

An integrative approach to reviewing the literature on judicial efficiency in Europe

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ABSTRACT

The law exists to regulate the behaviour of the members of its community. Economics exists to study the behaviour of individual or group economic agents in allocating resources for production, distribution, and consumption. Together, law and economics concern the application of economics to the practice of law, seeing the law as an economic efficiency-promoting tool for social purposes. Indeed, economic development and litigation have evolved hand in hand, which led to a growing difference between supply and demand with a direct impact on judicial efficiency. However, evaluating the functioning of judicial machinery has been addressed superficially in the literature. Furthermore, grasping the big picture of judicial efficiency in a structured way has never been attempted. Therefore, this integrative literature review investigates judicial efficiency within the European context by synthesising law and economics research. From over 6,500 articles, 50 were critically analysed, offering new perspectives for future research and policy implications on enhancing European judicial systems. This analysis concerned bibliographic data (e.g., 80% of the studies have been published over the last decade), application context (e.g., Italian courts are the most studied entities), model structure (e.g., Data Envelopment Analysis-based methods are the most used ones to measure judicial efficiency), and key findings (e.g., courts across Europe are very heterogeneous). In the end, we provide several renewed perspectives on judicial efficiency that can pave the way for the future of this topic.

1. Introduction

Embedded in complex social interactions, we are governed by evolving societal norms, resulting in the creation of laws to regulate behaviour. The law is broadly divided into public and private domains and is implemented through systems such as civil law, common law, or religious law. Common law, exemplified by countries like the United Kingdom and the United States, relies heavily on judicial precedents, while religious law, such as Islamic law (sharia) in Saudi Arabia or Jewish law in Israel, derives from spiritual texts and principles. Within the European Union, where civil law – characterised by codified statutes – is the predominant legal system, courts form an independent judiciary essential for protecting rights, ensuring economic reliability, and fostering development. The European Commission for the Efficiency of Justice (CEPEJ) plays a pivotal role in this context, providing targeted

guidance, data, and assessment frameworks that emphasise standardisation and comparability across European judicial systems. This makes CEPEJ an essential reference point for evaluating judicial efficiency within Europe.

However, economic growth and increased mobility have led to higher demand for legal services, causing processing delays and backlogs. To prevent prolonged legal uncertainty, enhancing judicial efficiency is crucial for democratic nations. The efficient functioning of courts is not merely a matter of administrative convenience but a fundamental pillar supporting the rule of law, economic development, and social stability. Inefficient courts can lead to delays in justice, increased litigation costs, and a loss of public confidence in the legal system. As Voigt [1] mentions, “Justice delayed is justice denied”, i.e., to prevent the perpetuation of legal and procedural uncertainty in the judiciary, as well as the consequences it has on individuals

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subjected to a trial, the efficiency of the judiciary should be on the agenda of democratic nations.

Judicial efficiency is just a component of *judicial performance*. According to Staats et al. [2], judicial performance comprises judicial independence (from other government branches and conflicting parties), judicial efficiency (regarding court delays and case backlogs), judicial accessibility (access to justice), judicial accountability (with respect to the letter of the law), and judicial effectiveness (in terms of the degree of enforcement of both legislation and judicial decisions). Furthermore, despite our sole focus on judicial efficiency, Dakolias [3] states that its measurement depends on substantive law, judicial decision-making, and judicial administration. Following Voigt [1], judicial organisation and judicial actors are key determinants of judicial efficiency, which makes a case for the existence of supply-side and demand-side considerations within the framework of Europe's civil law systems.

Inspired by the survey of Voigt [1], we take on a more structured and comprehensive approach to the subject via an integrative literature review on judicial efficiency to synthesise information about this specific issue in European civil law by combining the two unmistakable fields of law and economics. It is important to note that our emphasis on *civil law* refers to the overarching legal system, not to civil cases alone. After designing the review and conducting it in the 'Web of Science' and 'Scopus' databases, we analyse 50 judicial efficiency publications taking into account their bibliographic data, application context, model structure, and key findings. To the best of our knowledge, this study is the first *bona fide* literature review, whether systematic, semi-systematic, or integrative, in this area and it differs from the seminal survey of Voigt [1] in the sense that we improve the search strategy and focus on European civil law, as well as other methodologies for measuring judicial efficiency besides quantitative ones. Note that there is also the need for such a new survey because 32 new publications on judicial efficiency have been published since 2016, which corresponds to more than 60% of all publications in this evolving area.

Finally, a recently published meta-regression analysis [4] examines the impact of methodological choices and court diversity on judicial efficiency by analysing 36 studies from 1992 to 2019. While Aiello et al. [4] provide valuable quantitative insights into how factors such as parametric versus nonparametric approaches, data structure, and court specialisation affect efficiency scores, their focus is primarily on method-driven variability. However, meta-regressions have inherent limitations when applied to an emerging research field with relatively few studies, such as judicial efficiency. With a small sample size of 36 studies, Aiello et al. [4] face challenges common to meta-regressions, including weak statistical power, inflated standard errors, inadequate assessment of heterogeneity, and the risk of overfitting due to the number of predictors relative to the sample size. Moreover, meta-regression combines studies with differing methodologies, population assumptions, and measures, which further complicates the reliability of estimators in such heterogeneous settings. By contrast, our study employs an integrative literature review methodology, examining 50 studies published between 1992 and 2023. This broader approach captures economic, procedural, and regional influences that extend beyond purely methodological factors, offering a more comprehensive understanding of judicial efficiency. By synthesising a wider range of literature, our review contextualises findings from narrower quantitative analyses and identifies research gaps that can inform policy reforms and judicial system improvements.

This document is structured as follows. Section 2 addresses supply-side and demand-side considerations in terms of judicial efficiency that are useful to introduce and motivate the integrative literature review. Section 3 designs, conducts, and analyses the integrative literature review. Section 4 concludes the study by providing several renewed perspectives on the area and detailing its limitations and future research avenues.

2. Conceptual framework

Applying economic theory and method to the practice of law is not effortless given the traditions of both sides. Thus, before attending the integrative literature review, it is wise to shed some light on key production economics (Section 2.1) and supply and demand (Section 2.2) considerations.

2.1. Production economics considerations

Over the past few years, many countries have been implementing partial or complete judicial reforms, usually as a part of wider political or legal reforms. Albania, Hungary, Montenegro, and Poland are recent examples of such reforms in the context of European civil law. However, to conduct judicial reforms, one must first diagnose the problems of the systems. For this reason, benchmarking judicial systems is needed, which, in turn, requires a quantification of the efficiency of those systems. Merryman et al. [5] were the first to attempt to compare different countries (in Mediterranean Europe and Latin America) by means of straightforward legal indicators, thus starting a tradition of *quantitative comparative law*. Dakolias [3] continued this tradition by comparing the efficiency and productivity of courts in more countries across a common set of key performance indicators (KPIs). Nevertheless, the work of Lewin et al. [6] is considered the seminal judicial efficiency study since these authors measured the efficiency of courts in the United States of America using well-established production efficiency concepts and state-of-the-art methods, such as the popular nonparametric deterministic frontier models often denoted under the umbrella Data Envelopment Analysis (DEA).

Indeed, *production efficiency* is a concept from microeconomics that concerns a situation in which a certain system operating within the limitations of its *production technology* cannot increase the production of one good without reducing the production of another good [7]. Hence, such a transformation must be supported by a *production process*. As an essential part of any activity, a production process corresponds to the way of using resources (e.g., labour, capital) - inputs - to produce goods and services - outputs - whose technological relation is given by a *production technology*. The frontier of the production technology can be either defined as the minimum inputs required to obtain given outputs or as the maximum outputs obtained from given inputs. This efficiency frontier can be achieved by individual units within the system through input reduction - minimising waste - or by increasing production.

