



ACADEMIC ARTICLE

Utility Maximizing Judges and Judicial Assistants: Testing Rational Choice Theory in 22 EU Countries

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By using a longitudinal bi-annual dataset (2012–2018) from the European Commission for the Efficiency of Justice (Cepej) for 22 EU countries, this study tests four hypotheses that have been derived from rational choice theory at individual and aggregated level. The positive associations between caseload and productivity support the hypothesis that judges sacrifice leisure or the quality of their decisions to achieve a reduction in backlogs. While the lack of association between the number of assistants and judge's productivity supports the hypothesis that appointing new staff reduces caseload, thereby inducing judges to substitute time they spend on resolving cases for leisure or improving the quality of their decisions, while the positive association between the number of judges and productivity contradicts this hypothesis. The finding that assistant's caseload negatively moderates the relationship between judge's caseload and judge's productivity supports the hypothesis that as the caseload of assistants increases, judges are relieved of more administrative tasks, thereby allowing judges to spend more time on leisure or improving the quality of their decisions rather than on resolving cases. Our findings suggest that assistants use similar trade-offs as judges and affect judges' utility maximizing behaviour.

Keywords: Caseload; Judge's productivity; Judicial assistant; Rational choice theory; structural equation modelling; Staffing

JEL Codes: C31, H59, K41

Introduction

Rational choice theory, which is applied to judges by Cooter¹ and Posner,² suggests that judges want to maximize utility. Judge's utility function contains benefits such as time for leisure, prestige, reputation and popularity as well as costs such as training to become

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¹ R. D. Cooter, The Objectives of Private and Public Judges. *Public Choice* 41, no. 1 (1983): pp. 107–32.

² R.A. Posner, What Do Judges and Justices Maximize? (The Same Thing Everybody Else Does). *Supreme Court Economic Review* 3 (1993) pp. 1–41.

a judge and work efforts. According to this theory, the rational judge aspires leisure,³ while at the same time she does not want to undermine her prestige or reputation by resolving less cases than is expected of her and causing delays or congestion. Rational choice theory is used to explain the trade-offs that judges make between the different costs and benefits within time-limits. In the meanwhile, there is a whole body of literature that is dedicated to the application of rational choice theory to judge's utility maximizing behaviour.

However, the theory may be in need of adaptation. During the past decades caseloads in courts all over the world have risen. In order to cope with increasing backlogs and to speed up judicial procedures, the number of assistants and the duties assigned to them have increased.⁴ Posner, therefore, expressively speaks of 'the age of the law clerk'.⁵ As the involvement of judicial assistants in adjudication is becoming more prevalent and prominent, a theory that focuses on the judge alone may increasingly fall short. The aim of this paper is therefore to expand the application of rational choice theory to adjudication by subsuming the role of judicial assistants in it. This will be done not only by spelling out and testing the utility-maximizing functions of the judge and the judicial assistant but also by showing how the judicial assistant affects the time preferences of the judge.

In support of rational choice theory this study shows that judge's and assistant's caseload are positively associated with judge's productivity, while the number of assistants is not. Also in support of the theory is the finding that judicial assistants' caseload negatively moderates the positive association between judge's caseload and judge's productivity. These findings all suggest that judge's and assistants maximize their utility by trading off a good reputation by being productive with time for leisure or a good reputation by making high-quality decisions. What contradicts the theory is our finding that judge's productivity is higher as the number of judges is higher, when controlling for caseload. It was expected that an increase in output by newly appointed judges is offset by the fall in output of incumbent judges who respond to a reduction in caseload by spending more time on leisure or improving the quality of their decisions. Our study makes a contribution to the literature by showing that the utility maximizing behavior of judges and assistants can be explained well with the same theory. This is a timely achievement in an era wherein the role of judicial assistants in adjudication can no longer be ignored.

In the next section, we review the literature about rational choice theory and discuss some of its contestations. The second part of the theoretical section is devoted to subsuming judicial assistants in rational choice theory. The four hypotheses that we derive from the theory, are tested by way of a bi-annual longitudinal dataset from the European Commission for the Efficiency of Justice (Cepej) for 22 European Union countries. We use panel data estimation and structural equation modelling to test our hypotheses. Our method is presented in Section 3. Section 4 discusses the results. Section 5 concludes.

³ E. Helland & J. Klick, "The Effect of Judicial Expedience on Attorney Fees in Class Actions," *Journal of Legal Studies* 36 (2007) pp. 25–63.

⁴ For references, see N. L. Holvast & P. Mascini (2020) Is the judge or the clerk making the decision? Measuring the influence of judicial assistants via an experimental survey among Dutch district court judges. *International Journal for Court Administration* and P. Mascini & N. L. Holvast (2020) Explaining judicial assistants' influence on adjudication with principal-agent theory and contextual factors. *International Journal for Court Administration*.

⁵ R. A. Posner (2008) *How Judges Think*. Harvard University Press p. 61.

Utility maximizing judges and judicial assistants

Are judges utility maximizers?

