The Private Cost of Legal Uncertainty: Evidence from the Unified Patent Court

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Abstract

"Legal certainty" signifies certainty of economic agents about the meaning and enforceability of legal rules and the procedures of resolving legal disputes. It has been considered a cornerstone of market economies for centuries, yet it remains difficult to quantify. This paper leverages the introduction of the Unitary Patent (UP) system in the European Union as an exogenous shock that exposed patentees to uncertainty about the new Unified Patent Court (UPC). While the reform aims to reduce the cost of maintaining patents across multiple European countries, the established system of national validations (EP) remains available. Patentees can thus "pay" to avoid UPC jurisdiction by opting for national validations. I calculate that patentees who retained the national route despite possible savings forfeited approximately EUR 100 million, while those who accepted simultaneous UPC jurisdiction left EUR 65 million in savings on the table. On a per-patent basis, this equates to around EUR 10,000 per grant and EUR 25,000 per patentee. For patentees with a long history of maintaining European patents, I estimate that the average patentee requires fee savings of EUR 4,000-6,000 per patent to be indifferent between the UP and EP routes. I disaggregate part of these costs of the UPC route into expectations about litigation costs, litigation outcomes, and the importance of patent licensing, and find considerable heterogeneity in the remaining baseline cost between patentees from different UP member countries.

JEL classifiers: O34, K41, C35, D81.

Keywords: legal uncertainty; patent systems; patent enforcement; litigation costs; institutional reform; European patent system

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1 Introduction

Legal certainty is widely regarded as a cornerstone of functioning market economies. From John Locke's emphasis on secure property rights as the basis of individual freedom to Max Weber's view of the rule of law as central to the rise of industrial capitalism, the importance of legal predictability has been highlighted across disciplines. Consistent with these perspectives, economic research has shown that legal certainty lowers transaction costs, encourages investment, and promotes economic growth.

Yet, legal uncertainty is pervasive. It arises from changes in legislation, shifts in political power or priorities, and judicial rulings with implications beyond the individual case. For businesses, such uncertainty imposes both direct costs and strategic challenges, with potential spillover effects across markets. However, these costs are inherently difficult to observe and quantify. This paper leverages a unique setting to provide a direct estimate of the private costs of legal uncertainty: the establishment of the Unified Patent Court (UPC).

The UPC represents a major legal reform designed to centralize patent litigation across European Union member states. While its goal is greater efficiency and uniformity, its introduction created significant uncertainty for firms, including unclear procedural outcomes, jurisdictional complexities, and the risk of inconsistent rulings. This paper estimates the costs that firms were willing to incur to avoid relying on the UPC in its early stages, offering a concrete measure of the economic burden of legal uncertainty.

Using data on observed validations of patents granted since the Unitary Patent (UP) system came into force, it is comparably simple to calculate an estimate of the fees that would have been incurred had the same patent been validated as a Unitary Patent. It turns out that by far the majority of patents remain validated as traditional European Patents (EP), requiring payment of costs related to translation, validation and domestic legal representation. In the six months from June through November 2023, I find that patentees opted to pay around EUR 160 million in additional costs that could have been avoided had they chosen the UP route.

Explaining the motivation behind this behavior, I determine the set of countries in which patentees with a long-enough history of patenting in Europe have traditionally validated and maintained their patents. For this set of more experienced patentees, I estimate the importance of several drivers of the decision between validation routes: the possible saving of validation and maintenance costs, the difference between expected litigation costs and outcomes at the novel UPC and domestic courts, and the difference in the suitability of UPs and EPs for licensing activities. Overall, firms deciding between UP and EP routes require a cost saving between EUR 4,000 and 6,000 per patent to be indifferent between the two routes. The considered factors seem to account for this "cost of uncertainty" relatively well on average, but there is substantial heterogeneity between firms from different UP member countries.

By quantifying these costs, this paper contributes to the understanding of how legal uncertainty influences firm behavior and economic outcomes. The findings illustrate the value businesses place on a stable and predictable legal environment, demonstrating that legal certainty is not merely a legal issue but a key economic concern.

