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MARTA ESPASA
ALEJANDRO ESTELLER-MORÉ

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IS INEFFICIENCY UNDER CONTROL IN THE JUSTICE ADMINISTRATION?*

Marta Espasa*
Alejandro Esteller-Moré*

Abstract

Efficiency in the administration of justice is found to increase over time, while the variation in the efficiency of the courts tended to remain low and fall over time. This would appear to be good news, at least for the case studied here: the civil courts of first instance in Spain between 2005 and 2009. Apart from the simple passing of time, the percentage of temporary judges in the system also determines some of the differences in efficiency between courts over time. Thus, we find that the greater the percentage of temporary judges, the lower is the efficiency of the courts. Overall, the average *relative* efficiency level for the period 2005 to 2009 was 97.46%, suggesting the matter is under control.

Key words: Civil law courts, technical efficiency, stochastic frontier analysis, panel data

JEL Codes: K40, C23

Corresponding author: Alejandro Esteller, Dept. Public Finance, Faculty of Economics and Business, University of Barcelona, 08034 Barcelona, Spain. E-mail: aesteller@ub.edu

* Barcelona Institute of Economics (IEB) - University of Barcelona (UB)

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1. Introduction

In a recent survey carried out by the *Centro de Investigaciones Sociológicas* (CIS), respondents were asked to state their degree of satisfaction with the Spanish public services of education, health, the police, the country's infrastructure and justice (Question 2, CIS, 2010). Overall, 3.54% of respondents were highly satisfied with all the services, while only 0.6% (the lowest percentage, by some distance) expressed a high degree of satisfaction with the justice system. By contrast, 10.5% of respondents reported not being at all satisfied with the public services, but in the case of justice this figure rose to 24.6%. Thus, among the Spanish public, justice is the public service held in the lowest esteem.

A possible explanation for this opinion might be the belief that the service suffers from a lack of public funding. In response to the question as to whether public funding was inadequate for the public services mentioned (Question 7, CIS, 2010), 32.84% (36.65% if we exclude infrastructure) believed this to be true, rising to 39.5% in the case of justice. By contrast, in response to the question as to whether too much funding was devoted to the five services, 9.12% (5.375% excluding infrastructures) believed this to be true, which was slightly higher than the percentage (7.4%) for justice when considered alone. Thus, it is not entirely clear whether the Spanish public considers that the problems attributable to the justice system result from a lack of funding or inefficiency. It is probably the case that the current situation reflects a combination of inefficiency and the relative shortage in the provision of public resources[1].

Independently of the potential causes, the performance of the administration of justice has recently been forwarded as one of the factors hindering the recovery of the Spanish economy. Thus, a report issued by CESifo (EEAG, 2011) states that in Spain "(…) the administration of justice is slow and inefficiently organized, inflicting high costs on the operation of firms." (p. 143). Such an opinion is in line with the results reported by other scholars (including, among others, Barro, 1997, and Acemoglu *et al.*, 2005), who show how the poor operation of institutions, including the administration of justice, can negatively affect the market economy (such as the aforementioned high costs for firms) and lead to mistrust among citizens (as reflected in the CIS surveys), resulting in

[1] Both causes are, as such, on the "supply side", i.e. the demand for litigation is implicitly taken as given. However, in practice, both sides might have an influence when assessing court performance. See, for example, Vereeck and Mühl (2000) who – based on the work of Gravelle (1990) – analyze policy prescriptions on the "demand side" to reduce delay and, hence, improve the performance of the administration of justice.

a reduction in the aggregate output of the economy. Thus, it is essential to determine whether the administration of justice in Spain is efficiently employing public resources, which is precisely what we seek to do in this paper.

The concern in the literature for the (in)efficiency of the administration of justice is not new (see, e.g., North, 1990). Nor has it been a neglected topic for the Spanish case, where Pastor (2003a and 2003b, among many other references by this author) has repeatedly warned of the dangers of inefficiency, and proposed organizational reforms. Pedraja and Salinas' (1995) empirical analysis represented a step further in this research and more recently Rosales-López (2008) and García-Rubio and Rosales-López (2010) have attempted to quantify the inefficiency of the system[2,3]. In this paper, however, we propose a methodology of analysis based on the use of a stochastic frontier analysis and panel data that – as we argue later – should permit us to improve previous findings. Specifically, we use the technique developed by Wang and Ho (2010). From our results, we should not only be able to quantify the level of inefficiency, but also ascertain some of its explanatory factors, including the passage of time.

Our results do not show a very wide dispersion in the levels of efficiency (the coefficient of variation for the whole period is just 4.13%). In other words, the courts of justice – our analysis focuses on civil courts of first instance – tend to perform equally well, where "equally well" means with respect to the best performance measured from real practices. This means that for users of the justice system, the fact that the ratios of efficiency are relatively high (an average for the whole period of 97.46%) might be small consolation. This is a common restriction for any analysis of *relative* efficiency. Yet, the positive aspect of our results is the largely uniform performance of the administration of justice throughout the territory[4], which would seem to point to certain guarantees of equality of treatment. Moreover, and perhaps most importantly, in contrast with previous analyses we are able to show, thanks to the use of panel data, first, that efficiency levels – on average – tend to increase over time; and, second, that dispersion falls over time. These two findings should also represent additional consolation for current and future users of the justice system.

[2] See also Tulkens (1993) for Belgium; Kittelsen and Forsund (1992) for Norway; and Schneider (2005) for Germany.

[3] In a similar vein, a preliminary study by Bagues and Esteve-Volart (2010) attempts to estimate a production function for all Spanish judges, that is, working in all judicial areas between 2003 and 2008.

[4] As we discuss in section 2.4, our sample comprises all the civil courts of first instance in Catalonia and so our assessment of uniformity is restricted to the situation in that region. An interesting extension of this paper would, therefore, be a comparative analysis of the performance of courts in other regions.