However, when the production process and/or decision makers encompass behavioural objectives, we may be in a situation where we either want to produce given outputs at minimum cost, use given inputs to maximise revenue or allocate inputs and outputs to maximise profit. Each of these instances corresponds to a type of *economic efficiency*, namely *cost efficiency*, *revenue efficiency*, and *profit efficiency*, respectively. Therefore, the difference between technical and economic efficiency lies in the focus of the former on saving resources and the latter on producing at the lowest possible cost. Still, in the end, the literature seems to be more concerned with the rationality behind wasting resources rather than optimising resource allocation in the judiciary. One reason is the lack of unit input costs or output revenues in many cases. For example, in courts, the outputs produced are typically cases solved: it is very difficult to assign a value (price) since these outputs are not sold on a competitive market. Thus, this work is more devoted to technical efficiency.

Regardless of the type of efficiency, two distinct methodologies are used in the literature to measure (judicial) efficiency. It is common to distinguish between quantitative and qualitative methodologies.

On the one hand, there are the more commonly employed quantitative methods, among which we can find DEA and its directional distance function (DDF) variant and two-stage approach, the Malmquist productivity index (MPI), Stochastic Frontier Analysis (SFA), regression analysis, and descriptive analysis.

First, nonparametric deterministic frontier models, often known under the DEA umbrella, envelop the observed production units using some form of piecewise linear production frontier maintaining a minimal series of production axioms [see 8, for a detailed review]. Depending on the exact assumptions imposed, these production frontiers enable one to evaluate various forms of inefficiencies. For instance, if the assumption of convexity is disregarded, we are in the context of Free Disposal Hull (FDH). In the case of an input-oriented efficiency measurement approach, these efficiency notions include cost, technical, allocative, and scale inefficiencies. Exceptionally, it is also possible to evaluate congestion or structural inefficiency – an extreme form of technical inefficiency. In addition to traditional input – and output-oriented efficiency measurements, in the late nineties, the DDF was introduced by Chambers et al. [9]. This efficiency measure can be oriented or non-oriented, i.e., it can contract inputs and expand outputs simultaneously, and, in the latter case, the DDF has a normalised profit interpretation. Besides, once some efficiency concept is measured, then it is very tempting to try to find an explanation for the determinants of the considered inefficiency. This leads to so-called two-stage methods that are widely popular, but that are subject to a whole series of methodological caveats [see, e.g., 10, for a survey].

Second, when panel data are available, many authors analyse not only efficiency but also its change over time. Hence, to assess the evolution of efficiency over time, one needs to consider not only the efficiency changes but also technology changes. As a result, among a few suitable discrete time frameworks, one finds the MPI — introduced by Caves et al. [11] based on the proposal of Malmquist [12]. Other technology-based productivity indices, like the Hicks-Moorsteen total productivity index, have been proposed, with slightly different characteristics [see, e.g., 13, for a comparison].

Third, alternatively, all of the above efficiency and productivity concepts can also be estimated using stochastic parametric frontiers in an approach labelled SFA [see 14, for an overview]. In the basic composed error model, a specific parametric functional form representing a production function is fitted to the data, allowing for, on the one hand, a normally distributed error term, and, on the other hand, an error term representing inefficiency and following some asymmetric distribution.

Fourth, regression analysis is a group of statistical procedures used in statistical modelling to model cause–effect relationships where the cause(s) is(are) independent variable(s) and the effect is a single dependent variable. In linear regression, the most typical type of regression analysis, the line that most closely fits the data in terms of a given mathematical criterion is found. Ordinary least squares is one of its most popular techniques, which rests on fitting a line that minimises the sum of the squared distances between each observed value of the dependent variable and the fitted value on that line.

Fifth, descriptive analysis concerns a summary of key statistics that describe the features of a sample. Examples of common measures include central tendency (e.g., mean, median, mode) and variability of dispersion (e.g., standard deviation, minimum, maximum).

On the other hand, there are also qualitative methods, among which we highlight case study analysis and the literature survey. First, case study analysis is typically meant for investigating a problem, examining its alternative solutions, and proposing the best one based on the available evidence. In this context, it includes background information on judicial efficiency at the court level and highlights effective strategies and recommendations to address quality and performance issues.

Second, a literature survey analyses the literature regarding a particular problem to critical- and concisely establish connections to new research and find possible insufficiencies. However, it is not conducted in a systematic way.

2.2. Supply-side and demand-side considerations

Whether simple indicators (e.g., number of judges as inputs, number of resolved cases as outputs), KPIs (e.g., clearance rate,¹ quality of judicial decisions), or more advanced production efficiency tools (e.g., DEA, SFA) are used to measure judicial efficiency, one thing is certain: quantitative comparative law is far from easy. In fact, Voigt [1] presents several views regarding judicial decision-making and judicial administration being the primary ingredients of judicial efficiency at its most elementary nature: it concerns a two-dimensional trade-off between speed and quality. Nevertheless, the author concludes that the subject is far more complex, begging not only for the consideration of technical efficiency but also the numerous actors of the judicial system, which calls for a distinction between the supply side (e.g., individual judge incentives, organisational structure) and the demand side of justice (e.g., costs incurred by judicial parties, the propensity to litigate, court delay).

On the one hand, Rosales-López [15] has already observed that the judicial efficiency literature has been focusing more on the demand side rather than the supply side. Then, Voigt [1] put forward several supply-side considerations regarding the production function for the estimation of judicial efficiency in the sense that we must be aware of the relevant inputs (e.g., judges, clerks, infrastructure, equipment) and their possible substitution among each other (Gillespie [16] has already claimed that judging time is combined with other resources in a fixed proportion), as well as the presence of constant or variable returns-to-scale that leads to questions about possible economies of scope. As for determinants of supply-side judicial efficiency, Voigt [1] conjectures factors that can be modified in the short and medium term.

On the other hand, the literature is clear about the greater importance of the role played by demand-side factors in comparison with supply-side factors [1]. According to the same author, examples of the former regarding judicial efficiency can be found in the attitude of litigants towards risk, legal costs, economic prosperity, and cultural traits as examples of key determinants of court efficiency. Nonetheless, interactions between supply-side and demand-side, court services need to be taken into account since a reduction in court delay is expected to increase the value of litigation, which results in the inevitability of court delay [17], although the opposite argument has also been made [3].

Finally, this reflection enables us to infer that not only judicial efficiency but also judicial performance are concurrently influenced by multifactorial supply and demand. Therefore, we must first advance towards a literature review that can provide a conceptual look at the subject to further clarify such notions and their determinants.

3. Integrative literature review

The foundations of academic research comprise the construction of blocks of knowledge and the relationship between these. This priority task assumes an even greater relevance in a world where the production of knowledge is simultaneously increasing and remaining fractured [18]. Hence, to push the knowledge frontier, we must first ascertain its location. This can be achieved by conducting a literature review of the existing body of knowledge in breadth and depth to find clear knowledge gaps [19].

A literature review is a more or less systematic procedure to collect and synthesise previous research [20,21]. If done correctly, then it can be the cornerstone of the advancement of knowledge. Furthermore, it can also provide insights into unstructured or unexplored research fields that can lead to the creation of theoretical frameworks and conceptual models [18,22]. Otherwise, the absence of a thorough

¹ The clearance rate, which shows what portion of filed cases are resolved, and the number of resolved cases are closely linked concepts.

and systematic approach may result in the assembly of the blocks of knowledge under fallacious assumptions [see 21].