Rational choice theory suggests that judges maximize their utility function, which contains preferences for income, time for judicial work, time for leisure, prestige, reputation and avoiding reversals.⁶ Judge's maximization of utility is subject to a time constraint. The theory is based on the assumption that judges make a trade-off between preferences for leisure or, equivalently, effort aversion, and for preferences such as a good reputation, popularity, prestige and avoiding reversals.⁷

In an influential study, Beenstock and Haitovsky⁸ tested judge's utility-maximizing behaviour for Israeli courts and found support for it. They found that newly appointed judges reduce the productivity of incumbent judges as measured by the number of resolved cases. This pattern is in accordance with rational choice theory, which predicts that appointing new judges reduces the total workload, thereby inducing incumbent judges to reduce the time they spend on judicial tasks and to allocate this additional time on leisure. 'The newly appointed judges naturally increase the output of the court. However, this increase may be partly or even totally offset by the fall in output of the incumbent judges.'⁹ Conversely, the theory predicts that judge's productivity increases as caseload increases because judges do not want to jeopardize their reputation and prestige by a mounting backlog. Similar findings that support rational choice theory have been achieved based on studies of the Slovenian¹⁰ and Bulgarian¹¹ judiciary. Together, these studies indicate that productivity is endogenous in the sense that incumbent judges complete fewer cases in the presence of new judicial appointments and that judges' productivity increases with caseload. These findings also have implications for policymaking, as it means that pairing the rate of appointing new judges to a growth in demand for legal services is not necessarily an efficient policy.

For different reasons, the support for rational choice theory is contested. First, the theory leaves room for different interpretations. If caseload is indeed positively correlated with productivity, then this need not imply that judges sacrifice a preference for leisure for a preference for prestige and reputation by reducing backlogs. An alternative interpretation for the same pattern is that judges sacrifice the quality of their decisions for productivity. This is also acknowledged by proponents of rational choice theory. Posner argues that judges aspire effort avoidance *and* minimizing reversals. Beenstock and Haitovsky acknowledge that it is possible that rather than trading-off leisure and productivity, judges trade-off productivity and quality of decision-making.¹² Engel and Weinshall¹³ have indeed shown that judges working in courts with reduced caseload invest more resources in resolving each case. Furthermore, Jonski and

⁶ R. A. Posner, What Do Judges and Justices Maximize? (The Same Thing Everybody Else Does). *Supreme Court Economic Review* 3 (1993) pp. 1–41.

⁷ L. Epstein, W. M. Landes & Richard A Posner, Why (And When) Judges Dissent: A Theoretical And Empirical Analysis. *Journal of Legal Analysis* 3 No. 1 (2011) pp. 103–137.

⁸ M. Beenstock & Y. Haitovsky, Does the Appointment of Judges Increase the Output of the Judiciary?. *International Review of Law and Economics* 24, No. 3 (2004): pp. 351–369.

⁹ *Ibid.*, p. 352.

¹⁰ V. Dimitrova-Grajzl, P. Grajzl, J. Sustersic & K. Zajc, Court Output, Judicial Staffing, and the Demand for Court Services: Evidence from Slovenian Courts of First Instance. *International Review of Law and Economics* 32(1) (2012) pp. 19–29.

¹¹ V. Dimitrova-Grajzl, P. Grajzl, A. Slavov & K. Zajc, Courts in a Transition Economy: Case Disposition and the Quantity–quality Tradeoff in Bulgaria. *Economic Systems* 40(1) (2016): pp. 18–38.

¹² M. Beenstock & Y. Haitovsky, Does the Appointment of Judges Increase the Output of the Judiciary?. *International Review of Law and Economics* 24(3) (2004): pp. 351–369.

¹³ C. Engel & K. Weinshall, Manna from Heaven for Judges – Judges' Reaction to a Quasi-Random Reduction in Caseload. *Discussion Papers of the Max Planck Institute for Research on Collective Goods* (2020) pp. 1–31.

Mankowski¹⁴ find that judicial lateness and irritation tends to be more likely around and beyond the breakpoint of judicial capacity, thereby also suggesting there exists a trade-off between increased productivity and quality. This means that it may not be a preference for leisure (alone) that explains why some studies find that an increase in judicial staff is not paralleled with a proportionate increase in court output. Rather, this may, at least partly, be due to a preference for improving the quality of judicial decision-making. And, of course, the preference for effort avoidance and quality decision-making may vary between judges. In other words, to a certain extent, utility maximization may have been falsely attributed in several studies to judges' preference for leisure.

Second, there is the study by Jonski and Mankowski,¹⁵ which does not question the existence of a positive correlation between caseload and productivity either, but which problematizes the linearity of this association. They hypothesize that there is a limit to the increase in productivity that judges can achieve in order to manage a growing caseload. Supposedly, at a certain point, the judge gets overburdened and can no longer adjust to an increase in workload.¹⁶ They indeed show that the positive association between caseload and resolved cases is non-linear, but, allegedly, the slope rather has the shape of a hockey-stick. Their metaphor is somewhat misleading though, since what they actually find is a further increase in productivity after a temporary flattening of the curve as caseload mounts. In other words, rather than a hockey-stick, the slope likens the shape of an inverted 'S'. This increase of productivity at the end of the slope challenges Jonski and Mankowski's presupposition that the capacity of judges to cope with increased workload is confined.¹⁷

Third, there are several studies which findings contradict the hypothesis that an increase in the number of judges decreases the number of resolved cases when controlling for caseload. For example, Rosales-López¹⁸ shows that, controlled for caseload, the number of judicial staff have a significant and positive effect on the court's output by using OLS regression for 61 first instance civil courts in Spain. Similar empirical results are also reported by Grajzl and Silwal¹⁹ for Nepalese district courts.²⁰ This means that some studies have established that staffing does not increase the output of courts when controlling for the number of cases,²¹ while other studies have demonstrated that it does increase the output of courts.²²

These inconclusive results may be linked to a fundamental flaw in the testing of the utility-maximizing function, which has been brought up by Jonski and Mankowski.²³ Most tests of

¹⁴ K. Jonski & D. Mankowski, Is Sky the Limit? Revisiting 'Exogenous Productivity of Judges' Argument. *International Journal for Court Administration* 6(2) (2014) p. 68.