Aside from the simple passage of time, the number of days in which temporary judges are employed tends to have a negative impact on the courts' efficiency, while vacancies have no impact. In other words, while temporary workers hired to boost staffing levels might increase the number of resolutions passed (Rosales-López, 2008), they are significantly less efficient compared with regular employees[5]. The application of a stochastic frontier analysis – in contrast with non-parametric techniques such as Data Envelopment Analysis (DEA) – allows us to estimate consistently the impact of this internal variable and of the passage of time on differences in efficiency.

The rest of the paper is organized as follows. Next, in section 2, we present our empirical framework, including an explanation of our unit of analysis - civil courts of first instance (*juzgados de primera instancia*), the specification of the frontier and of the inefficiency effects model, and our data that spans the years 2005 to 2009. The results of our analysis are presented in section 3. Section 4 concludes.

2. Empirical framework

2.1. The unit of analysis: the case of the "juzgados de primera instancia"

In 2008, concern about the performance of the courts in Spain led the General Council of Judges (*Consejo General del Poder Judicial* (CGPJ)) to introduce a program aimed at modernizing the Administration of Justice (*Plan de modernización de la justicia*). Among other measures it proposed implementing new technologies, improving the legislation[6] and establishing a new judicial office (*Nueva oficina judicial*). The idea underpinning this last measure was to share administrative cases between the courts regardless of the particular legal area in which each operated. As García-Rubio and Rosales-López (2010) point out a further aim of the program was to improve the analysis of the courts' performance, which is precisely what we seek to do here by focusing on the civil courts of first instance (*juzgados de primera instancia*). However,

[5] Recall productivity is accounted for by a combination of factors: economies of scale, operating efficiency, environmental factors, and production technology (see, for example, Fried *et al.*, 2008, pp. 7-8). Here, we focus solely on operating or production efficiency and – as we argue in due course – environmental factors, which can be considered the most significant. In our case, the scale of production is similar between the units, while production technology is equally available to all the courts. In the empirical literature on efficiency, operating efficiency is usually labeled as the *net* efficiency of environmental factors (see, e.g., Coelli *et al.*, 1999). If the factors were not filtered out (by means of being included in the frontier as control variables), the resulting efficiency would have to be labeled as *gross* efficiency.

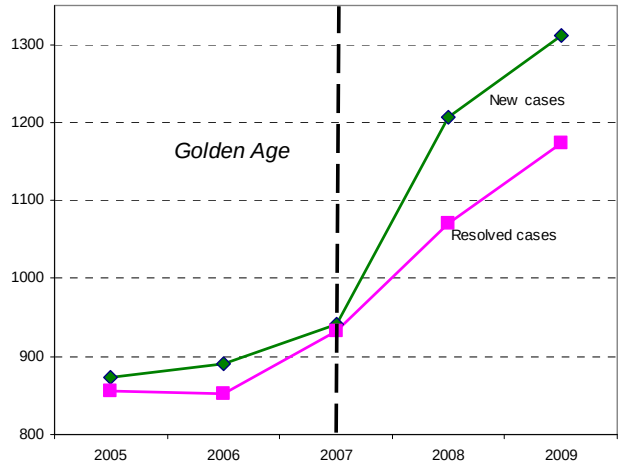
[6] See, for example, Di Vita (2010) on the effects of the complexity of legislation on the performance of the courts of justice.

more specifically, as we argue in greater detail in section 2.4 below, we analyze the whole universe of the court system in Catalonia.

Civil courts of first instance comprise a judge and a qualified court secretary (*secretario judicial*). Thus, all courts are unipersonal, as just one judge is empowered to resolve the cases with the aid of his or her court secretary. In addition, and here there is some variation between courts albeit not over time, the courts employ other staff (*gestión procesal* (GP), *auxilio judicial* (AJ) and *tramitación procesal* (TP)) of lower professional standing than that of the judge and court secretary. These courts are authorized to resolve civil disputes, i.e. lawsuits between private individuals, which might include eviction orders, outstanding mortgage payments, common complaints between neighbors, etc.

In Figure 1, we show the average evolution in the numbers of both resolved cases *vs.* new cases for all the Catalan courts between 2005 and 2009. Systematically, the number of new cases has climbed above that of court resolutions, resulting inevitably in system congestion and delay. However, the situation has deteriorated since 2008. Between 1995 and 2007, Spain enjoyed its *Golden Age*, an exceptional macroeconomic period marked by very high economic growth rates and very high levels of employment creation. The recent crisis however has increased the caseload in the civil courts of first instance. While in 2005 there was an average of 873.2 new cases per court, in 2009 this figure had risen to 1,311.9 per court, that is, a 50% increase. However, in the same period the number of cases resolved per court increased from 855.92 to just 1,173.88, that is, a 37% increase. Thus, the raw data seem to confirm the conclusions of the EEAG report (2011) quoted in the Introduction. Note that an awareness of this problem of congestion has seen the 110 courts of Catalonia in 2005 increased to 119 in 2009, in an effort to expand supply and reduce the gap between new and resolved cases.

Figure 1
Evolution in the number of new and resolved cases (2005-2009)



Source: *Consejo General del Poder Judicial* (CGPJ), several years.