The implications extend beyond the specific context of the UPC. The uncertainty surrounding patent enforcement in this case is representative of broader challenges faced by firms in response to legislative reforms, landmark court decisions, or changes in public policy. By providing a direct estimate of firm-level costs in the UPC case, this paper sheds light on the broader economic consequences of legal uncertainty, including in contexts where no mechanism exists to "pay to avoid" the uncertainty.

The paper is structured as follows: 2 starts by providing an overview of the institutional framework for patenting in Europe and the recent changes. Section 3 discusses connections to the existing literature, especially regarding the role of legal uncertainty in economic outcomes and decision-making. Section 4 describes the data sources, while Section 5 presents patterns in patent validation since the Unitary Patent became available, including estimates of fees "left on the table." Section 6 discusses the factors that influence the validation route choice and translate this into a regression model, with results discussed in Section 7. Section 8 concludes and outlines future directions for this research.

2 Institutional Setting

2.1 The European Patent Organization

The European Patent Organization (EPO) provides a framework for the centralized application and examination of patents under the European Patent Convention (EPC) of 1973. This system allows applicants to seek protection in multiple countries through a single filing, which reduces administrative redundancy compared to filing independent applications in each member state. The EPO's primary function is to *grant* European patents. Once filed, applications undergo substantive examination by the EPO to ensure compliance with EPC criteria, including novelty, inventive step, and industrial applicability. Patents meeting these criteria are granted as European patents.

Despite the centralization of the initial phases of patenting, the enforcement of granted patents in the pre-UPC system (referred to as "EP" in the following) remains decentralized (Harhoff, 2009). Patent holders are required to validate their patents separately in each member state where the seek protection. Validation involves fulfilling country-specific requirements, such as translations into official languages, payment of national fees, and appointment of local representatives. Once validated, the patent then is governed by the national legal system of the respective country. Annual renewal fees are thus separately payable in each country to keep the patent in force, and legal enforcement must take place in the country's national courts.

The decentralized enforcement of European patents represents a significant challenge for patent holders. Separate litigation in each jurisdiction leads to higher legal costs, greater administrative burdens, and the risk of divergent legal outcomes across countries. Differences in the interpretation of patent scope, procedural rules, and enforcement standards creates additional legal uncertainty. However, while these inconsistencies complicate intellectual property management across Europe, I argue that patentees can form expectations about the outcome of each national patent litigation proceeding, and that they take the possibility of differing outcomes between countries into account.[1]

2.2 The Unitary Patent System and the Unified Patent Court

Launched in June 2023, the Unitary Patent ("UP") system complements the existing framework of the European Patent Organization (EPO) by introducing a single, uniform patent right that is automatically valid across all participating EU Member States (Ullrich, 2023).[2] By eliminating the need for separate national validations, translations, and fees, the UP system reduces the procedural complexity and cost for patent holders.

Disputes involving Unitary Patents are adjudicated exclusively by the newly established Unified Patent Court (UPC), a centralized judicial body intended to harmonize patent enforcement across participating countries. The UPC replaces national courts as the forum for resolving disputes over Unitary Patents. However, the UP system remains optional and coexists with the traditional EP system. This allows patent holders to choose between a Unitary Patent and the traditional national validation route, based on strategic and jurisdictional considerations.

The Unitary Patent is valid only in EU member states that have ratified the Agreement on a Unified Patent Court (UPC Agreement). As of its launch, not all EU member states had joined, resulting in an only partially unified system. Notably, Poland and Spain, the fifth- and fourth-largest EU member states by population, have opted out entirely. The United Kingdom, which was initially set to host one of the three UPC seats, withdrew due to Brexit. The resulting geographical limitation reduce the potential benefits of uniform protection, as firms seeking broad European coverage must still pursue national validations in non-participating countries (Mahina and Pottelsberghe, 2023). For this reason, I restrict attention to patentees who, based on their previous validation behavior, would profit from choosing the UP route.