¹⁵ Ibid.

¹⁶ M. Beenstock & Y. Haitovsky have also mentioned this possibility. See supra note 12, p. 366.

¹⁷ See also Dimitrova-Grajzl et al. supra 10, p. 28.

¹⁸ V. Rosales-López, Economics of Court Performance: An Empirical Analysis. *European Journal of Law and Economics* 25(3) (2008) pp. 231–251.

¹⁹ P. Grajzl & S. Silwal, The Functioning of Courts in a Developing Economy: Evidence from Nepal. *European Journal of Law and Economics* 49 (2017) pp. 101–129.

²⁰ J. Beldowski, L. Dąbroś & W. Wojciechowski, Judges and court performance: a case study of district commercial courts in Poland. *European Journal of Law and Economics* 50 (2020) pp. 171–201.

²¹ M. Beenstock & Y. Haitovsky, Does the Appointment of Judges Increase the Output of the Judiciary?. *International Review of Law and Economics* 24(3) (2004): pp. 351–369; V. Dimitrova-Grajzl, P. Grajzl, A. Slavov & K. Zajc, Courts in a Transition Economy: Case Disposition and the Quantity–quality Tradeoff in Bulgaria. *Economic Systems* 40(1) (2016) pp. 18–38; V. Dimitrova-Grajzl, P. Grajzl, J. Sustersic & K. Zajc, Court Output, Judicial Staffing, and the Demand for Court Services: Evidence from Slovenian Courts of First Instance, *International Review of Law and Economics* 32 (1) (2012) pp. 19–29.

²² P. Grajzl & S. Silwal, The Functioning of Courts in a Developing Economy: Evidence from Nepal. *European Journal of Law and Economics* 49 (2017) pp. 101–129.

²³ K. Jonski & D. Mankowski, Is Sky the Limit? Revisiting 'Exogenous Productivity of Judges' Argument. *International Journal for Court Administration* 6(2) (2014) pp. 53–72.

the utility-maximizing function are conducted by linking the aggregated number of cases and judges at court level in order to obtain the aggregated number of resolutions. This is remarkable as the rational choice theory is a microeconomic theory which aim is to explain decisions made by individuals. Therefore, contrary to the traditional court level approach, the utility-maximizing function should link *individual* workload with the number of resolved cases *per individual*: '...each judge has a defined docket and time resources which define his or her capacity – the number of cases feasible to adjudicate in a given time period.'²⁴ For this reason they calculate the productivity of the judge by dividing the number of resolved cases in the given year by the number of judges.²⁵

There is a small number of studies that have indeed tested the utility-maximizing function by explaining the resolved cases per judge by using caseload per judge. It is important to mention that Beenstock and Haitowski is one of these studies, as Jonski and Mankowski mistakenly claim that this study is based on aggregated data. The plot on page 359 undeniably shows a strong positive correlation between productivity, as measured by completed cases *per judge* for each court over time and caseload *per judge*, as measured by pending and lodged cases *per judge*. As such, the findings of Beenstock and Haitowsky are congruent with the rational judge hypothesis that judges become more productive as their caseload increases. Jonski and Mankowski²⁶ and Gomez, Guimaraes, and Akutsu²⁷ similarly find positive correlations between the average judge's workload and output, albeit that the correlation found in the former study is non-linear.

Three conclusions can be drawn from the literature review about the application of rational choice theory to adjudication. First, compared to studies that are based on data that are aggregated at court level, studies that use data that are disaggregated at the individual-level provide a more valid test of judges' utility-maximizing behaviour. Second, the studies that use per capita data seem to provide more consistent support for the hypothesis that an increase of caseload increases productivity than do studies that use aggregated data. Third, the second conclusion does not exclude the possibility that this positive correlation is caused to a smaller or larger extent by judge's preference for improving the quality of judicial services rather than a preference for leisure.

Are judicial assistants utility maximizers?

So far, we have only discussed the literature about utility-maximizing judges. However, according to Posner,²⁸ it is important to also subsume the role of judicial assistants in rational choice theory's application to adjudication. During the past decades of rising caseloads in courts all over the world, the number of assistants and the duties assigned to them have increased.²⁹ Judicial assistants support judges in performing administrative duties and by deliberating with judges about legal cases. Incorporating judicial assistants in rational choice theory involves two steps: first, formulating a utility function for judicial assistants and, second, formulating the expected impact of the involvement of judicial assistants in adjudication on the utility function of the judge.

Regarding the first step, we assume that the utility function of judges and judicial assistants contains identical costs and benefits. According to rational choice theory, judicial assistants

²⁴ Ibid. p. 57.

²⁵ Ibid. p. 63.

²⁶ Ibid.

²⁷ A. O. Gomes, T. A. Guimaraes, & Akutsu, The Relationship between Judicial Staff and Court Performance: Evidence from Brazilian State Courts. *International Journal for Court Administration* 8(1) (2016): pp. 12–19.

²⁸ R. A. Posner (2008) *How Judges Think*, Harvard University Press.

²⁹ For references, see Holvast & Mascini supra note 4.

will behave such that the marginal utilities of administrative tasks and leisure are equalized. Furthermore, like judges, judicial assistants are expected to seek maximization of their utility function by trading-off between a preference for a good reputation and prestige by contributing to a decrease in backlogs and a preference for leisure or for improving the quality of judicial decisions. This means that time spent on administrative work and leisure or high-quality decision-making varies with caseload: assistants spend less time on leisure or quality decision-making and more on administrative work as caseload increases and vice versa.