Hence, as Figure 1 shows, the situation has clearly deteriorated. The ratio between Resolved cases (*R*) and New (*N*) cases – which is implicit to Figure 1 and referred to by the CGPJ as the "resolution ratio" (*Rr*) – is usually employed to assess the relative performance of the courts. However, note that this ratio can be decomposed in the following way:

$$Rr \equiv \frac{R}{R^*} \times \frac{R^*}{N} \qquad [1]$$

Yet, for obvious reasons, assessing the performance from ratio [1] might offer a biased – or, at least, incomplete – picture of the performance of the courts of justice. On the one hand, inefficiency might be present if the number of resolved cases is below that of a given benchmark, which we label as optimal[7], R^*. On the other hand, even if a court resolves the optimal number of cases per year, the resolution ratio might still be low if the number of new cases is sufficiently high, that is, if $R^*<N$. Only in this latter case should we strictly speak of congestion[8]. In normal conditions, though, $R^*=N$, and so *Rr* would be a good performance measure. In this paper, we focus our analysis on the first factor of expression [1]. However, in line with Figure 1, depending on the (estimated) evolution in R/R^*, we might be able to identify whether the cause of the (increasing) gap between resolved and new cases is the inefficiency attributable to the courts side or whether it is a problem of the adaptation of the current supply (given the current

[7] Our (in)efficiency analysis specifically enables us to endogenously estimate R^*.

[8] See Vereeck and Mühl (2000) for an interesting categorization and definition of court delay (pp. 244-245).

technology of production), *R**, to the litigation demand (given the current incentives to litigate), *N*. Next, we specify the empirical model that allows us to answer this and other related questions.

2.2. Model specification: the frontier

In order to estimate judicial inefficiency, first, we have to estimate the best practice, that is, the stochastic frontier of production of the civil courts of first instance. Thus we define the following equation:

$$\ln Resol_{it} = \alpha_i + \beta_1 \ln New_{it} + \beta_2 \ln Pending_{it} + \beta_3 (\ln New_{it})^2 + \beta_4 (\ln Pending_{it})^2 + \beta_5 (\ln New_{it} \times \ln Pending_{it}) + \\ + \beta_6 Trend + \beta_7 Trend^2 + \beta_8 \ln New_{it} \times Trend + \beta_9 \ln Pending_{it} \times Trend + \eta_{it} \quad [2]$$

where $Resol_{it}$ is the output, defined as the total number of cases resolved by court *i* in year *t*[9] , while η_{it} is a composite error term, which is described more precisely in section 2.3. All the variables are expressed in logs, and so pending further explanation of the functional form below, the estimates can be interpreted as elasticities. The number of resolved cases should depend on physical inputs (personnel, computers, offices, and so on), as well as on the system's caseload. As argued by Schneider (2005): "[…] omitting the caseload would imply that productivity is underestimated for those years in which a court is charged with a small caseload" (p. 134)[10]. Additionally, we distinguish between those new cases entering the court in year *t* (*New*) from those pending at the beginning of year *t* (*Pending*). *A priori*, the productivity of new cases should be higher than that of pending ones if we suppose that by definition qualitatively the latter are more difficult to resolve.

As noted in section 2.1, each court of first instance comprises a judge and a court secretary, while the number of administrative staff can vary between courts but not over time. Thus, in a panel of data it is not possible to estimate the productivity of each

[9] Resolved cases is a heterogeneous measure of court activity, as it includes both *asuntos resueltos* and *ejecutorias*, where the latter are a consequence of the former (basically, involving procedures implementing judges' decisions), and so the amount of effort required for *ejecutorias* should be lower. A further source of heterogeneity is attributable to the fact that the qualitative difficulty of each new or pending case is not equal. However, these sources of heterogeneity should approximately cancel each other out with a panel of data. In any case, for the first source of heterogeneity, we have distinguished between both types of case, and our results do not change qualitatively.

[10] This is in contrast, though, with the approach followed by Pedraja-Chaparro and Salinas-Jiménez (1996).

member of staff, while in a cross-section it would only be possible to estimate the productivity of the administrative staff. However, although estimating the productivity of each production factor is not the aim of this paper, in order to obtain unbiased estimates of the remaining parameters and, thus, to obtain a well estimated production function, we still need to control for differences in personnel between courts. In expression [2] we control for this difference by means of fixed effects, α_i. Note that, in common with most previous studies, by estimating a judicial production function we leave aside other physical inputs. In our case, this is due to a lack of data. Nevertheless, in line with arguments presented elsewhere in the literature, this should not be a great problem as judicial production is labor intensive. Moreover, this should be even less problematic in our case, as we are able to control for unobserved heterogeneity. That is, we can reasonably assume that those other unobserved inputs are picked up by the fixed effects. Finally, we also include a time trend and a squared time trend in order to control for common shocks in the technology of production (e.g., institutional reforms or changes in technology, such as those envisaged by the CGPJ in its *Plan de Modernización*, as described in section 2.1)[11].

Thus, the use of panel data seems particularly convenient when controlling for common shocks and structural heterogeneity. A further source of heterogeneity between the courts could be their differing propensity to litigate depending on geographical area, although this has already been controlled for by explicitly including the number of new and pending cases in the frontier. Thus, no one court suffers discrimination in the empirical analysis if particular individuals under its jurisdiction tend to litigate more than average, as the court is compared with another with the same level of litigation. In spite of this control for *levels*, litigation might not provoke the same workload as this will ultimately depend on the nature of the lawsuits. In this sense, the effect of immigration might be paradigmatic (see Calvo *et al.*, 2004). Disputes involving immigrants might be more difficult to resolve as in some cases language and cultural differences might prove an additional obstacle, and the social and economic fragility of some immigrants (primarily because of irregular place of residence) might hinder communication between litigants and the justice administration. For this reason, in expression [2], we include, in an *ad hoc* manner, the percentage of immigrants with respect to total population. Hence, our estimates of (in)efficiency are net of the potential effect of

[11] For ease of interpretation, but also in line with most of the previous empirical literature on the estimation of stochastic frontiers, we include a time trend and a squared time trend. However, our qualitative results both in the frontier and in the inefficiency effects model (available upon request) remain unchanged if we employ time effects instead.

immigration (see also fn. 5).