According to Snyder [18], there are three possible approaches to literature reviews – systematic, semi-systematic, and integrative – that differ in terms of purpose and the quality of execution. First, systematic literature reviews abide by strict search and selection requirements. These can be used to harmonise the results of a collection of studies and provide evidence of an effect relevant for practice or policy-making [see 18]). Second, semi-systematic literature reviews arise when the research questions at hand are broad and multidisciplinary, which hinders the rigidity of the former approach. It can be used to identify themes in the literature and track the development of an area over time [23]. Third, integrative literature reviews call for a more creative data collection since it does not need to cover all research articles published on a topic, but rather combine the angles of different research traditions in either emerging or mature areas to develop new theoretical frameworks or present new perspectives, respectively [see 24].

Naturally, deciding on which approach to use is a challenge since there is a trade-off between how systematic and broad a review should be. Nevertheless, the choice must be made in line with the research question and the purpose of the review. In this study, we address the emerging topic of judicial efficiency - a subject divided between the fields of law and economics, each with its own conventions. Despite the potential issues regarding the flexibility of an integrative literature review, the literature states that, if adequately conducted, the reward of contributing a new conceptual model is significant [25]. Hence, we opt for this approach, which is in line with the rationale proposed by Cronin and George [26]. In essence, an integrative literature review allows for a flexible exploration and synthesis of varied disciplinary perspectives, essential for developing new theoretical models across these fields; this contrasts with a systematic literature review, which, while rigorous and structured, is less suited for the broad and interdisciplinary nature of our research question (hence, we did not adopt the PRISMA approach, as expected). Note that a bibliometric analysis has not been conducted due to its focus on the analysis of massive amounts of data (ranging from hundreds to thousands of publications) [27] - something that was not the case here given the dispersed and relatively recent facets of judicial efficiency.

At last, in line with Snyder [18], we have considered a three-step integrative literature review to meet the standard requirements for publication, namely: designing the review (Section 3.1), conducting the review (Section 3.2), and analysing the review (Section 3.3) before actually writing it.

3.1. Designing the review

As mentioned above, there is a need for a literature review on the topic of judicial efficiency given its emergence in recent years. Moreover, an integrative literature review is justified as a useful tool to solidify the state of the knowledge of this topic due to the existence of distinct communities debating it, namely law and economics, and the urgency of summarising it given its use of different methodologies and, at times, contradictory results. Therefore, its potential audience includes a broad spectrum of scholars and researchers. At last, the search strategy for this particular review involved searching the ‘Web of Science’ and ‘Scopus’ databases using the terms *judicial efficiency* OR *court efficiency* until the end of 2023.

3.2. Conducting the review

The initial search generates 6,535 publications (3,599 from ‘Web of Science’ and 2,936 from ‘Scopus’). After excluding those that were not written in English ($n = 303+352$), we removed: (i) extraneous document types ($n = 202+317$), namely reviews, editorial material, notes, reprints, errata, and letters; (ii) publications unrelated to the areas of economics

and business and social sciences ($n = 1340 + 650$); (iii) publications unavailable in abstract or full-text formats ($n = 38 + 10$); (iv) publications specifically unconnected to the topic of measuring judicial efficiency and its determinants within the scope of European civil law, which excludes not only studies that use judicial efficiency for other purposes (e.g., as a determinant), but also countries belonging to the common law Anglosphere and the African, American, and Asian continents ($n = 1669 + 1573$) after reading their respective title and abstract. In the end, as a result of checking for and eliminating duplicate publications between the two databases ($n = 31$), we are left with a final sample of 50 publications.

3.3. Analysing the review

For each of the 50 publications, we collect information on its bibliographic data (Section 3.3.1), application context (Section 3.3.2), model structure (Section 3.3.3), and key findings (Section 3.3.4). Accordingly, the supplementary material attached to this paper details the relevant information retrieved from those publications, which, for the sake of conciseness, could not be adequately displayed here.

3.3.1. Bibliographic data

Here, information regarding bibliographic data is framed in terms of authorship, year of publication, and the type and venue of publication.

Authorship. 81 distinct authors have published papers about judicial efficiency within the scope of the fields of law and economics. On average, each publication is authored by approximately 2 researchers, ranging from a minimum of 1 to a maximum of 5. For the sake of brevity, Fig. A.8, depicting those authors with 2 or more publications, is displayed in Appendix.

This results in 17 authors (about 21% of the total number of authors) affiliated with institutions located in 5 different countries: Greta Falavigna [28–32], Massimo F. Castro [33–35], Calogero Guccio [33–35], Giovanni B. Ramello [28,29,36], Carlo Cusatelli [37,38], Massimiliano Giacalone [37,38], and Eugenia Nissi [37,38] in Italy (41%); Jonas Månsson [39–41], Pontus Mattsson [39,40,42], Christian Andersson [39,41], and Fredrik Bonander [39,41] in Sweden (24%); Roberto Ippoliti [28–32,43] and Stefan Voigt [1,44] in Germany (12%); Małgorzata Guzowska [45,46] and Tomasz Strąk [45,46] in Poland (12%); and Michael Mitsopolous [47,48] and Theodore Pelagidis [47,48] in Greece (12%).

Year of publication. From 1992 to 2023, only 18 out of 32 years contain publications about judicial efficiency within the scope of the fields of law and economics. On average, two articles on the subject are published per year in the considered period. For space reasons, Fig. A.9, showing the evolution of the number of publications over time, is displayed in Appendix.

It is clear that there has been a noticeable growth over the last decade with exactly 80% of the studies being published between 2014 and 2023. Before 2014, only 10 studies have been published on the subject [15,45–53]. Note that there is a publication gap of twelve years between 1996 and 2007.

Type and venue of publication. 94% of all publications about judicial efficiency within the scope of the fields of law and economics are in the form of scientific journal papers, with the remaining 6% being conference papers [54–56]. Regarding the former, 27 scientific journals are selected as ideal venues of publication, averaging approximately 2 publications per journal. In particular, the range of publications per journal varies between 1 and 10 publications over time. Once more, for reasons of space, Fig. A.10, portraying the journals with 2 or more publications, is available in Appendix.

This results in 7 journals (approximately 26% of the total number of journals) with a total of 27 publications (54% of the total number of publications): the European Journal of Law and Economics [1,15,33,

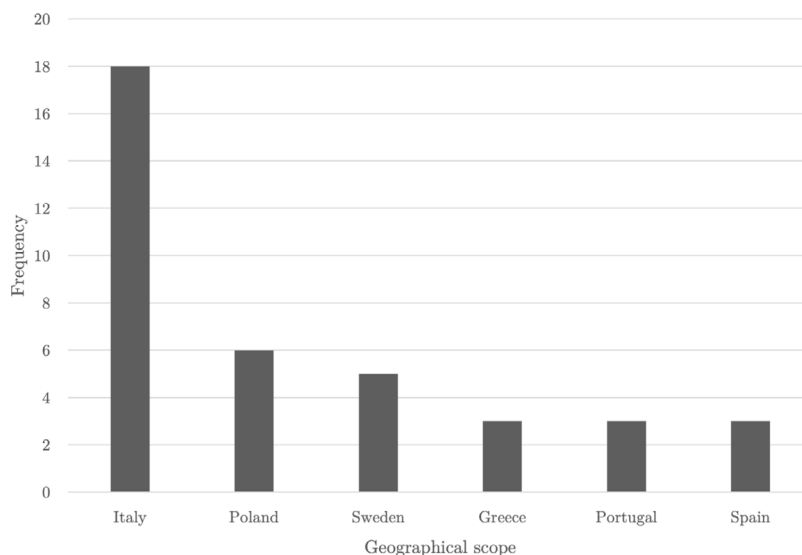


Fig. 1. Frequency of the geographical scope of countrywide analyses present in two or more publications.