As regards the second step, we expect that the involvement of judicial assistants affects the utility maximization of judges. Judicial assistants can play a role in enhancing the efficiency and cost-effectiveness of adjudication by supporting judges. Judicial assistants are subordinate to judges. All their duties derive from the judges' responsibility to adjudicate. At the same time, judicial assistants can release judges of routine, administrative tasks so that judges can focus their attention on the more complex aspects of adjudicating. Without receiving support, judges have to spend time on administrative duties themselves. According to rational choice theory, judges will behave such that the marginal utilities of judicial tasks, leisure and administrative tasks are equalized. Judicial tasks can be fulfilled only by a judge. Administrative tasks can be fulfilled by a judge or a judicial assistant. In the former situation, the judge has to devote her time to administrative tasks by decreasing time spent on adjudicating or on leisure or the quality of decision-making. In the latter situation, the time the judge can devote to judicial tasks will not decrease because assistants will perform the administrative tasks, so that the judge will have more time to spend on leisure or improving the quality of decisions. Consequently, increasing the number of judicial assistants is expected to decrease judge's productivity.

There is a limited number of studies that have investigated the impact of the number of judicial assistants on judicial output. For example, Gomes et al.³⁰ have investigated the relationships between the number of judges and administrative assistants on the one hand and court's productivity on the other hand by using moderation analysis. Their study shows that the number of assistants negatively moderates the relationship between caseload and resolved cases per judge per year. This means that judge's productivity decreases as the number of judicial assistants increases. Gomes et al.³¹ have replicated these findings on the moderating effect of judicial assistants for the civil, criminal and mixed courts in Brazil. They interpret this finding in terms of rational choice theory: 'When judges have a small number of administrative assistants, such as [is] the case of judges who work in small courts, they work harder than other judges to meet the increasing caseload, both to make judgments and to conduct hearings'.

Hypotheses

Rational choice theory assumes that judges maximize their utility by dividing time between work and leisure. The theory rests on two expectations: first, that judges' productivity increases as caseload increases because judges do not want to jeopardize their reputation and prestige by a mounting backlog. Second, that appointing new judges reduces the total workload, thereby inducing incumbent judges to reduce the time they spend on judicial tasks and to allocate this additional time either on leisure or on improving the quality of their decisions.

³⁰ A. O. Gomes, T. A. Guimaraes & L. Akutsu, The Relationship between Judicial Staff and Court Performance: Evidence from Brazilian State Courts. *International Journal for Court Administration* 8(1) (2016): pp. 12–19.

³¹ A. O. Gomes, T. A. Guimaraes & L. Akutsu, Court Caseload Management: The Role of Judges and Administrative Assistants. *Revista de Administração Contemporânea* 21(5) (2017) p. 659.

As recommended by Richard Posner, applying rational choice theory to adjudication can be expanded by subsuming the role of judicial assistants in it. This expansion can be based on the assumption that the utility function of the assistant contains the same preferences as that of the judge. The difference between judges and assistants is that the judge is ultimately responsible for adjudication, while the duties of judicial assistants are limited to supporting judges. Taking into consideration both the similarity in preferences of judges and assistants and the difference in their duties, it can be presupposed that an increase in the number of judicial assistants will reduce judges' productivity because judges will shift the trade-off from work to leisure or improving the quality of their work. Judges will have more time for leisure or delivering quality as the number of assistants increase because their workload will reduce when they are relieved of more administrative duties.

As the literature review has shown, rational choice theory has been tested at the individual level and the court level. The following four hypotheses can be derived from the theory:

- Whereas caseload at the aggregate level (*hypothesis 1a*) and caseload per judge (*hypothesis 1b*) and caseload per assistant (*hypothesis 1c*) at the individual level are positively associated with productivity, the number of judges (*hypothesis 2*) and assistants (*hypothesis 3*) are not.
- Assistant's caseload negatively moderates the relationship between judge's caseload and judge's productivity (*hypothesis 4*).

Method

Data

To test our hypotheses, we use the longitudinal dataset from the European Commission for the Efficiency of Justice (Cepej). It is the most comprehensive and systematic dataset currently available for evaluating the European judicial system.³²

Cepej was established in 2002 by European states to assess the efficiency of judicial systems and to propose empirically validated practical tools for increasing the efficiency of judicial services. For these purposes, Cepej introduced the European Judicial Systems Report in 2006, which contains cross-country judicial data for Council of Europe member countries and observer countries in 2004. Since then, every two years, Cepej has published the report. This report has become an important source for judicial statistics in the European Union. The report constitutes country-specific data that are collected by a questionnaire that is filled-in by national correspondents from the Ministries of Justice.³³

Cepej's datasets have been criticised for comparing different judicial systems of European countries. Allegedly, the counting of judges and court staff differs between jurisdictions.³⁴ This issue is also acknowledged in a separate section of a recent Cepej report.³⁵ Nevertheless, Cepej also reports that the dataset is based on standardised national data of

³² N. Garoupa, *Constitutional Courts in Civil-Law Western Europe: Quantitative Approaches*. George Mason Law & Economics Research Paper 20–05 (2020).

³³ The report has 12 sections and 207 questions with sub-questions. See: www.coe.int/cepej.

³⁴ M. Fabri, *Methodological Issues in the Comparative Analysis of the Number of Judges, Administrative Personnel, and Court Performance Collected by the Commission for the Efficiency of Justice of the Council of Europe*. *Oñati Socio-Legal Series* 7.4 (2017); P.Langbroek, *Fake Facts: The Justice Scoreboard of the Directorate General for Justice and Consumer Protection*, (2017), <<http://blog.montaignecentre.com/index.php/837/fake-facts-the-justice-scoreboard-of-the-directorate-general-for-justice-and-consumer-protection/>>.