Finally, note that the functional form of expression [2] is translogarithmic, i.e. we estimate a function that is as flexible as possible[12]. Thus, for instance, this means that that the productivity rate of new cases is not independent of pending cases at the beginning of the year, which might seem reasonable since pending cases could well create something of a bottleneck. Then, from expression [2], the impact on resolved cases (in terms of elasticity, given we are working with logs) of an increase in new ones is the following:

$$\varepsilon_{R,N} = \beta_1 + 2\beta_3 \ln New + \beta_5 \ln Pending + \beta_8 Trend \qquad [3]$$

and similarly if we wish to estimate the impact of pending cases on the total number of resolved ones. We can then test empirically whether the translogarithm is the adequate specification. Were a Cobb-Douglas specification to be preferred, $\beta_3 = \beta_4 = \beta_5 = \beta_8 = \beta_9 = 0$; and thus from expression [3], faced by a 1% increase in new cases, the total number of resolved cases would increase by β_1, independently of the initial number of new cases, pending cases, and the specific moment in time. In other words, the elasticity would be constant. By contrast, our more flexible specification allows elasticity to be highly non-linear. Having explained the frontier, we now move to the specification of the inefficiency effects model.

2.3. Model specification: the inefficiency effects model

Up to this juncture, we have been concerned with providing a detailed explanation of the stochastic frontier. However, a further concern must be explaining the differences in the efficiency of the courts of first instance over time. In other words, we are interested in explaining deviations from the stochastic frontier leaving aside the error term[13]. In a stochastic[14] frontier model such as that specified in [2], we have a composite error

[12] See, for example, Coelli *et al.* (2005) for a definition of flexibility in this context, which is obviously welcome so as to provide a more precise estimation of the parameters of the model, together with other properties of the trans-log specification (pp. 211-212).

[13] Note that given the definition of our frontier (expression [2]), our measure of technical inefficiency is output-oriented. That is, it conveys information about how many additional cases – in percentage terms – could be resolved while keeping demand (see fn. 1) and all staff numbers constant.

[14] We refer here to a stochastic frontier production function because the output values are bounded from above by a random variable that does not only include the inputs but also the error term (see, for example,

term:

$$\eta_{it} = v_{it} - u_{it} \quad [4]$$

where v_{it} is a zero-mean random error with the usual statistical properties, $v_{it} \sim N(0, \sigma_v^2)$, and the term u_{it} is a stochastic variable that accounts for technical inefficiency, so that:

$$u_{it} = h_{it}.u_i^* \quad [5]$$

$$h_{it} = f(z_{it}\delta) \quad [6]$$

$$u_i^* \sim N^+(0, \sigma_u^2),\ i=1,\ldots,46,\ t=1,\ldots,10 \quad [7]$$

where h_{it} is a positive function of $1 \times L$ vector of non-stochastic inefficiency determinants z_{it}[15], and δ is a vector or parameters to be estimated. The notation "+" indicates that the underlying distribution is truncated from below at zero so that realized values of the random variable u_i^* are zero. We suppose u_i^* follows a half-normal distribution[16]. Note, though, that according to expression [5], technical inefficiency, h_{it}, is a product of a time-varying function, $f(z_{it}\delta)$, and a time-invariant random variable (once we have accounted for structural heterogeneity in the frontier), u_i^*. Our purpose is to estimate the determinants of the former.

The model proposed above follows Wang and Ho (2010). Greene (2005) argues that traditional stochastic frontier models fail to distinguish structural heterogeneity in the frontier – which is critical in our case due to the equal number of judges and court secretaries in all the courts and the invariant composition of the rest of staff – from structural inefficiency. In fact, by disentangling the two components we obtain the so-

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Coelli *et al.*, 2005, pp. 243-4). Otherwise, if the frontier was deterministic, the distance to the frontier would be a mix of noise (*i.e.*, error of estimation) and inefficiency.

[15] The factor *h* ensures that the model exhibits the "scaling property". See Wang and Ho (2010) and the references cited therein for a discussion of the technical advantages of this property. In fact, according to Wang and Schmidt (2002), p.132, one of the advantages of this property is that it allows the researcher to obtain the estimates of partial effects as in any linear model. Note this linearity is immediate from [5], since the partial effect of the variables, *z*'s, included in h_{it} (expression [6]) does not depend on *u**.

[16] In the empirical application, we also ran a truncated normal distribution but, after various attempts, the convergence process of the maximum likelihood function did not work.

called “true fixed-effect model”, which basically involves controlling for fixed effects both in the stochastic frontier and in the inefficiency effects model (Greene, 2005). Leaving aside any computational difficulties, however, such a specification gives rise to an “incidental parameters problem” (Neyman and Scott, 1948). That is, for a fixed *T* (as it is in our case), estimates become inconsistent. In order to overcome this problem of inconsistency and yet still deal with heterogeneity in the stochastic frontier framework, Wang and Ho (2010) propose a transformation of the stochastic frontier model. Specifically, after transforming the model (in our case, expression [2]) by either first-difference or within-transformation (both transformations produce the same results), the fixed effects are removed before the estimation is carried out based on a consistent maximum likelihood estimator for a panel stochastic frontier model. Therefore, this empirical approach enables us to estimate consistently a fixed-effect stochastic frontier model by means of a within-transformation, and so deal with time-invariant individual heterogeneity in the frontier.

We, then, propose the following basic specification for expression [6]:

$$h_{it} = \delta_1 \%Temporary\,Workers_{it} + \delta_2 \%Vacancies_{it} + \delta_3 Trend + \delta_4 Trend^2 + \omega_{it} \qquad [8]$$

where ω_{it} is a random error with the usual statistical properties, and δ_i are the parameters to be estimated. A positive sign implies a positive contribution of the corresponding variable to inefficiency. In the inefficiency effects model, we also include a trending function, but in this case it aims at estimating the extent to which the level of inefficiency depends on the passing of time. Additionally, we also include an internal characteristic of the courts: the percentage number of days filled by temporary workers and the percentage number of days that remain unfilled or vacant. With regard to the passing of time, we have no hypothesis, though we clearly expect $\delta_1 \geq 0$ and $\delta_2 > 0$. That is, temporary workers – albeit productive – might be less efficient than regular employees, or at most, equally efficient, while by definition an increasing number of vacancies should lead to a reduction in the number of cases resolved, and so *ceteris paribus* increase inefficiency. However, δ_2 could be equal to zero if the staff member whose position is unfilled is unproductive (pessimistic view) or if the rest of the staff then tend to work harder to compensate his or her absence (optimistic view)[17].