39,41,44,48,52,57,58] and the Journal of Productivity Analysis [49,50] published by Springer (44%), Omega [59–62] and Socio-Economic Planning Sciences [29,38,42,63] published by Elsevier (30%), the Justice System Journal [64–66] and the Journal of Applied Economics [31, 43] published by Taylor and Francis (19%), and the Review of Law and Economics [34,36] published by De Gruyter (7%).

3.3.2. Application context

Information regarding the application context in terms of the country, sample size and level of analysis, and period is detailed below.

Geographical scope. The 50 retrieved publications about judicial efficiency within the scope of the fields of law and economics are either focused on countrywide or cross-country analyses. This corresponds to 88% and 12% [1,36,44,52,58,67] of all publications, respectively. Regarding the former, 6 countries had 2 or more publications about some aspect of their judicial system (see Fig. 1).

It is apparent that 71% of the countries shown in Fig. 1 are located in Southern Europe, with the remainder being located in Eastern Europe [45,46,55,57,65,68] (16%) and Northern Europe [39–42,69] (13%).

Sample size and level of analysis. On average, the collected publications analyse 1 type of judicial entity, although they range from 1 to 5 distinct entities. The tiers to which these entities belong within the judiciary vary broadly, namely: judicial staff; judicial procedures; judicial cases; Justices of the Peace, courts of first instance, courts of appeal, and high courts, both civil and administrative; judicial districts; and judicial systems. The frequency of these entities addressed in 2 or more publications is shown in Fig. 2.

Courts, in general, are the most common type of entity analysed in the literature (68%), followed by judicial districts [32,33,54,64,69,70] (12%), and judicial cases [48,58,67] (8%), and judicial systems [1,36, 52] (6%). There is one publication about judicial staff [56] and one about judicial procedures [71].

Furthermore, if we focus our analysis specifically on courts, judicial districts, and judicial systems (and bearing in mind that 21 out of the 50 publications either did not disclose the sample size or use a sample with variable size), we are left with 29 publications that analyse between 21 and 316 courts (20/29), 26 and 45 judicial districts (6/29), and 22 and 47 judicial systems (3/29). In particular, concerning courts, 1 publication analyses judge benches [56], 1 publication analyses Justices of the Peace [50], 17 publications analyse courts of first instance (also known as *district courts* in Eastern and Northern Europe), and 1

publication analyses high courts [51]. The absence of courts of appeals from this analysis is due to the lack of disclosure regarding sample characteristics, with only Fusco et al. [66] including them in their analysis alongside courts of first instance.

Period. Apart from 3 publications that do not disclose the period of analysis, it is safe to say that 32% of the collected studies are single-period and 68% are multi-period. Overall, the most recent of these studies contain data from 2019 while the earliest one addresses aspects from 1954. In essence, although the span of periods varied between 1 and 64 years, there are about 78% of two or more publications concerning periods of relatively shorter periods (up to 4 years). Fig. 3 details this information.

Interestingly, multi-period publications usually do not take period dynamics into account, being mere static efficiency analysis alongside its evolution per period [see, e.g., 66]. Only 6 papers out of the 32 that used multi-period data computed shifts in technology through Malmquist indices. This is a relevant aspect because, when one assesses efficiency over time, it is important to disclose what is efficiency change from what is technological change, i.e., the frontier from one period to the next is not static and may suffer some progress or decline.

3.3.3. Model structure

Information regarding the model structure in terms of method and indicators is detailed subsequently.

Methods. 17 distinct methods are employed in the sampled articles about judicial efficiency within the scope of the fields of law and economics. Nevertheless, on average, each publication uses approximately 1 method, ranging from a minimum of 1 to a maximum of 3. For the sake of simplicity, Fig. 4 depicts the methods used in 2 or more publications.

This classification results in a total of 8 methods (about 47% of the total number of methods). First, there are quantitative ones, namely nonparametric techniques - such as DEA [28–31,33–43,45,46,49–52, 59–62,68], FDH [50,69], and the MPI [29,31,32,38,39,49] - and parametric techniques - such as SFA [54,57,72], regression analysis [15,44, 47,57,65,73], and descriptive analysis [48,56,67,71,74]. Second, there are qualitative ones, namely case study analysis [48,67,74] and the literature survey [1,56]. Bear in mind that DEA is the method with the highest number of variants (more than 2/3 of the total number of different methodological alternatives), among which we call attention to the DDF [60,61] and the two-stage approach [28–34,36–38,43, 52,59,66,70] - either with hypothesis tests or the truncated double

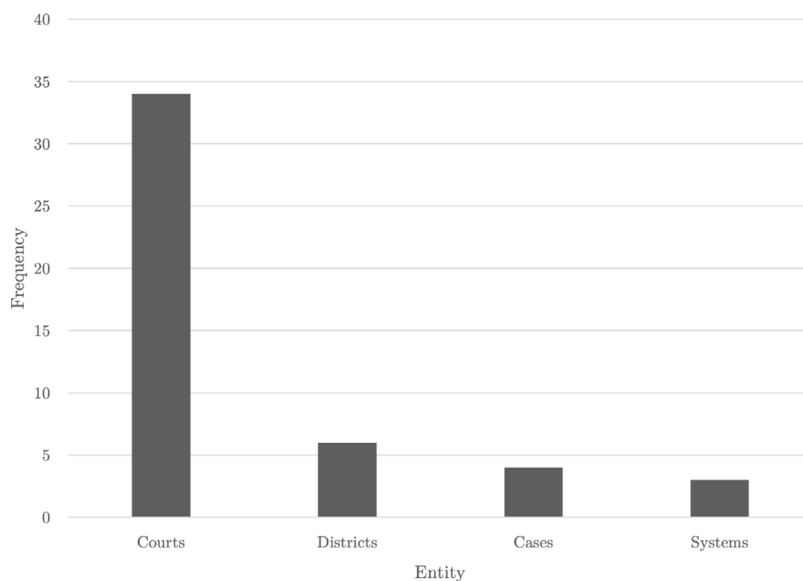


Fig. 2. Frequency of judicial entities present in two or more publications.

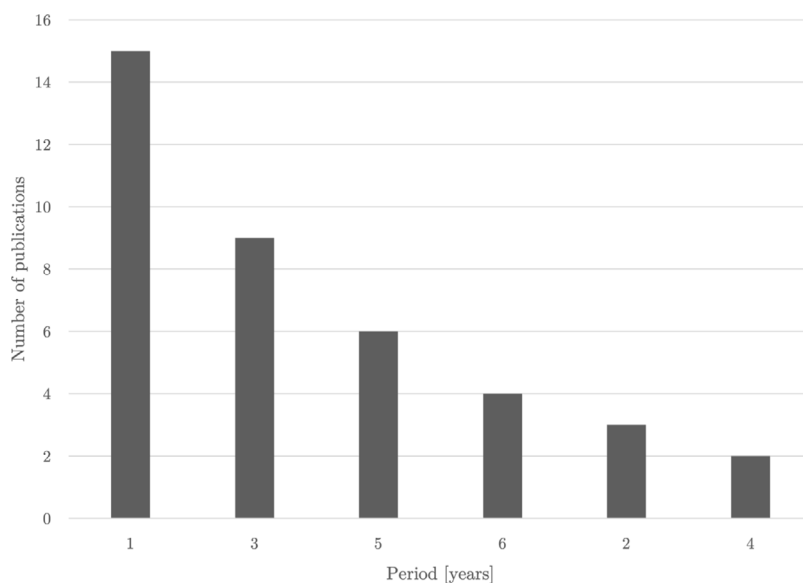


Fig. 3. Frequency of periods of analysis.

bootstrap regression. Additionally, it is worth mentioning that the MPI is always used alongside DEA.