³⁵ Cepej, *European Judicial Systems: Efficiency and Quality of Justice*, Council of Europe 2016.

judicial systems³⁶ and extensive work has been carried out by the Secretariat of Cepej to verify the quality of the data submitted by the national correspondents.³⁷ Cepej's datasets are said to be unique in allowing researchers to investigate different judiciary systems on cross-country basis.³⁸ Several studies have indeed used the Cepej dataset for cross-country comparisons.³⁹

We use the Cepej reports published in 2012, 2014, 2016 and 2018. The bi-yearly dataset consists of 22 countries; Belgium, Bulgaria, Croatia, Czechia, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden. For each country, we use data on pending cases of the previous year, incoming cases, resolved cases, number of judges and judicial assistants for first instance courts. The total number of observations is less than 88 (22 countries*4 years) because some countries have missing values for certain years.

Measurement

First we explain which aggregated data at country level we use to test the hypotheses.

Resolved cases (y) is the dependent variable, which is measured by the total number of resolved cases. Ideally, two other dependent variables would also have been included in our study: one variable indicating the quality of judicial decisions, for instance the number of reversals⁴⁰ and one variable indicating the time judges spend on leisure. This would have enabled us to test the extent to which a potential decrease in resolved cases is accompanied by an increase in either the quality of judicial decisions or time spent on leisure, as expected by rational choice theory. However, unfortunately, the Cepej dataset does not contain indicators for either variable.

Caseload (x) is measured by summing the total number of pending cases from the previous year and the total number of the newly filed cases in the current year.

Judges (m) is measured by the total number of professional judges sitting in courts.

Assistants (w) is measured by the total number of the non-judge staff whose task is to assist judges directly. Question 53 of the Cepej questionnaire distinguishes between the following five categories of non-judge staff: 1) Rechtspfleger, 2) non judge staff whose task is to assist judges directly. This category consists of judicial advisors and registrars, who assist judges in their judicial activities (hearings in particular) and may have to authenticate acts, 3) staff responsible for various administrative matters, 4) technical staff responsible for IT equipment, and 5) other types of non judge staff (Cepej 2018). We use the second category to measure the number of judicial assistants.

Table 1 shows the summary statistics of the variables.

³⁶ L. Roussey & B. Deffains, Trust in Judicial Institutions: An Empirical Approach. *Journal of Institutional Economics* 8(03) (2012): pp. 351–369.

³⁷ Cepej (2018), European Judicial Systems Efficiency and Quality of Justice, Edition 2018, p. 8.

³⁸ S. Voigt & N. El-Bialy, Identifying the Determinants of Aggregate Judicial Performance: Taxpayers' Money Well Spent? *European Journal of Law and Economics* 41(2) (2015) pp. 283–319.

³⁹ F. B. Cross & D. C. Donelson, Creating Quality Courts. *Journal of Empirical Legal Studies* 7(3) (2010) pp. 490–510; F. Deyneli, Analysis of Relationship between Efficiency of Justice Services and Salaries of Judges with Two-Stage DEA Method. *European Journal of Law and Economics* 34(3) (2011) pp. 477–493; S. Voigt & N. El-Bialy, Identifying the Determinants of Aggregate Judicial Performance: Taxpayers' Money Well Spent? *European Journal of Law and Economics* 41(2) (2015) pp. 283–319; R. Ippoliti, A. Melcarne, & G. B. Ramello, Judicial Efficiency and Entrepreneurs' Expectations on the Reliability of European Legal Systems. *European Journal of Law and Economics* 40(1) (2014) pp. 75–94; S. Bielen, P. Ludo, M., Wim & V. Lode, Backlogs & Litigation Rates: Testing Congestion Equilibrium across European Judiciaries., *International Review of Law and Economics* 53 (2017) pp. 9–22; A. Melcarne & G. B. Ramello, Judicial Independence, Judges' Incentives and Efficiency. *Review of Law & Economics* 11(2) (2015) pp. 149–69; S. Voigt, Determinants of Judicial Efficiency: A Survey. *European Journal of Law and Economics* 42(2) (2016) pp. 183–208; L. Roussey & B. Deffains, Trust in Judicial Institutions: An Empirical Approach. *Journal of Institutional Economics* 8(3) (2012) pp. 351–369.

⁴⁰ V. Rosales-López, Economics of Court Performance: An Empirical Analysis. *European Journal of Law and Economics* 25(3) (2008) pp. 231–251.

Table 1: Summary Statistics (Country level).

Variable	N	Mean	Std. Dev.	Min	Max
Resolved cases (y)	56	2,038,149	2,863,048	89,406	1.13e+07
Caseload (x)	56	1,147,272	1,644,451	42,667	6,519,002
Judges (m)	56	2,378.9	2,911.3	163	14,861
Assistants (w)	56	6,480.9	7,435.6	220	29,144

Table 2 shows the summary statistics of the variables.

Table 2: Summary Statistics (Individual level).

Variable	N	Mean	Std. Dev.	Min	Max
Productivity per judge (y_j)	73	889.20	579.35	143.68	3663.70
Caseload per judge (x_j)	68	432.53	296.36	84.06	1322.58
Caseload per judicial assistant (x_{ja})	56	182.55	179.65	39.92	976.31
Productivity per judicial assistant (y_{ja})	61	401.95	402.62	81.69	2309.10

For testing the hypotheses at the individual level, we will use the following measures:

Per capita productivity of judges (y_j) is calculated by dividing the number of resolved cases (y) by the number of judges (m).

Per capita caseload of judges (x_j) is calculated by dividing the caseload (x) by the number of judges (m).