[17] We also attempted to include in expression [8] variables that picked up shocks of demand that could create tensions of supply, and thus inefficiency, at least in the short run. For example, we tested for the inclusion of the annual variation in the percentage of immigrants, in the rate of unemployment and in total population. However, none of these variables – probably, because of their low time and cross-section

2.4. Data

Descriptive statistics for all variables are shown below in Table 1. Our time span runs for the five-year period, 2005-2009, and the basic units of analysis – as presented above – are the civil courts of first instance in Catalonia. The panel consists of 565 observations, with the number of courts increasing over time: 110 (2005 and 2006), 112 (2007), 114 (2008) and 119 (2009) given that new courts were created during the period of analysis. However, in order to guarantee homogeneity, these courts were only included within the dataset two years after their creation, which explains why the number of courts varies over time[18]. All the statistical information is drawn from the CGPJ (http://www.poderjudicial.es), with the exception of the percentage number of immigrants with respect to the overall population which was obtained from the Spanish National Institute of Statistics (www.ine.es). This last variable is defined as the total number of immigrants minus those from the EU (15)[19].

The percentage of temporary workers and vacancies (note subscripts omitted, but calculated every year for each court) was calculated according to the following formula:

$$\%Temporary\,Workers = \frac{Jc + Sc + AJc + GPc + TPc}{240 \times (1 + 1 + \#AJ + \#GP + \#TP)} \qquad [9]$$

J and *S* refer to judges and court secretaries, respectively, while *AJ*, *GP* and *TP* refer to the other staff positions (see section 2.1). In the numerator of expression [9], for each staff type, we include the number of days filled by temporary workers: for example, *Jc* is the number of days filled by temporary judges. In the denominator, we include the maximum number of days that ought to be filled by regular personnel, fixing the number of labor days as being equal to 240. Recall from section 2.1 that in each court there is one judge and one court secretary; having said that, for example, #*AJ* picks up the number of *AJ* in the corresponding court. Similarly, in the case of vacancies we employ the following formula:

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variation – were statistically significant. These results are not shown in section 3, but are available upon request.

[18] We also discarded the years 2007 and 2008 for court #1 of Lleida after having detected inconsistencies in the data for these two years.

[19] As discussed, there were 119 courts in 2009. However, they are organized geographically (*partidos judiciales*). In our sample, we have 11 areas (L'Hospitalet del Llobregat, Barcelona, Girona, Tarragona, Badalona, Lleida, Mataró, Terrassa, Reus, Granollers and Sabadell). Then, the percentage of immigrants was calculated for each of these broad areas, which means that each court within an area has the same percentage of immigrants. This obviously contrasts with the percentage of vacancies or temporary workers, where we have data for each individual court.

$$\%Vacancies = \frac{Jnc + Snc + AJnc + GPnc + TPnc}{240 \times (1 + 1 + \#AJ + \#GP + \#TP)} \quad [10]$$

While the denominator is equal to that of expression [9][20], in this case, the numerator picks up the number of days unfilled for each category of personnel. Given the obvious differences in terms of the responsibilities and skills of the various categories of personnel, we also calculated both indices for temporary workers and vacancies for judges and court secretaries, on the one hand, and for the rest of the personnel, on the other. If we look at Table 1, the percentage of vacancies – especially for judges and court secretaries – is very low on average. This, however, is not the case for temporary staff, where the maximum value of 0.984 for judges and court secretaries is quite outstanding. In the case of temporary workers the percentage is above 1, which means that in those cases the administration assigned reinforcement personnel.

Table 1
Summary statistics (2005-2009)

	Average	Standard deviation	Maximum	Minimum
Stochastic frontier				
Resolved cases	980.184	210.072	1697	503
New Cases	1049.19	249.944	1707	571
Pending cases	536.794	189.450	1360	200
% Immigrants	0.145	0.029	0.236	0.077
Inefficiency effects model				
Temporary workers (%#days)-*all*	0.228	0.217	1.232	0
Vacancies (%#days)-*all*	0.014	0.023	0.187	0
Temporary workers (%#days)-*judge*	0.087	0.169	0.984	0
Vacancies (%#days)-*judge*	0.003	0.027	0.486	0
Temporary workers (%#days)-*rest*	0.254	0.246	1.415	0
Vacancies (%#days)- *rest*	0.016	0.026	0.219	0

Note: Statistics based on pooled cross-sections for the whole set of courts throughout the period of analysis.

[20] Note both expressions do not add to 1. First, as we show later, because of the use of reinforcement personnel; and, second, because obviously in order to sum one we still require the percentage number of days filled by regular personnel. This explains why in the regression we can include both potential explanatory variables.