While the UP system aims to reduce legal fragmentation and enhance predictability in patent enforcement, the establishment of the UPC introduces significant legal uncertainty during its transitional phase. The UPC is an entirely new judicial body,and its procedural and substantive frameworks are untested,leaving firms uncertain about how key aspects of patent law will be interpreted and enforced. Early rulings by the UPC will shape future interpretations but remain unpredictable at this stage.[3]

[1] In other words, I do not consider parallel proceedings, or multi-fora litigation, as a source of legal uncertainty per se as one could assume that it is ex-ante possible to form an expected value of patent validity across validation states.

[2] The EPO provides detailed information on the UP system at https://www.epo.org/en/applying/european/unitary.

[3] The UPC's first decision on the merits was not issued before July 3rd, 2024.

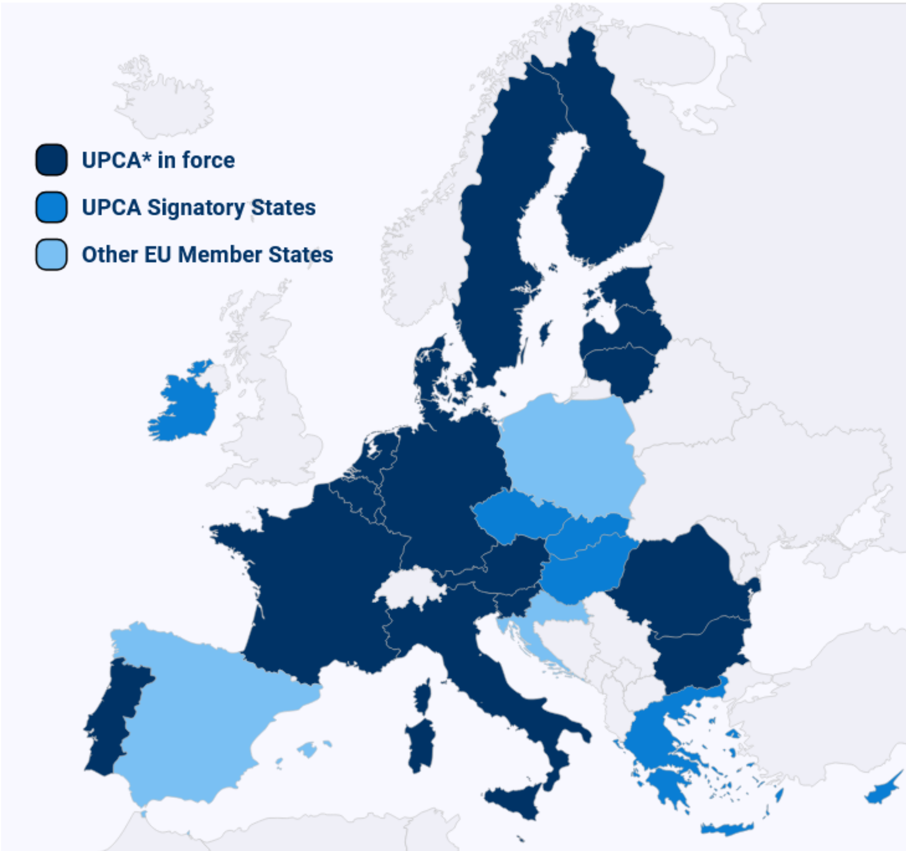


Figure 1: Countries shaded in dark-blue participate in the UP system. Romania joined the UP system in 2024. Source: https://www.unified-patent-court.org/en.

Importantly, the traditional EP system remains the *default* option (Veugelers and Harhoff, 2023). Patent holders must explicitly opt in to the UP system; otherwise, their patents follow the standard national validation process. However, any EP granted since June 2023 that is validated in at least one participating UP country is automatically subject to UPC jurisdiction *in addition* to national courts, unless the patent holder submits an opt-out request (Mimler, 2023). I will refer to EPs under the additional jurisdiction of the UPC as "EP+" throughout the text.

In summary, the core function of the EPO—examining and granting patents—remains unchanged under the UP system. The key differences are (i) a change in validation costs, which the paper controls for, and (ii) a change in the legal forum, which becomes the primary factor shaping firms' strategic validation decisions.