Per capita caseload of assistants (x_{ja}) is calculated by dividing the caseload (x) by the number of judicial assistants (w).

Analysis

In line with many researchers, we use panel data models to investigate at the aggregate level the relationships between caseload, the number of judges and the number of assistants on the one hand and the number of resolved cases on the other hand.⁴¹ We first apply pooled ordinary least squares. This means all countries are combined in a pool, which means that potential differences between countries are not taken into account. Next, we use panel data analysis with random effect estimation. This technique does take into account the impact country-specific characteristics may have on the number of resolved cases by allowing slopes to vary between countries. We do both analyses to estimate the following equation:

$$y_{it} = \alpha + \beta_1 x_{it} + \beta_2 m_{it} + \beta_3 w_{it} + \varepsilon_{it}$$

Where y_{it} is the number of resolved cases per country per year, x_{it} is the caseload per country per year, m_{it} is the number of judges per country, w_{it} is the number of assistants per country,

⁴¹ M. Beenstock & Y. Haitovsky, Does the Appointment of Judges Increase the Output of the Judiciary?. *International Review of Law and Economics* 24(3) (2004): pp. 351–369; J. Beldowski, L. Dąbrós, & W. Wojciechowski, Judges and Court Performance: A Case Study of District Commercial Courts in Poland, *European Journal of Law and Economics* 50 (2020) pp. 171–201; V. Dimitrova-Grajzl, P. Grajzl, A. Slavov & K. Zajc, Courts in a Transition Economy: Case Disposition and the Quantity–quality Tradeoff in Bulgaria, *Economic Systems* 40(1) (2016) pp. 18–38; V. Dimitrova-Grajzl, P. Grajzl, J. Sustersic & K. Zajc, Court Output, Judicial Staffing, and the Demand for Court Services: Evidence from Slovenian Courts of First Instance, *International Review of Law and Economics* 32 (1) (2012) pp. 19–29; A. O. Gomes, T. A. Guimaraes & L. Akutsu, Court Caseload Management: The Role of Judges and Administrative Assistants. *Revista de Administração Contemporânea* 21(5) (2017) pp. 648–665.

i represents the countries, t represents the year. Next, we use structural equation modelling to test our hypotheses at the individual level. We estimate the associations between caseload per judge and caseload per judicial assistant on the one hand and judge's productivity on the other hand. Also, we estimate the moderation effect of the caseload per judicial assistant on the relationship between caseload per judge and judge's productivity. Moderation occurs when the direction or strength of the relationship between two variables is dependent on a third variable.⁴² The moderator interacts with the independent variable.⁴³ The basic moderation model can be written as follows:⁴⁴

$$y_j = \beta_0 + \beta_1 x_j + \beta_2 x_{ja} + \beta_3 x_j x_{ja} + \varepsilon$$

Where y_j is per capita productivity of the judge, x_j is the per capita caseload of the judge, x_{ja} is the per capita caseload of the judicial assistant. The latter is the moderator and estimates the extent to which the effect of x_j on y_j is moderated by x_{ja} . So that $x_j x_{ja}$ shows the moderation effect. The coefficient for the interaction term (β_3) shows how the slope of y_j on m_j is dependent on the value of w_j .

Structural equation modelling is the designated technique to estimate the moderation effect of the caseload per judicial assistant on the relationship between caseload per judge and judge's productivity.⁴⁵ Structural equation modelling with MLMW (maximum likelihood with missing values) aims to retrieve as much information as possible from observations containing missing values.⁴⁶ For MLMW joint normality of all variables is assumed and missing values are assumed to be missing at random. This means that either the missing values are scattered completely at random throughout the data or that values more likely to be missing than others are predicted by the variables in the model.⁴⁷ We run the structural equation modelling with missing values in Stata statistics software.

Results

We report the results of the panel data analysis in **Table 3**. The analysis including the number of assistants is based on 17⁴⁸ countries and 56 observations, while the analysis including the number of assistants is based on 19⁴⁹ countries and 68 observations.

The panel data with random effect results⁵⁰ (col. 3 and 4 in **Table 3**) indicate that the relationship between caseload (x) and the total number of resolved cases (y) is positive and statistically significant, both in Model 3 (beta $x = 0.478$; $p < 0.01$) and in Model 4 (beta

⁴² K. J. Preacher, D. D. Rucker & A. F. Hayes, Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research* 42(1) (2007) pp. 185–227. R. Baron & D. Kenny, The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology* 51 (1986) pp. 1173–1182.

⁴³ J. R. Edwards & L. S. Lambert, Methods for Integrating Moderation and Mediation: A General Analytical Framework Using Moderated Path Analysis. *Psychological Methods* 12(1) (2007) pp. 1–22.

⁴⁴ K. Preacher, D. Rucker, & A. Hayes, Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research* 42(1) (2007) pp. 185–227.

⁴⁵ C. Nachtigall, U. Kroehne, F. Funke, R. Steyer "(Why) Should We Use SEM?—Pros and Cons of Structural Equation Modelling. *Methods Psychological Research Online* 8 (2003) pp. 1–22.

⁴⁶ Stata, *Stata Structural Equation Modeling Reference Manual*. Stata Press Publication, Texas, Release 13 (2013), pp. 44–45.

⁴⁷ Ibid. K. Preacher, D. Rucker, & A. Hayes, Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research* 42(1) (2007) pp. 185–227.

⁴⁸ Bulgaria, Croatia, Czechia, Estonia, France, Germany, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden.

⁴⁹ Bulgaria, Croatia, Czechia, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

⁵⁰ Hausman test and F-test for random effects indicate that the random effect is the most appropriate and has the best fit. Therefore, we discuss only random effects even though we report the pooled data results. Variables have been transformed into logarithmic form.