3. Empirical results

3.1. Frontier and inefficiency effects model

Table 2 shows the empirical results. Model 1 is the basic model, where the frontier is specified as a Cobb-Douglas functional form, while we include a trend (and its squared trend) and control for the percentage of immigrants. The estimate of new and pending cases is immediately interpretable as elasticity: a 10% increase in new cases results in a 5.85% increase in the cases resolved by the courts, which is above the elasticity of pending cases (2.67%). This seems reasonable as the nature of pending cases might mean it is more difficult to resolve them. Yet, given that the elasticity in both cases (and its summation) is below one, the performance of the courts on average generates delays, which is in accordance with Figure 1. The percentage of immigrants with respect to the total population does not seem to affect the frontier, while the structure of staff (% of temporary workers and vacancies) does not affect inefficiency. The mere passing of time, though, improves performance as is shown by the estimates of the trend in the inefficiency effects model. Specifically, the relationship between inefficiency and time is non-linear: as long as the value of the trend is greater than 1.52 (note the marginal impact of the passing of time is $0.404-2\times0.133\times Trend$) – recall in our sample: 2005 equals 1 and 2009 equals 5, the simple passing of time tends to increase performance. Thus, this represents good news for efficiency levels. Moreover, given the estimated non-linearity of the trend, the impact of time tends to increase over time. Yet, these results must be treated with caution as the frontier might not be properly specified. For this reason, in the models that follow we basically seek to estimate more flexible production functions.

In Model 2, we estimated a translogarithmic function, and hence the interpretation of the estimates is not straightforward given the interactions between all the variables (see the example given by expression [3]), with the exception of immigration which is included in an *ad hoc* fashion as it has only a potential influence on levels. According to a log-likelihood ratio test ($\lambda=-2\times[462.387-486.961]=49.148$, a value that is well above 11.07, the critical value at 5% for five degrees of freedom - recall this test followed a Chi-square distribution), Model 2 is clearly preferred to Model 1. However, nothing changes in the inefficiency effects model, while in the frontier *ceteris paribus* the percentage of immigrants tends to lead to a fall in the number of cases resolved. It would seem that because the percentage number of vacancies and temporary workers were measured too roughly (the situation for judges and court secretaries, and for the

rest of the staff being included in a single variable) means we do not find any statistically significant effect on inefficiency. For this reason, from the translogarithmic specification, Model 2, we disaggregated these variables per type of worker. Now, in Model 3, we find that the higher the percentage number of days filled by temporary judges or court secretaries, the lower is the level of efficiency. This again is reasonable as we suppose that these members of the justice system are key for the good performance of the courts. In Models 4 and 5, we test whether we can reject the inclusion in the inefficiency effects model of these groups of variables, but then we cannot reject – because of the log-likelihood ratio test – the exclusion of the variables that refer to the rest of the staff. Thus we prefer Model 4. Moreover, note that in the case of Model 6, by way of a robustness test, we checked the Cobb-Douglas specification once we had distinguished in the inefficiency effects model for the different types of staff, but we were still unable to confirm that Model 6 performed better, and so this serves as the reference for us to conclude that Model 4 is preferable.

Therefore, we can conclude from Model 4 that over time, efficiency increased, and that also its impact increased over time: paralleling the same calculation performed for Model 1, now the threshold is slightly lower, 1.38. Although the estimate is not very precise (i.e. it is only statistically significant at 90% confidence level), the percentage of immigrants tended to affect the frontier negatively. And perhaps, most importantly, the percentage of temporary workers (acting as judges and court secretaries) had a marked negative impact on efficiency. However, the percentage of vacancies did not have any impact for any category of personnel. This would seem a reasonable finding as for all categories of personnel – especially for judges and court secretaries – the percentage of vacancies was very low (see Table 1).

In the case of the frontier, given the (flexible) functional form of Model 4, it is not as straightforward as it was in Model 1 to interpret the elasticities. As we know, this is due to the interactions between the explanatory variables of the frontier. In Table 3 we show the estimates of elasticity for different levels of congestion (defined as the number of cases pending at the beginning of the year) and for different points in time. We present the elasticity both with respect to new and with respect to pending cases, but also the sum of both. The characterization of the frontier is quite clear: independently of the level of congestion, total elasticity is equal for all three levels of congestion and increasing over time. The key difference between courts is their specialization: in the more heavily congested courts, the elasticity of pending cases is

equal or greater than that of new cases. Note, also, that over time there seems to be a trend towards the resolution of pending cases, i.e. towards reducing congestion. Therefore, on average, the management of pending cases seems to be being conducted appropriately.

Table 2
Estimation of stochastic frontier: Total number of resolved cases (2005-2009)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
ln(new)	0.585*** (15.12)	4.939*** (2.96)	4.699*** (2.88)	4.795*** (2.95)	4.875*** (2.92)	0.597*** (15.75)
ln(new)×ln(new)	-.-	-0.165 (-1.31)	-0.138 (-1.11)	-0.145 (-1.16)	-0.161 (-1.27)	-.-
ln(new) ×Trend	-.-	0.018 (0.63)	0.013 (0.46)	0.012 (0.41)	0.018 (0.64)	-.-
ln(pending)	0.267*** (10.05)	0.311 (0.51)	0.474 (0.78)	0.484 (0.79)	0.301 (0.49)	0.268*** (10.38)
ln(pending)×ln(pending)	-.-	0.180*** (4.81)	0.176*** (4.78)	0.175*** (4.75)	0.180*** (4.83)	-.-
ln(pending) ×Trend	-.-	0.033*** (3.03)	0.034*** (3.13)	0.035*** (3.14)	0.032*** (3.02)	-.-
ln(pending)×ln(new)	-.-	-0.343*** (-4.61)	-0.361*** (-4.86)	-0.361*** (-4.83)	-0.343*** (-4.61)	-.-
Trend	0.035 (1.21)	-0.293 (-1.51)	-0.281 (-1.47)	-0.278 (-1.45)	-0.291 (-1.50)	0.018 (0.65)
Trend^2	-0.009** (-2.08)	-0.008* (-1.83)	-0.006 (-1.40)	-0.005 (-1.27)	-0.008** (-1.91)	-0.006 (-1.52)
% Immigrants	-0.988 (-1.34)	-1.200* (-1.69)	-1.130* (-1.64)	-1.136* (-1.64)	-1.193* (-1.69)	-0.845 (-1.19)
Inefficiency effects model						
Temporary workers (%#days)-*all*	0.067 (0.36)	0.142 (0.66)	-.-	-.-	-.-	-.-
Vacancies (%#days)-*all*	0.923 (0.88)	1.092 (0.97)	-.-	-.-	-.-	-.-
Temporary workers (%#days)-*judge*	-.-		0.913*** (2.59)	0.840*** (2.58)	-.-	0.848** (2.20)
Vacancies (%#days)-*judge*	-.-		-0.999 (-1.01)	-0.787 (-0.87)	-.-	-0.844 (-0.89)
Temporary workers (%#days)-*rest*	-.-		-0.238 (-0.97)	-.-	0.047 (0.25)	-0.267 (-1.15)
Vacancies (%#days)- *rest*	-.-		0.894 (0.77)	-.-	1.181 (1.15)	0.661 (0.56)
Trend	0.404* (1.63)	0.587** (2.25)	0.570** (2.09)	0.551** (2.01)	0.600** (2.31)	0.380 (1.48)
Trend^2	-0.133* (-1.90)	-0.189*** (-2.69)	-0.196*** (-2.72)	-0.199*** (-2.66)	-0.190*** (-2.74)	-0.144** (-2.04)
V2	-5.108*** (-64.96)	-5.231*** (-66.77)	-5.238*** (-66.55)	-5.238*** (-66.56)	-5.231*** (-66.74)	-5.113*** (-64.81)
U2	-4.254*** (-3.93)	-4.974*** (-5.70)	-5.364*** (-5.85)	-5.511*** (-5.92)	-4.918*** (-5.79)	-4.850*** (-4.47)
Mean efficiency	0.966	0.971	0.974	0.975	0.971	0.972
Log-likelihood	462.387	486.961	492.848	492.036	486.922	467.559

