Analysis of variance				
	Sum of squares	df	Mean square	*F*-ratio	*p*-Value
Between groups	0.00363367	1	0.00363367	0.00	0.9727
Within groups	178.73	58	3.08155		
Total (Corr.)	178.733	59			

Therefore, p value > 0.05 there is not significant difference between the medians of the two groups

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