Table 3: Pooled Data and Random Effects.

Dependent variable	(1)	(2)	(3)	(4)
<i>resolved cases (y)</i>	Pooled	Pooled	Random	Random
<i>Independent Variables</i>	OLS	OLS	Effects	Effects
Caseload (x)	0.434*** (0.098)	0.443*** (0.0968)	0.478*** (0.111)	0.453*** (0.132)
Judges (m)	0.521*** (0.163)	0.817*** (0.218)	0.379** (0.158)	0.496** (0.217)
Assistants (w)		-0.304** (0.111)		-0.081 (0.103)
Constant	4.378*** (0.506)	4.589*** (0.550)	4.796*** (0.848)	4.927*** (0.974)
N	68	56	68	56
R-squared	0.886	0.889		
F-test	185.48***	97.70***		
Hausman Test			0.2829	0.3653
Wald chi2(2)			126.23***	107.88***
R-sq: within			0.1503	0.1320
R-sq: between			0.8788	0.8770
R-sq: overall			0.8843	0.8813

Robust standard errors are given in parentheses for pooled ordinary least squares models. y = Logarithmic form of the total number of resolved cases, x = Logarithmic form of the total caseload, m = Logarithmic form of the total number of judges, w = Logarithmic form of the total number of judicial assistants. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

$x = 0.453$: $p < 0.01$). This relationship is reasonably stable after adding the total number of the judicial assistants in Model 4. This result not only supports hypothesis 1a, it is also similar to other studies.⁵¹

Next, the relationship between the total number of judges (m) and the number of resolved cases (y) is positive and statistically significant both in Model 3 (beta $m = 0.379$: $p = p < 0.05$) and in Model 4 (beta $m = 0.496$: $p = p < 0.05$). This positive coefficient in Model 4 (col. 4) indicates that a 10% increase in the number of judges is associated with a 5% increase in the resolved cases. This contradicts hypothesis 2, which predicts that, controlled for caseload, the number of resolved cases is not higher as the number of judges increases. In other words,

⁵¹ M. Beenstock & Y. Haitovsky, Does the Appointment of Judges Increase the Output of the Judiciary? *International Review of Law and Economics* 24(3) (2004): pp. 351–369; V. Dimitrova-Grajzl, P. Grajzl, J. Sustersic & K. Zajc, Court Output, Judicial Staffing, and the Demand for Court Services: Evidence from Slovenian Courts of First Instance. *International Review of Law and Economics* 32 (1) (2012) pp. 19–29; V. Dimitrova-Grajzl, P. Grajzl, A. Slavov & K. Zajc, Courts in a Transition Economy: Case Disposition and the Quantity–quality Tradeoff in Bulgaria. *Economic Systems* 40(1) (2016) pp. 18–38; A. O. Gomes, T.A. Guimaraes & L. Akutsu, The Relationship between Judicial Staff and Court Performance: Evidence from Brazilian State Courts. *International Journal for Court Administration* 8(1) (2016): pp. 12–19; J. Bełdowski, L. Dąbroski, & W. Wojciechowski, Judges and Court Performance: A Case Study of District Commercial Courts in Poland. *European Journal of Law and Economics* 50 (2020) pp. 171–201.

contrary to rational choice theory, we do not find that when new judges are appointed, incumbent judges reduce their productivity. Model 4 also shows that the total number of judicial assistants (w) is not associated with the number of resolved cases (y) (beta $w = -0.0811$: $p = n.s.$). This supports hypothesis 3, as it shows that, controlled for caseload, the number of resolved cases remains constant as the number of assistants increases. Apparently, the increase in output that is generated by the administrative support of newly appointed assistants is offset by the fall in judge's productivity who use the ensuing reduction of work to spend more time on leisure or improving the quality of their work.

The results of the structural equation modelling are shown in **Table 4**. They are based on 22⁵² countries and 73 observations.

In Model 1 (col. 1), there is a statistically significant and positive association between caseload per judge (x_j) and productivity per judge (y_j) (beta $x_j = 0.503$: $p < 0.01$). This positive coefficient indicates that a 10% increase in the caseload per judge is associated with a 5% increase in judge's productivity. So that when the caseload per judge is higher, the judge adjusts her utility function by starting to work harder to defend her prestige and reputation. When caseload per assistant is added as an explanatory variable (col. 3), the positive association between caseload per judge and judge's productivity ceases to be significant (beta $x_j = 0.190$: $p < n.s.$). However, when caseload per assistant is added as a moderator variable rather than the explanatory variable, caseload per judge has a positive and statistically significant effect once more (col. 4; beta $x_j = 1.552$: $p < 0.05$). In this model caseload per assistant is also positively associated with judge's productivity (beta $x_{ja} = 1.177$: $p < 0.05$). These findings support hypothesis 1b.

Model 2 (col. 2) shows that the association between caseload per assistant (x_{ja}) and productivity per judge (y_j) is positive and statistically significant (beta $x_{ja} = .430$: $p < 0.01$). This positive coefficient means that a 10% increase in the caseload per judicial assistant is associated with a 4% increase in judge's productivity. This result not only supports hypothesis 1c,

Table 4: Structural equation modelling.