3 Relation to Prior Work

3.1 Legal Certainty as a Precondition of Economic Activity

Legal certainty is a foundational element of modern market economies. It underpins the efficient allocation of resources, provides incentives for investment, and ensures the protection of property rights. Its philosophical roots trace back to thinkers such as John Locke and David Hume. John Locke (1988) argued that the primary role of government is to safeguard individuals' "life, liberty, and property," making secure property rights as essential for personal freedom and social stability. Hume (1986) expanded on this idea, emphasizing that property rights emerge from social conventions aimed at resolving conflicts over scarce resources, thereby facilitating cooperation and enhancing economic efficiency. Both viewed the protection of property as a central function of government.

Building upon these philosophical foundations, the concept of the minimalist "Night-watchman state" emerged in the 19th century, initially coined by German socialists as a critique of limited government intervention (Lassalle, 1993). Von Mises (1962) defended this model, arguing that attempts to expand governmental roles beyond these functions are no more justified than those advocating for state involvement in unrelated economic activities. More important for the present context is his realization that even a minimal state must fulfill the essential functions of protecting citizens from aggression, theft, and fraud, and to enforce contracts and property rights. Von Mises contended that provision of these functions is indispensable for enabling free markets and individual initiative.

Weber (1922) extended this discussion by emphasizing the critical role of legal certainty in economic development. He attributed the rise of modern industrial capitalism to the establishment of stable, predictable legal institutions, which he argued were essential for facilitating complex economic interactions and fostering long-term growth.

More recent research corroborates the economic importance of legal certainty. Transaction-cost economics highlights how well-defined property rights and predictable legal environments govern contractual relations and organizational structures (Williamson, 1979; Posner, 1972). Similarly, institutional economics emphasizes the role of legal systems in reducing transaction costs and promoting growth

(North, 1990; Acemoglu et al., 2005). Empirical studies further demonstrate the impact of judicial predictability on economic outcomes. For instance, Djankov et al. (2003) show that judicial efficiency and predictability across countries influence investor confidence and economic performance, underscoring the broader relationship between legal institutions and economic growth (see also, Haggard et al., 2008; Haggard and Tiede, 2011).

Despite its importance, empirically capturing legal uncertainty remains a challenge. While economic literature has extensively studied many forms of uncertainty (e.g., see the survey in Bloom, 2014), such as policy uncertainty (Baker et al., 2016), legal uncertainty is a distinct concept that has received comparatively little attention. Policy uncertainty is uncertainty about the direction of (economic) policy and the likely next steps that policy makers will take on a given topic. Legal uncertainty instead refers to unpredictability in the functioning of the legal system or the outcomes of disputes, as distinct from uncertainty about future policy directions.

The framework proposed by Lee et al. (2024) is particularly relevant here, as it categorizes legal uncertainty into three types: decision uncertainty (unpredictability of judicial rulings), assignment uncertainty (uncertainty about which judge will preside over a case), and parameter uncertainty (systemic uncertainty about legal norms or potential changes in the law).[4] Of these, parameter uncertainty is most pertinent to the Unified Patent Court (UPC), as it affects all cases uniformly and is not diversifiable by firms with multiple legal exposures. In contrast, decision and assignment uncertainty are case-specific and can be mitigated through diversification.[5]

The specific uncertainties surrounding the UPC—such as procedural ambiguity, unavailability of case law, and transitional disruptions—are examples of parameter uncertainty. These uncertainties impose additional costs on firms, which are likely to influence their litigation strategies and patent validation decisions. Relatedly, Lee et al. (2024) find that firms prefer legal forums with lower uncertainty, as higher legal uncertainty reduces credit availability and adversely affects investment.

While possible downsides of legal uncertainty are widely covered, two studies identify potential upsides. Baker et al. (2004) argue that uncertainty in criminal sanctions can enhance deterrence, and Lang (2017) show that uncertainty

[4] A fourth form of legal uncertainty that is specific to the traditional European Patent system arises from parallel proceedings. For instance, even when the EPO rejects a patent application a similar application may yet be granted at a national patent office for its respective jurisdiction (Van Pottelsberghe de la Potterie, 2009). However, since this paper restricts attention to patents granted by the EPO, this uncertainty is not relevant to the analysis. Additionally, the EPO allows third parties to file an opposition within nine months of a patent grant. Van Pottelsberghe de la Potterie (2009) documents a case in which a national court awarded damages for patent infringement, only for the relevant patent to be later invalidated in an EPO opposition proceeding. Since most patent litigation occurs after this nine-months opposition window, this source of uncertainty is also unlikely to affect the present findings and is not explicitly considered.