Notes: * signif.: 10% level, ** signif.: 5% level, *** signif.: 1% level; C_v and C_u are unconstrained constant parameters, such that $C_v=\ln(\sigma_v^2)$ and $C_u=\ln(\sigma_u^2)$, so according to the parameterization provided by Aigner *et al.* (1997), $\lambda^2=\sigma_u^2/\sigma_v^2$, if $\lambda=0$ there are no technical inefficiency effects and all deviations from the frontier are due to noise.

Table 3
Characterization of the frontier: Elasticity of resolved cases with respect to new and pending cases

High level of congestion					
	2005	2006	2007	2008	2009
New	0.3734*** (5.40)	0.3849*** (7.19)	0.3965*** (7.78)	0.4081*** (6.63)	0.4197*** (5.16)
Pending	0.3483*** (6.50)	0.3827*** (8.08)	0.4172*** (9.69)	0.4517*** (10.94)	0.4861*** (11.48)
TOTAL	0.7216*** (8.11)	0.7677*** (10.67)	0.8137*** (12.67)	0.8598*** (12.44)	0.9059*** (10.74)
Medium level of congestion					
	2005	2006	2007	2008	2009
New	0.5198*** (8.45)	0.5314*** (12.53)	0.5430*** (14.56)	0.5546*** (10.96)	0.5662*** (7.77)
Pending	0.2063*** (5.70)	0.2408*** (8.22)	0.2753*** (10.81)	0.3097*** (11.89)	0.3442*** (11.17)
TOTAL	0.7261*** (10.22)	0.7722*** (15.07)	0.8182*** (18.77)	0.8643*** (16.13)	0.9104*** (12.23)
Low level of congestion					
	2005	2006	2007	2008	2009
New	0.7702*** (9.67)	0.7817*** (12.03)	0.7933*** (13.06)	0.8049*** (11.70)	0.8165*** (9.53)
Pending	-0.036 (-0.69)	-0.0019 (-0.04)	0.0326 (0.63)	0.0670 (1.21)	0.1015* (1.68)
TOTAL	0.7338*** (8.72)	0.7799*** (10.81)	0.8259*** (11.64)	0.8720*** (10.77)	0.9180*** (9.29)

Note: In a court with a medium level of congestion, the number of pending cases is equal to the average for the period (537), while in courts with high and low levels of congestion, the number of pending cases is 50% above (805) and below (268) the average, respectively. In all cases, though, we use the average number of new cases (1,049).

3.2. Inefficiency: levels and distribution among courts

Finally, in Table 4, we show a description of the results obtained for efficiency levels[21].

Table 4
Description of efficiency levels (%) for period (2005-9): civil courts of first instance (Model 4, Table 2)

	2005	2006	2007	2008	2009	2005-9
Average	0.9574	0.9596	0.9723	0.9870	0.9947	0.9746
Maximum	0.9896	0.9885	0.9937	0.9974	0.9993	0.9993
Minimum	0.6575	0.7225	0.8111	0.9134	0.9405	0.6575
Standard deviation	0.0565	0.0500	0.0340	0.0165	0.0096	0.0403

According to the estimates obtained from Model 4, the average efficiency value increased over time (from 0.9574 to 0.9947), and most importantly, dispersion in levels of efficiency tended to vanish in the last period of our sample[22]. This is more readily

[21] The rankings per year for the whole set of courts are available upon request from the authors.

[22] Therefore, having access to a panel of data not only increases the efficiency of the estimates of the production function (see, *e.g.*, Fried *et al.*, 2008, p.39), but it also avoids the risk of obtaining potentially misleading rankings of efficiency due to the arbitrariness of the year chosen for the analysis. In our case, this is particularly important as efficiency clearly evolves over time.

verifiable in Figure 2, where the distribution function of the efficiency ratio is shown for each year. In 2009, all ratios were clearly around the average. Overall, we can conclude that the falling trend in the resolution ratio shown in section 2.1 (Figure 1) – especially since 2008 – was not due to decreasing efficiency, but rather to an increase in the amount of litigation (a factor picked up by *N*)[23], which was not matched by a corresponding increase in supply. In fact, if indeed most of the increase in the amount of litigation is temporary (attributable to the current economic crisis, as Figure 1 suggests), it makes sense not to implement structural measures aimed at increasing the level of supply (more staff and/or courts). Measures of this type should, however, be implemented to tackle the long-term forecasts of increased litigation.