Dependent variable	(1)	(2)	(3)	(4)
<i>Per capita productivity of judges (y_j)</i>				
<i>Independent variables</i>	y_j	y_j	y_j	y_j
<i>Per capita caseload of judges (x_j)</i>	0.503*** (0.0805)		0.190 (0.150)	1.177** (0.549)
<i>Per capita caseload of assistants (x_{ja})</i>		.430*** (.0706)	0.315** (0.123)	1.552** (0.675)
<i>Interaction ($x_j x_{ja}$)</i>				-0.210* (0.113)
<i>Constant</i>	3.671*** (0.477)	4.507**** (0.354)	3.954*** (0.480)	-1.792 (3.108)
<i>N</i>	73	73	73	73

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

⁵² Belgium, Bulgaria, Croatia, Czechia, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

it also supports our assumption that the same utility function can be applied to the judge and the assistant.

The moderation effect on the relationship between caseload per judge and judge's productivity is negative at the 10 per cent significance level ($x_j x_{ja} = -0.210$; $p < 0.1$).⁵³ This means that the moderation effect of the caseload per judicial assistant ($x_j x_{ja}$) negatively influences the strength of the positive relationship between caseload per judge and judge's productivity. This finding supports hypothesis 4, which states that as the caseload of assistants increases, judges are relieved of more administrative tasks, thereby allowing judges to spend more time on leisure or improving the quality of their decisions rather than on resolving cases.

Conclusion

In this study, we have tested the application of rational choice theory to adjudication by way of four hypotheses, three of which we found support for. Both at country level and individual level, productivity increases with caseload. These findings are in accordance with the expectation that judges sacrifice leisure or quality of decisions in order to establish a good reputation by reducing backlogs. We also find that, controlled for caseload, the number of assistants is not associated with an increase in the number of resolved cases, while the number of judges is. Whereas the former supports the expectation that appointing new staff reduces caseload, thereby inducing judges to spend more time on leisure or improving the quality of their decisions rather than on resolving cases, the latter contradicts this hypothesis. Finally, we find that caseload per assistant negatively moderates the relationship between caseload per judge and productivity per judge. This supports the hypothesis that as the caseload of assistants increases, judges are relieved of more administrative tasks, thereby allowing judges to spend more time on leisure or improving the quality of their decisions rather than on resolving cases. By spelling out and testing the utility-maximizing functions of the judge and the judicial assistant and by showing how the judicial assistant affects the time preferences of the judge, this study has provided an application of rational choice theory to adjudication that includes the increasingly important role of judicial assistants.

At the same time, the data on which this study is based, have two fundamental limitations. First, we calculated—for each country—the 'average judge's workload and output' and the 'average assistant's workload'. This is the closest we could get to measuring the utility maximizing behaviour of judges and assistants at the individual level. The reason for this is that Cepej contains only data at the aggregate country level. This means we had to ignore numerous factors that may affect the association between caseload and the number of resolved cases. For example, individual judges may differ in caseload, the composition of their caseload (e.g. how time-consuming their cases are or whether cases are decided by single judges or a panel of judges), the number of assistants who assist them, experience, specialization, being a parttime or a fulltime judge, etcetera. This means that an important avenue for follow-up research is the use of detailed micro-data that allow for controlling for crucial variables or matching similar cases.

A second limitation of our data relates to the measurement of the dependent variable: resolved cases. In the literature, two different explanations have been given for the positive association between caseload and productivity. While some researchers suggest that judges sacrifice leisure for a good reputation by reducing backlogs, others argue that it is the quality of their decision that they sacrifice. Whereas former studies are based on the assumption that judges trade-off between leisure and productivity, Jonski and Mantowski (2014) and, more scrupulously, Engel and Weinshall (2020) have actually demonstrated that judges trade-off

⁵³ Due to the small number of observations in our analysis, we have used a p-value of 10%.

between quality and productivity. Since Cepej does not contain measures for leisure or the quality of judicial decisions, we were unable to establish the extent to which judges sacrifice leisure or quality in order to increase productivity.

Designing a study that includes operationalizations for both preferences provides another avenue for follow-up research.⁵⁴ The quality of decisions can be indicated, for example, by reversals⁵⁵ or the resources spent on each case (number of hearings, oral or written judgments, number of witnesses, length of proceedings, number of pages of judgements),⁵⁶ while the allocation of time can be indicated by time spent on administration, adjudication, management, non-judicial work such as writing and lecturing and leisure.⁵⁷ In line with this, it may also be interesting to examine to what extent judges differ in the priority they give to leisure or improving the quality of their decisions and how such differences can be explained. Conducting studies that assess the different trade-offs is also important for policy reasons. The more an increase in judicial productivity goes at the expense of the quality of judicial decision-making rather than of judge's leisure, the more reason there is to spend resources on staffing even if this does not increase judicial output. This is particularly so in circumstances wherein judges are overburdened to such extent that they are no longer capable to further increase productivity when demand for judicial services continues to rise.

Regardless of the fact that several important questions remain to be answered, our study has made a contribution to the literature by showing that the role of judicial assistants can fruitfully be subsumed in rational choice theory. Not only by assuming that the utility maximization of judges and assistants is based on similar preferences, but also by explaining how the involvement of judicial assistants in adjudication affects judges' utility function. This contribution is important as the number of assistants and the duties assigned to them have increased substantially during the past decades all over the world.

Additional File

The additional file for this article can be found as follows:

- **Data File.** The file contains data for caseload, resolved case, the number of judges and the number of judicial assistants in MS Excel format. DOI: <https://doi.org/10.36745/ijca.361.s1>

Competing Interests

Neither author has any competing interest in relation to the study that is being published.

⁵⁴ Examples of the measurement of Jonski and Mantowski and Engel and Weinshall.

⁵⁵ Rosales-López (2008).

⁵⁶ Engel & Weinshall (2020).

⁵⁷ E. Buscaglia & M. Dakolias (1999) *Comparative International Study of Court Performance Indicators: A Descriptive and Analytical Account*. The World Bank: Washington.

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