If we focus our analysis on quantitative efficiency measurement methods ($n = 42$), then it is clear that frontier-based nonparametric approaches are the most frequently used, with applications in 84% of publications. Note that qualitative research studies [1,48,53,55,56,67,71,74] comprise 16% of the total number of collected publications.

In particular, regarding nonparametric frontier-based methods, we can make the following observations: (i) 97% measure technical efficiency, with the single study on economic (cost) efficiency belonging to the work of Månsson et al. [41]; (ii) 94% assume convex production possibility sets, with the exception being the use of FDH by Tulkens [50] and, recently, by Chen and Kerstens [69]; (iii) 27% assume an input orientation and 67% an output orientation, with the remaining 7% corresponding to the studies of Kittelsen and Førsund [49] and Chen and Kerstens [69] that tested both assumptions separately; and (iv) 31% assume constant returns-to-scale (CRS), 31% assume variable returns-to-scale (VRS), and 38% test both assumptions separately. It is important to recognise that the studies that tested both returns-to-scale

assumptions were mainly interested in economies of scale [35,37,39,45,46,49,66,68]. At last, note that a few studies did not report all of their assumptions, which may influence this analysis.

Indicators. First, 73 different inputs/independent variables are retrieved from the collected publications. Nonetheless, on average, each one uses about 4 of these indicators, varying between 1 and 18. Fig. 5 shows those that are employed in 2 or more publications, adding up to 14.

In essence, supply-side inputs/independent variables are the most used, mainly the *Number of judges* and the *Number of non-judge staff*. Demand-side inputs/independent variables follow from a distance, namely the *Backlog/Number of pending cases* and the *Number of incoming cases*.² Less frequent inputs/independent variables include *Office area*

² It may be important to distinguish between *Caseload*, *Workload*, and the *Number of incoming cases*. *Workload* is the total amount of work that a person or group of people is expected to complete in a given length of time, which may

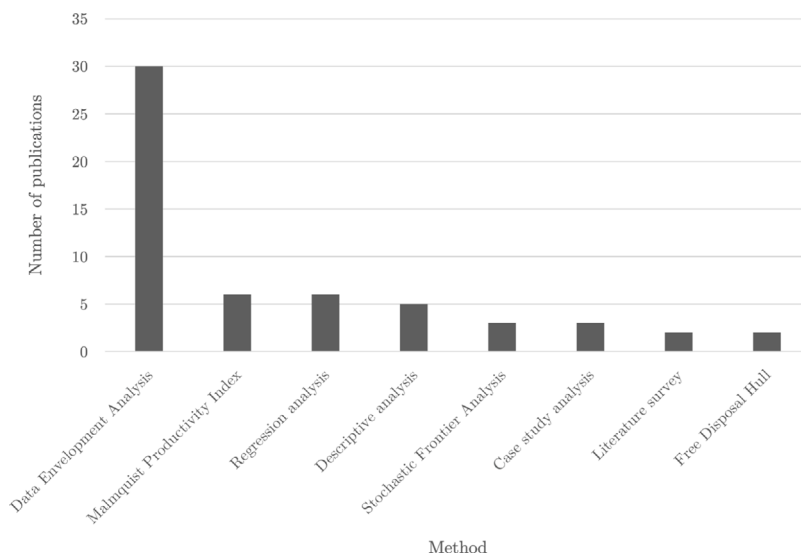


Fig. 4. Frequency of methods used in two or more publications.

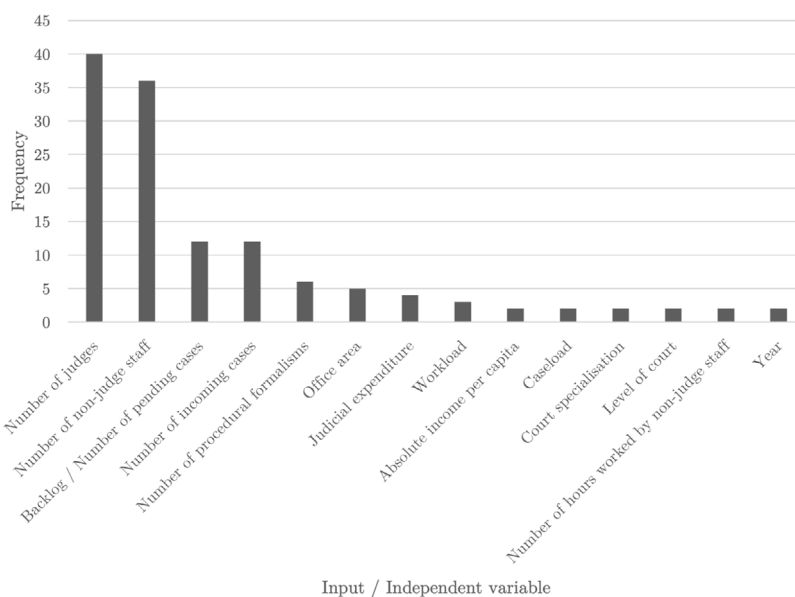


Fig. 5. Frequency of inputs/independent variables used in two or more publications.

and *Absolute income per capita* - the former a proxy for capital and the latter an environmental variable regarding the area where the court was located that was used as part of the production process. Other environmental variables used as inputs/independent variables concern the *Level of court* and *Court specialisation*³ [see, e.g., 44,63]. It is relevant to keep in mind that the option for including variables in the input / independent variable set that do not directly relate to financial and human resources at the disposal of courts may be questionable

refer to tasks, projects, or assignments. *Caseload* is the total number of cases that a person or organisation is in charge of managing. The *Number of incoming cases* simply concerns the cases that have been added to a court's caseload during the reporting period and include new, reopened, and reactivated cases. However, the literature does not seem to employ these notions uniformly but rather as synonyms [see, e.g., 15,43].

³ If the *Level of court* regards the level of the judicial system in which a court is located, *Court specialisation* concerns the degree to which a court deals with more specific types of cases.

when frontier models are used since the operational environment, in principle, should not define the production process and its influence should be considered in different ways - for example, through two-stage approaches.

Second, 50 distinct outputs/dependent variables are obtained from the sampled publications. Still, on average, each one uses approximately 3 of these indicators, varying between 1 and 43. Fig. 6 depicts those that are employed in 2 or more publications, totalling 13.

At heart, outputs/dependent variables are demand-side-focused, with the greater use of the *Number of resolved cases*, the *Caseload*, and *Enforcement mechanisms*.⁴ There are also some outputs/dependent variables used in two or more publications unrelated to cases, namely those

⁴ Note that a few outputs / dependent variables have a frequency greater than the number of sampled publications because some publications report the use of multiple similar outputs/dependent variables. For instance, the *Number of resolved cases* is signalled as an overall indicator or, at times, specified as civil or criminal.

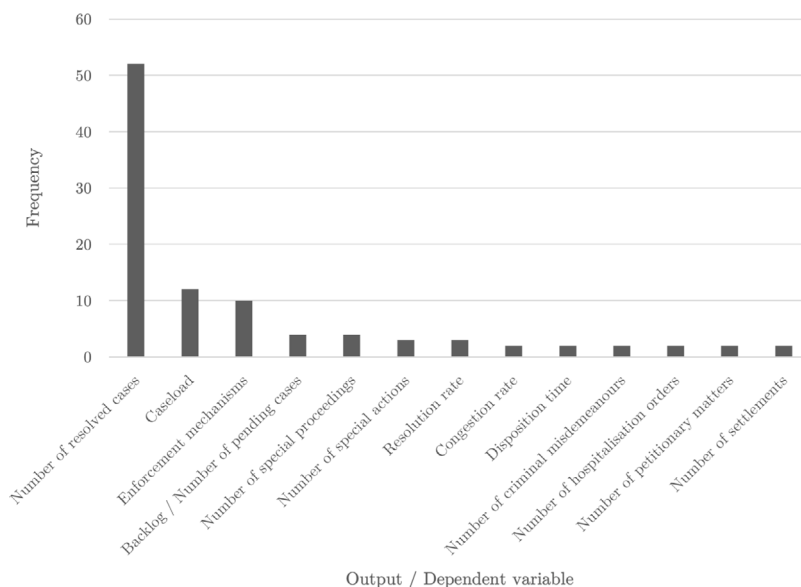


Fig. 6. Frequency of outputs/dependent variables used in two or more publications.