4. Conclusions

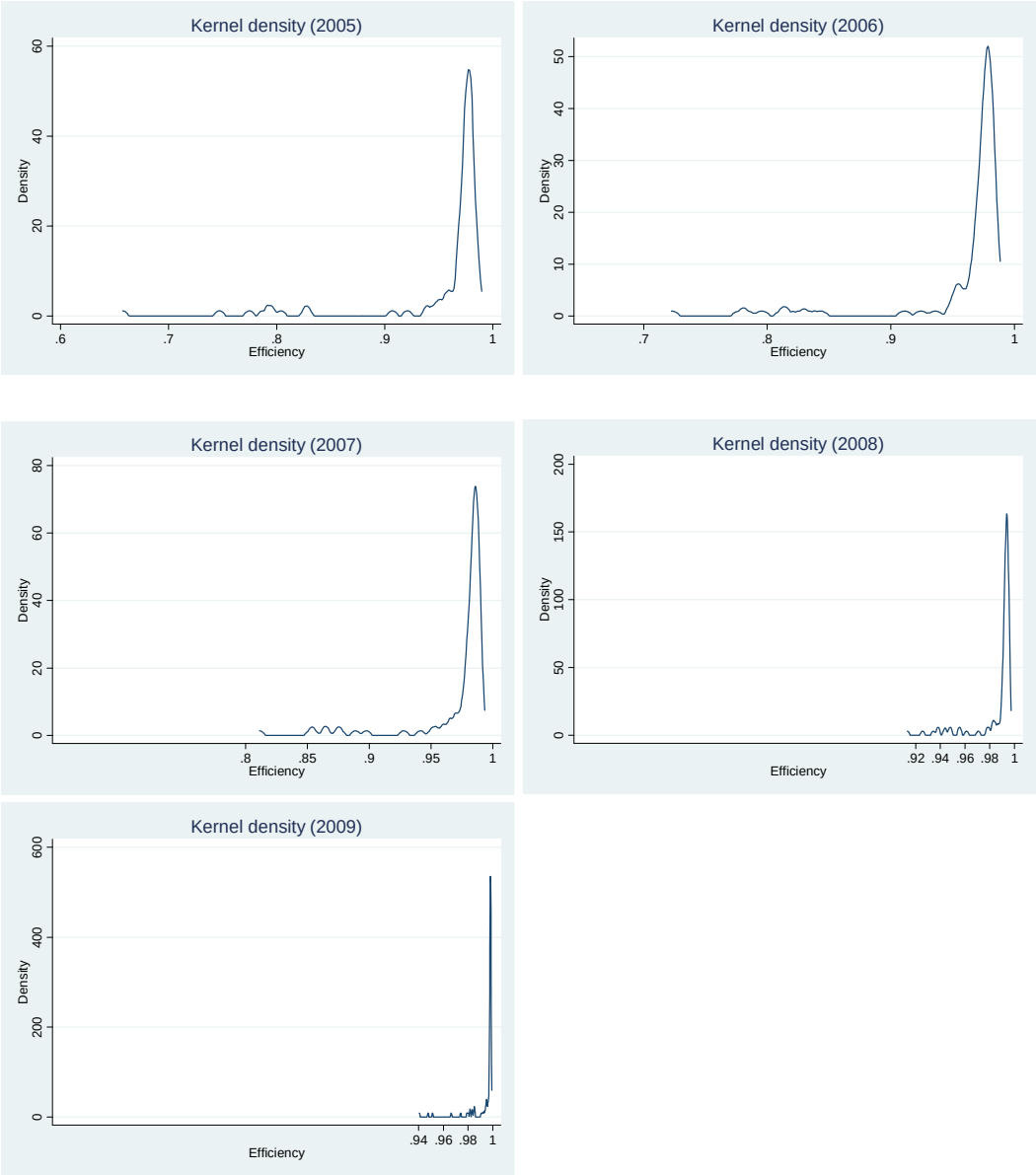
In the Introduction to this paper, we discussed the fact that a recent survey had highlighted the discontent expressed by Spanish society with its justice administration. Here, taking this opinion as our starting point, we have sought to assess the performance of this system, in particular, that of the civil courts of first instance. Based on our efficiency estimates, however, we are led to the conclusion that the system is under control; that is, whatever the absolute benchmark level of efficiency is, Spain is certainly approaching it. We believe this to be good news.

In contrast to previous studies, here, in conducting our analysis we have been able to take advantage of a panel of data – which has allowed us to verify the evolution in efficiency levels over time – and of a stochastic frontier analysis – which has enabled us to conduct a consistent estimation of the explanatory factors of efficiency. Among these factors, we have identified the negative impact of the percentage of temporary judges and of the percentage of temporary court secretaries. Thus, inefficiency tends to increase the greater the number of days these positions are filled by temporary staff. The explanation is simple: these personnel are less productive. This finding points to the need for a better selection process and, in general, ensuring that temporary workers are more carefully matched with the courts. In short, in the future, further empirical work assessing the performance of the justice administration – including analyses of other areas of the justice administration – is essential if we wish to corroborate the overly negative view held by Spanish society of one of the pillars of the

[23] This might be in contrast with the mistrust expressed in the operating of the justice system. In other words, despite their poor opinion, people still turn to the justice system to solve their private disputes. I owe this suggestion to Josep Montefusco.

State of Law.

Figure 2
Density functions of technical efficiency (2005-9)



Note: Calculated from results provided by Model 4. The range of values on the x-axis is common to all years (0.65-1).

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