[5] These types of legal uncertainty are intrinsic to judges and therefore capture what the legal and law & economics literature has discussed under the terms of "judicial discretion" (e.g., Higgins and Rubin, 1980; Hoffmaster, 1982), "judicial bias" (e.g., Posner, 2008) and "ideology" (e.g., Bonica and Sen, 2021).

about the legality of certain actions can improve welfare in cases of asymmetric information between firms and regulators. However, these studies focus on static settings where uncertainty is intentionally embedded. In contrast, the uncertainty associated with the UPC arises from a transitional institutional change, where welfare considerations were unlikely to have guided the design.

Finally, it is important to distinguish legal uncertainty from the inherent stochastic nature of intellectual property rights. Patents, by their very nature, involve litigation risks (Lemley and Shapiro, 2005). However, these risks do not necessarily entail legal uncertainty if the probability of success in litigation is known and stable. Differences in these probabilities across jurisdictions may be important to firms but are distinct from uncertainty about the legal system itself.

3.2 The Concept of Uncertainty in Economic Research

The common approach in the mainstream (macroeconomics) literature measuring uncertainty is to focus on the variance of a variable (Bloom, 2009; Carriero et al., 2018; Forni et al., 2025). In other words, most of economic research does not distinguish "uncertainty" from "risk". In the present setting, I cannot follow this approach due to lack of time series data and an obvious and observable variable that increases in variance due to the UPC. At a later point in time, another study could look at how the development of case law at the UPC affected the trend in opt-in/opt-out decisions, but the present paper explicitly studies the impact of patentees' "veil of ignorance" regarding the UPC's future case law. Here, therefore, uncertainty is understood in the tradition of Knightian uncertainty (Knight, 1921).

Despite the concept of "uncertainty proper" as opposed to risk reaching back at least a century, empirical quantification, especially in a firm context, is rare. Exceptions include Dibiasi and Iselin (2021) and unpublished work by Bachmann et al. (2020). These authors define and identify uncertainty as the inability of firms (managers) to form expectations, i.e,. to quantify risk.

Using cross-sectional data from prior to any experience with (outcomes at) the UPC, it is not possible to reliably identify the presence or absence of expectations. While I do attempt to disentangle expectations about outcomes and costs from residual uncertainty, this is based on theoretical assumptions instead of empirical identification.

Uncertainty versus Trust A different angle to view the introduction of the UP system from is that of whether patentees *trust* the new court (van Zimmeren, 2023); even if they are unable to form expectations, they might have a baseline level of trust in institutions, given their past experience with the EPO and more generally of doing business in the EU and its member states. This study is unable to empirically distinguish the precise reason as to why certain firms prefer not using the UP despite an obvious financial advantage. The findings obtained at this point lend themselves to interpretation from various theoretical angles.

3.3 Studies of the European Patent System

The literature on the peculiarities of the traditional European Patent System is summarized at book length by Guellec and de la Potterie (2007). The most recent articles focusing on European patents date from around the same time: on transfer of ownership (Gambardella et al., 2007), patent value (Deng, 2007; Gambardella et al., 2008), and patent litigation Graham and Van Zeebroeck (2014); Cremers et al. (2017).

In contrast to the lively discussion of the UP system by legal scholars (Desaunettes-Barbero et al., 2023; Matthews and Torremans, 2023), empirical researchers have only just begun investigating it. I am aware of work by Gamarra (2024), who studies how ownership of standard-essential patents moderates the opt-out decision, and unpublished work by Harhoff and Erhardt (2025), who examine more broadly strategic motivations driving the opt-out decision.