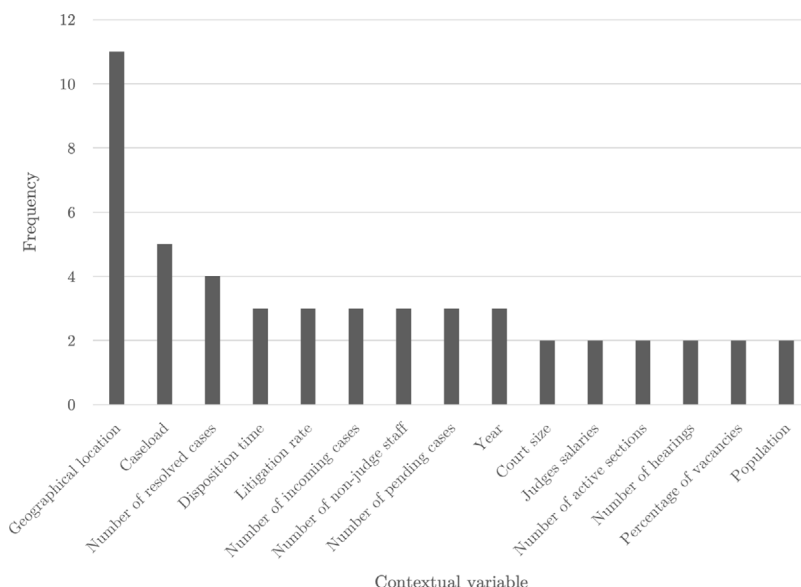


Fig. 7. Frequency of contextual variables used in two or more publications.

concerning proceedings, actions, misdemeanours, and settlements. It is relevant to highlight that *Caseload* and the *Backlog/Number of pending cases* have also been found to be used as inputs/independent variables, which generates some debate (especially the latter, given its nature as a stock indicator that moves systemically on a yearly basis) since specifying the sets of the production process is crucial. For instance, Antonucci et al. [54] and Espasa and Esteller-Moré [72] consider it as an input while Castro and Guccio [33,34] see it as an output.

Third, 46 non-identical contextual variables are collected from the analysed publications. Bear in mind that these were the ones used in the two-stage approaches, regardless of their type. Nevertheless, on average, each one uses 2 of these indicators, varying between 1 and 16. Fig. 7 portrays the 15 that are employed in 2 or more publications.

Bottom line, it is clear that *Geographical location* is the most employed contextual variable despite its seldom use [28–32,34,37,38,43, 66,70] (22%). (Un)Surprisingly, all these studies are focused on Italian courts. Apart from this indicator, there is not a well-defined framework regarding contextual variables given the rarity and heterogeneity of the

remaining ones. In fact, once again, analogously to what we reported above, this time we find instances of inputs/independent variables (e.g., *Caseload*) and outputs/dependent variables (e.g., *Number of resolved cases*) being used as contextual variables, not to mention the special case of the *Backlog/Number of pending cases*. These choices are debatable and, undoubtedly, case-dependent, such as their use in meaningful contextual ratio measures [see, e.g., 33] in the sense of Papaioannou and Podinovski [75].

3.3.4. Key findings

Judicial inefficiency levels are quite heterogeneous among the various judicial entities, but high nonetheless [1,29,33,38,50–52,54,59,61, 66,68]. This variation points to underlying methodological disparities, contextual differences across studies, and the inherent diversity in case-mix across jurisdictions, which may influence reported efficiency levels. Contrary findings by Milovanović et al. [53] underscore the need for a nuanced understanding of judicial metrics and their applicability across diverse legal systems. The debate on the assumption of CRS vs. VRS

remains unresolved, with Pedraja-Chaparro and Salinas-Jiménez [51] supporting the former, while Voigt [1] highlights the inconclusiveness of these insights. Such discrepancies suggest that judicial efficiency is influenced by a complex interplay of factors, including court size, case mix, and regional economic conditions, which are not fully captured by current models. Regardless, most efficiency losses seem to be due to non-optimal scale size [49], despite the more recent claims of Peyrache and Zago [60] that technical inefficiency is the main source of inefficiency. Additionally, Falavigna and Ippoliti [32] suggest that judicial procedures themselves present a significant opportunity for improving the efficiency of judicial districts, though policymakers might be misled in the reform process.

Furthermore, studies indicate that the adoption of IT systems may lead to unintended reductions in judicial efficiency [45], suggesting a complex interaction between technology adoption and judicial processes that warrants further investigation. Paradoxically, Falavigna et al. [29] argue that technology enhances rather than replaces the judicial role, highlighting a potential misalignment between technology implementation and judicial workflows.

Troisi and Alfano [70] caution that efficiency gains in appeal courts may risk compromising decision quality, emphasising the need for reforms that balance efficiency with quality, especially across diverse types of cases. Additionally, caseload congestion [72] and bottlenecks in processing [34,35] continue to impede efficiency, highlighting the need to account for case-mix as a factor in evaluating judicial performance comprehensively.

Judicial output is significant- and positively influenced by court size, workload, the existence of common procedural services, and the existence of judicial reinforcement, whereas it is significant- and negatively influenced by judge turnover [15,64] and the opportunistic behaviour from both claimants and lawyers [33]. Interestingly, taxpayers perceive courts as more efficient when fiscal obligations are reduced or annulled [71]. Kalliris and Alysandratos [73] support the efficiency of single-member courts in handling less complex cases swiftly, although the authors note concerns regarding ruling consistency and the impact of judge age and experience on efficiency. Judicial efficiency is significant- and positively influenced by judge salaries [52], as well as the percentage of vacancies and court expenditure per capita [54]. Belarouci et al. [76] add that efficiency correlates positively with factors enhancing the demand for settlement, including trial delay and judges' caseload, with the most efficient courts incorporating conciliation actively in the judicial circuit. Falavigna and Ippoliti [31] go on to say that a model containing both judicial expenditure and human resources is more appropriate than a model based only on human resources. Castro and Guccio [33] show that judicial efficiency is explained by demand factors, with Beldowski et al. [57] stating that the Polish judicial system is mostly driven by the demand for justice, which itself is endogenously affected by judicial delay [28].

Geographical disparities in judicial efficiency are evident, namely regional ones [28,29,37,38,41,63], with studies showing higher efficiency scores in Northern Italy compared to the South [34,35,54,60,66], for instance. Contini [74] highlight that in Italy, the perceived lack of independence among judges and prosecutors contributes to low trust levels in comparison to other EU countries, exacerbated by constitutional provisions allowing unlimited access to the Court of Cassation, leading to high caseloads and delays. Besides, relocating Swedish district courts from city centres and high-cost areas may offer operational benefits [41]. These findings underscore the influence of regional socio-economic conditions on judicial efficiency and suggest that regional policies might need to be tailored to specific local contexts. Nissi et al. [37] add that foreign companies that wish to invest in this nation will find a judicial context more aligned with the best and most developed European practices in the Northern region.