4 Data

4.1 Patent Data

The data on patent grants and patentees' choice between the EP and UP routes comes from the EPO's PATSTAT database, version Spring 2024. This version of the database covers published patent documents until around the end of 2023, which implies sufficiently many observations to reliably estimate patentee decision-making in the first months after the UP system became operational. Since lack of knowledge and experience with the operation of the UPC is the source of legal uncertainty in this setting, and the UPC started hearing its first legal proceedings only in 2024, I pool all observations between June and December 2023 as the preferred approach.

I restrict attention to European patent application that the EPO is willing to grant (has communicated "intention to grant" to the applicant). For each such application, I obtain information about whether the applicant has registered "unitary effect", i.e., opted-in to the UP system, and if not, has registered to opt-out from the jurisdiction of the UPC. The applicant (owner) of each EP patent grant is identified using name disambiguation data that is shipped with PATSTAT. I use these information to obtain information about the same applicant's validation behavior in the time period of up to 25 years prior to June 2023 (i.e., back until including May 1998). For each European patent application granted in this time frame, I determine the set of countries in which the EP was validated and the number of years for which patent renewal fees were paid to the relevant national patent office.I average these information at the patentee-year level and calculate different "mean validation sets" for each applicant. These are meant as approximations of the applicant's hypothetical validation behavior in absence of the novel UP system.[6]

[6]It is thinkable that patentees will choose different patent renewal rates for the same patent if it is validated via the UP and EP route (Mahina and Pottelsberghe, 2023); however, it is impossible to measure the extent of this phenomenon at this point. As a first approach, I take the renewal

In order to avoid interference from changes in the propensity to patent caused by changes in the relative cost of country coverage, I restrict the analysis to applicants who have a history of validating their EP grants in sufficiently many countries such that from a pure fee perspective, choosing the UP route would at most as expensive as choosing their historically representative set of EP validation countries.

In section 7 I additionally need a proxy for patent value. A range of measures has been suggested in the literature. The number of citations received, usually restricted to some time window to improve comparability over time, first suggested by Trajtenberg (1990), is still the most widely used measure today (Jaffe and de Rassenfosse, 2019). For this reason, I obtain the number of citations obtained by the underlying patent application at time of grant as well as within 1, 2, 3 years after filing. Nonetheless, due to the short time frame and the heterogeneity in the time lag between filing and grant date, I complement this measure by the number of claims, the length of the first claim, and the patent family size, i.e., the number of international patent application citing the same priority applications that are therefore considered to be protecting the same invention. The idea is that, since the cost of filing increase in the number of countries filed, the number of countries in which protection is sought should be indicative of the patent's value (Deng, 2007; Lanjouw et al., 1998; Schankerman and Pakes, 1986).[7] To allow comparison between UP- and EP-validated European patents I only consider applications in non-UP countries.

4.2 Fees to Obtain and Maintain a Patent in Europe

Information about the national requirements for validating a European patent grant are compiled in the EPO's website[8] and verified using information provided by each national patent office.

The amount of detail available in PATSTAT on legal events at national patent offices differs greatly between countries. The baseline approach to determining the set of validation countries for a patent application therefore uses the only source of information that is available for each EPO member state: patent renewal fee payments. While these payments are made to national patent offices, they are communicated to and recorded by the EPO. As a consequence, at least for the moment, I cannot distinguish between a patentee choosing not to validate a patent grant in a country and a patentee paying the necessary validation and translation fees and then deciding not to maintain the patent at the first due date of domestic renewal fees. Since this first due date lies with certainty within one year of patent grant, and early renewal fees are generally low compared to patent translation fees, I consider this case to be arguable rare. In a future revision I will however

decisions to be exogenous to the fee schedule.

[7]Other authors have used the number of years a patent has been kept alive by paying renewal fees as a measure of patent value (Pakes, 1986; Deng, 2007). This approach only works when using data with sufficient maturity that allows observing all or at least the majority of renewal vs lapsing decisions.

[8]National Law relating to EPC, available at https://www.epo.org/en/legal/national-law/2024/index.html.

try to take such cases into account for those countries where the legal events data allows to do so.

For each country that is part of a patentee's mean validation set, I use different sets of time horizons (5, 10, 15, or 20 years) to calculate the possible cost savings attainable by choosing the UP route. These cost savings are represented by the variable $\Delta Cost_i$ and represent the main incentive to choose UP over EP. They are calculated for the remainder of the (expected) patent life, i.e., between the grant date and the expected date of patent lapsing.