Still, there is no consensus regarding court size since there is concurrent evidence pointing to the lower efficiency scores of smaller courts [38,59], middle-sized courts [50], and larger courts [54,60] in

different countries, indicating that efficiency may be more closely tied to operational practices than to size per se. In fact, the subject of court mergers has been studied more exhaustively in Sweden, with Agrell et al. [40] showing that efficiency is higher after the mergers, despite the disclaimer by Mattsson and Tidånå [42] that an in-depth investigation before such decisions are made is required due to its potential production economic effects since some do not have the potential to gain efficiency while others could gain substantially — further gains can be achieved if both civil and criminal caseloads are taken into account [35]. As for the country size and judicial efficiency, the literature shows that there is no relation [36]. Chen and Kerstens [69] report that nonconvex methods typically yield higher efficiency and more realistic output levels than convex methods, highlighting that while efficiency and plant capacity utilisation of courts improve post-merger, these results require further validation.

From another angle, the literature also looks at the judicial backlog. Backlog causes efficiency to fall [58]. On the one hand, part of the backlog can be easily reduced by productivity improvements, i.e., courts can undeniably produce more resolutions with their current resources [15,45,55,59,68]. On the other hand, the majority of the backlog seems to only be reducible by personnel increases [47,50], with Santos and Amado [59] specifying that those increases should be focused on support staff and Mattsson et al. [39] proposing that a backup labour force could be developed to enhance flexibility. This dichotomy highlights the need for a balanced approach that combines resource augmentation with process optimisation, with temporary judges being shown to improve efficiency over time [72], which raises questions about the balance between expertise and flexibility in judicial staffing. In this respect, Staszkiwicz et al. [65] call it a “delegation system” in the case of judges, claiming that it has a positive short-term impact on judicial performance. Indeed, Voigt [1] state that increasing the number of judges does not necessarily reduce court delay despite the claim of Beldowski et al. [57] that an increase in the number of judges can significantly enhance the number of resolved cases that require a full court trial. However, Guzowska and Strąk [46] propose that human resource reallocation should be considered instead — something that is reinforced by the findings of Viapiana [67] and Bogetoft and Wittrup [62] and demonstrated by Månsson et al. [41]. In this context, Melcarne and Ramello [36] even state that “Money cannot buy justice”.

At last, the lack of regulation in the sector [50], as well as the existence of discretionary powers, the significance of the subject-matter for the appellants, the level of authority, the scope of the division deciding on the appeal, and the unilateral or bipartisan nature of the administrative proceeding [53], not to mention community education, sociological and financial aspects, and, more controversially, quality of decisions [56], may all contribute to explaining the observed efficiency diversity, which results in an insufficient judicial organisation, excessively burdensome procedures, the lack of sufficient accountability, and the lack of competition in the provision of legal services [1,29,30,34,43,48,56]. Note that judge performance has also been shown to be affected by political interference [36]. Besides, Voigt [1] also claims that reversal rates are not correlated with speed, although a high number of newly filed cases is correlated with a higher number of cases resolved. In the end, resolution rates are not a function of per capita income or the presence of judicial councils, but these are positively correlated with mandatory training for judges and negatively correlated with the court budget [44].

4. Conclusions

Finally, based on our current analysis and the considerations we have advanced in the previous section, we propose several major perspectives on judicial efficiency that are unmistakably suitable for aiding in the definition of a measurement framework and for stirring up ideas, thus, hopefully, guiding this area in the future (Section 4.1). Subsequently, this study's limitations and a few other research prospects are offered (Section 4.2).

4.1. Renewed perspectives

From the overly localised nature of collaborations (Section 4.1.1) and studies to the missing entities (Section 4.1.2), methodological considerations (Section 4.1.3), foundations (Section 4.1.4), and findings (Section 4.1.5), the following subsections address the multiple renewed perspectives derived from this integrative literature review.

4.1.1. Both scientific collaborations and the geographical scope of studies are too localised

The vast majority of judicial efficiency analyses are limited to a single nation. While 12% of studies conduct cross-country analyses, they focus on aggregated judicial systems, judicial cases, or publications across dozens of countries, rather than on detailed comparisons of courts in a small group of countries. Despite the controversy surrounding comparisons between countries with different judiciaries, this is precisely why comparative law and economics exist, even with their *uneasy* relationship [77]. Additionally, these studies are often authored by scholars with the same affiliation or from the same country. More diverse international collaborations could undoubtedly generate novel insights in the field. To unravel the complex dimensions of judicial efficiency, future studies should explore comparative methodologies across different European legal systems. This would uncover shared challenges and innovative practices that could significantly inform policy reforms.

4.1.2. What about the “other” courts?

Courts of first instance are the go-to judicial entities in the judicial efficiency literature, perhaps due to data availability. An emphasis on Justices of the Peace, courts of appeals, or even high courts is extremely scarce. Furthermore, combining more than one type of court in such analyses is also rare. In fact, only 10% of collected publications included other entities besides courts of first instance (typically, courts of appeals). Taking a look at the various entities within the judiciary at the same time could provide a fresh outlook on the system as a whole. Research should extend to administrative and constitutional courts whose efficiency metrics might reveal unique insights into systemic inefficiencies, offering a broader landscape of judicial effectiveness.

4.1.3. DEA is queen, but not a very dynamic or thorough one

DEA-based nonparametric deterministic frontier approaches total more than 60% of the methods employed in judicial efficiency publications. Hence, the dominance of nonparametric convex frontier methods is also verified in this sector, similarly to, for instance, healthcare [78] and water and sanitation [79]. However, this analysis remains rather temporally static. Although 68% of the collected publications concern multi-period measurements, these works do not exploit the time dimension in the sense of incorporating carry-over activities into the model to enable measuring period-specific efficiency based on optimisation over time [80]. This is an important issue in the case of courts because one of the debates regarding the consideration of inputs and outputs is whether the *Backlog/Number of pending cases*⁵ should be considered as an input or an output. In fact, this indicator could naturally be considered as a carry-over in inter-temporal and dynamic efficiency analysis. As a matter of fact, most applications also disregard the internal structure of the entities being analysed since modelling the internal components of, for instance, courts enables a more accurate study of the effects of their relationships and their contributions to system inefficiency: this can be achieved by resorting to network DEA [see 81], which has only been timidly used by Belarouci et al. [76] for the specific context of conciliation.

⁵ The *Backlog / Number of pending cases* concerns cases in which summons or notice of motion has been issued, but has not yet been withdrawn, abandoned, or dismissed, and no judgement has yet been rendered.

4.1.4. Framework? what framework?

The absence of a well-established judicial efficiency measurement framework that balances supply-side and demand-side considerations is clear. Naturally, there are problem-specific deliberations that exert influence on the modelling structure, but the selection of outputs/dependent variables is -to say the least- rather unsystematic at the moment. For instance, the *Caseload* is mentioned as a relatively popular input/independent variable, output/dependent variable, and contextual variable at the same time. Additionally, the *Backlog/Number of pending cases* is used as both an input/independent variable and an output/dependent variable.

4.1.5. Key research gaps

After the present attempt to integrate law and economics, it is impossible (and, perhaps, unreasonable now) to dissociate one from the other at this point. Thus, among the several law and economics considerations that are worthy of further research, we put forward the following few items.

The (ir)relevance of economic efficiency. The lack of studies on judicial economic efficiency (see Section 2.1), particularly concerning cost efficiency, appears to be driven by two factors: the absence of financial data at the court level and the limited interest of judicial entities in measuring it. Nevertheless, it remains relevant to explore whether resources are being allocated in a cost-efficient manner across various levels of the judicial system.

The existence (or not) of economies of scale and scope. It remains unclear whether changes in judicial input factors result in proportional and simultaneous changes in judicial output during the production process. For example, can judges, courts, or entire judicial systems increase their outputs to reduce unitary costs? Can judges diversify the types of cases they oversee to optimise resource usage and decrease costs? These questions highlight the broader issue of economies of scale and scope in judicial systems. Evidence on this topic is scarce, leaving significant gaps in understanding whether courts operate efficiently in terms of size or scope.