In addition to administrative fees payable directly to the relevant national patent offices, $\Delta Cost_i$ also contains the cost of translating a European patent granted in English and the cost of using a domestic representative (i.e., a domestic patent attorney) to handle the validation where such translations and representation are required.[9] Optionally, I calculate cost savings that also include using legal representation wherever this is "recommended" or using it in each country. Estimates for the cost of professional patent translation and legal representation come from two European law firms—one from Eastern and one from Western Europe—that offer patent validation services across all UP member states.

4.3 The Probability of Patent Litigation in Europe

Only a small fraction of patents ends up in litigation, or as the subject of disagreement on their scope and/or validity as a precondition leading to litigation more generally (Lanjouw and Schankerman, 2001). At the same time, the value of a patent comes from the ability of its owner to enforce it, and enforcement happens "in the shadow" of the court system.

Data on court litigation in European countries is hard to get by (Harhoff, 2009; Graham and Van Zeebroeck, 2014).[10] Martinelli et al. (2024) circumvent this problem by using data on opposition proceedings before the EPO, which are recorded in PATSTAT. By calling their measure "litigiousness', they operate under the assumption that the intensity of opposition proceedings and court litigation is strongly positively correlated. I use their data, aggregated at 2-digit NACE industries, and map it to patents using the IPC-NACE concordance table that comes with PATSTAT (original work by Van Looy et al., 2014). Since most patents are assigned to multiple IPC classes, the wide variety in IPC class combinations gives rise to a proxy for patent litigation with variation at the patent level.

Patent litigation in the EU is concentrated in a few countries (Harhoff, 2009; Graham and Van Zeebroeck, 2014), even more strongly than validation behavior

[9] I operate under the assumption that all EP grants are drafted in English, while in fact they can alternatively be drafted in French and German. For some countries, the required cost of translation increase in this case as they will require translating the full patent specification instead of merely the claims. Only for Austria, the translation costs would decrease for patents granted in German. I argue, however, that (a) EP grants in English are by far the most common, and (b) most firms interested in validating in countries where validating in French of German leads to higher cost will likely take this into account in their drafting decision, and (c) using a lower cost saving estimate analogously implies a lower estimated cost of using the UPC.

[10] Incidentally, this problem may remedied by the UPC as a side effect as it makes detailed data on all of its judgments publicly available, see https://www.unified-patent-court.org/en/decisions-and-orders.

(the latter is shown in the next section). Nonetheless, some litigation also happens outside the modal countries, and patents differ in their choice of third and further validation countries. As an additional proxy of the risk of patent litigation, I use country-specific relative litigation frequencies from the report by Harhoff (2009) and, where available, from the more recent compendium by Elmer and Gramenopoulos (2019). This variable with variation at the country level is averaged across a patentee's validation countries, using the relative validation frequency per country as weights. To enhance robustness of my empirical results, I use the product of the two variables (one obtained from technology properties, one from the set of validation countries) as the proxy for a patent's litigation probability in selected specifications.

5 Descriptive Analysis of the Validation Decision

The following subsections are based on descriptive statistics and a simple calculation of the amount of fees and attorney costs that a patentee could have saved by validating all their EPO grants as UPs. In the final Subsection **??**, I use a simple logistic regression to calculate the compensation value required to make the patentee indifferent between the EP and UP routes.

5.1 The prevalence of Unitary Patents

Figure 2 provides a first look at the uptake of the three different validation routes over time. The total number of patent grants seems to increase with the introduction of the UP system. However, this is likely an artifact of the introduction period that beginning in January 2023 allowed patentees to request to delay the patent grant until June 2023 if they expected the EPO's grant decision to be made in that time period. Back-dating some of the UP grants of June to the previous months shows a more modest increase in patent grants. On average, 25% of patent grants are validated as UPs between June and November 2023.

The number of UP validations seemingly decreases to zero in February 2024. This is however an artifact of the time lag in which data on legal events such as the opt-in decision to the UP system becomes available in INPADOC and is then included in PATSTAT. For this reason I restrict all future analyses in this paper to the period from June to November 2023.