A matter of location. Disparities in judicial efficiency across regions of the same country, often referred to as geographical asymmetries, are a documented reality. These asymmetries reflect differences in resources, caseloads, procedural norms, and regional economic conditions. Addressing these inefficiencies requires a nuanced understanding of regional variations and their underlying causes, as well as targeted policy interventions to ensure equitable access to efficient judicial services.

The absence of consensus regarding the determinants of judicial efficiency. Irrespective of whether parametric or nonparametric methods are used, a consistent set of potential determinants is still missing. It is conceivable that the prospective increase in the number of publications on judicial efficiency will enable more in-depth endeavours, such as meta-analyses, regarding not only common methodological factors but also efficiency scores. It is also worth mentioning that quality-related factors are rarely included in judicial efficiency analysis, except Espasa and Esteller-Moré [72] who consider the *Quality of resolved cases* as an input. Data availability may be a constraint hindering their broader usage.

The most suitable way to reduce the backlog. The literature indicates that strategies for reducing backlogs, whether by increasing judicial outputs with existing resources or optimising resource allocation, are highly context-specific. Their success depends on the unique characteristics and constraints of each judicial system.

The lack of understanding about the impact of judicial reforms. Over the years, several European countries have reformed their judicial systems. However, ascertaining whether these reforms have succeeded has just been marginally addressed by the literature, which is mostly focused on court mergers.

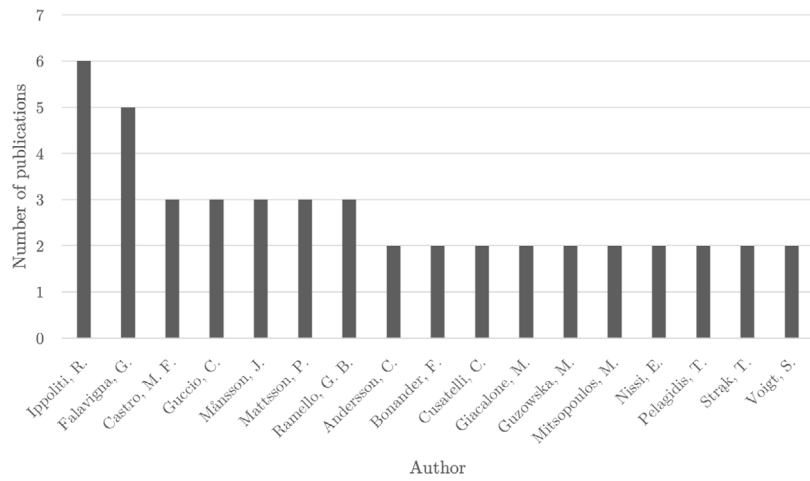


Fig. A.8. Frequency of authors with two or more publications.

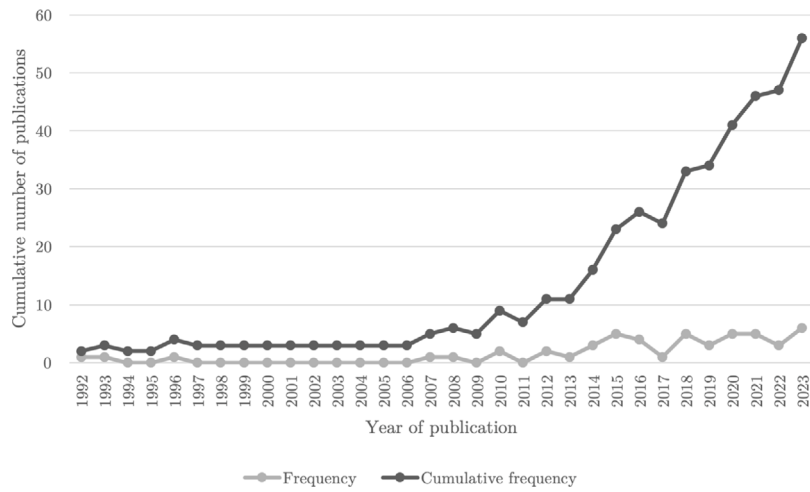


Fig. A.9. (Cumulative) Publication frequency over time.

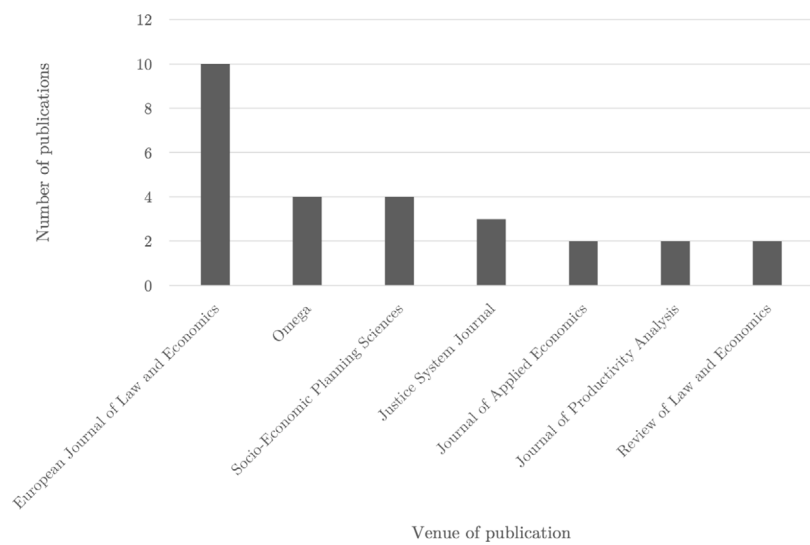


Fig. A.10. Frequency of scientific journals with two or more publications.

4.2. Limitations and future work

The combination of publications from empirical and theoretical perspectives from two distinct fields – law and economics – may have led to some degree of inaccuracy and bias in the analysis of the literature. This reflects not only the differing scientific styles of law and economics scholars but also the diversity of judicial system structures across European countries, even though they share a foundation in civil law. Additionally, the lack of well-defined methodological and structural guidelines for conducting integrative literature reviews introduces a degree of limitation inherent to this type of study.

Furthermore, one of the key challenges identified in our analysis is the limited incorporation of case-mix factors, such as case complexity and diversity, into judicial efficiency models. As the healthcare efficiency literature demonstrates, accounting for variations in case-mix is essential for fair comparisons across decision-making units with different types of cases. In the judicial context, while individuals typically cannot choose their court, variations in case complexity can significantly impact court performance and efficiency assessments. Future studies may benefit from exploring ways to incorporate case-mix considerations, potentially through complexity-weighted metrics or other methodological advancements, if reliable data becomes available.

At last, there is every reason to believe in the expansion of judicial efficiency-related research over the next decade, judging from the current publication trend. In fact, a preliminary review of 2024 already places this year in the top 4 in terms of the number of publications, given the works of Aiello et al. [4], Giancotti et al. [82] in Italy, Lopes and Silva [83] in Portugal, and Chen et al. [84] in Sweden. This growth could yield valuable national and international policy insights, facilitated by more robust analytical approaches, such as meta-analyses and bibliometric studies, which would enhance our understanding of judicial efficiency determinants and their implications for policy-making.

CRediT authorship contribution statement

Miguel Alves Pereira: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Luiza Bădin:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Conceptualization. **Kristiaan Kerstens:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Conceptualization. **Maria Conceição Silva:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Conceptualization.

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Appendix. Bibliographic data

Fig. A.8 depicts authors with 2 or more publications.

Fig. A.9 shows the evolution of the number of publications over time.

Fig. A.10 portrays journals with 2 or more publications.

Data availability

Data will be made available on request.

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