Table 1 disaggregates the total number of validations in that time period by applicant type, which is based on the variable `PSN_SECTOR`, the result of a patentee name disambiguation effort at K.U. Leuven. Unsurprisingly, the vast majority of patents is owned by businesses, of which only 21% are validated as UP. Similar to business-owned patents, those owned by hospitals and universities show a high rate of validation as EPs. In contrast, patents owned by public and non-profit entities are mostly validated as EP+. It is unclear if this is the result of strategic considerations or simply due to the fact that EP+ is the default route that a grant at the EPO takes absent an explicit opt-in or opt-out decision. Interestingly, UP validation is most popular with patents held by individual inventors.

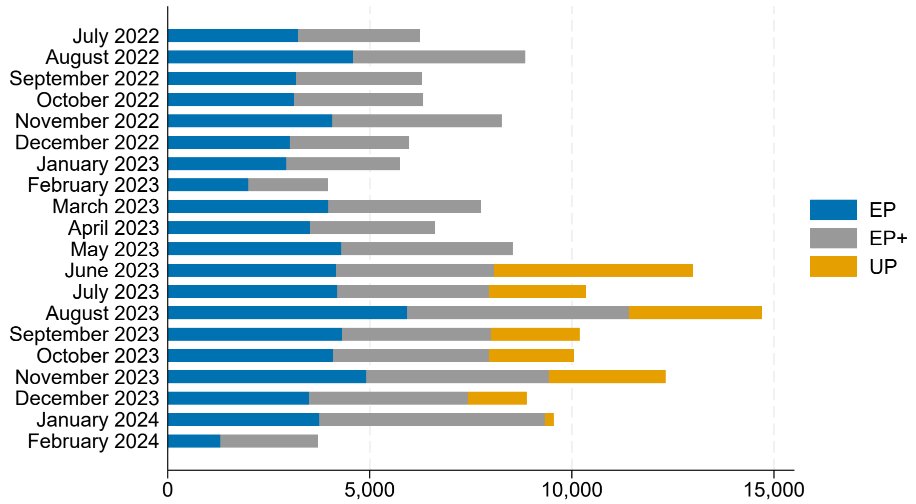
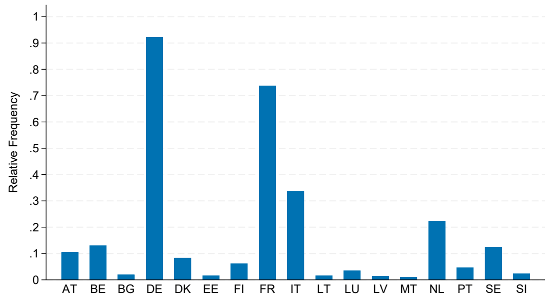


Figure 2: Monthly validations of EPO patent grants

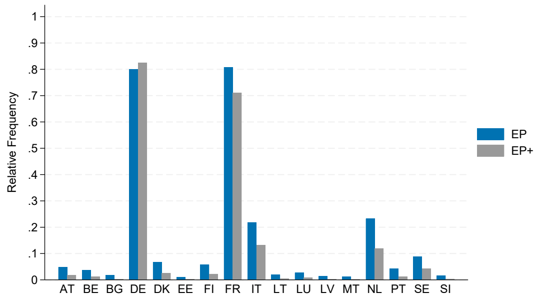
Table 1: Patent validations by applicant type

Applicant type	absolute numbers				percentage		
	EP	EP+	UP	Total	EP	EP+	UP
Company	21,119	19,897	10,578	51,594	0.41	0.39	0.21
Gov./Non-Profit	364	636	516	1516	0.24	0.42	0.34
Hospital	47	13	23	83	0.57	0.16	0.28
Individual	304	462	1,007	1,773	0.17	0.26	0.57
University	1,031	748	759	2,538	0.41	0.29	0.30
Unknown	4,715	3,474	4,875	13,064	0.36	0.27	0.37
Total	27,580	25,230	17,758	70,568	0.39	0.36	0.25

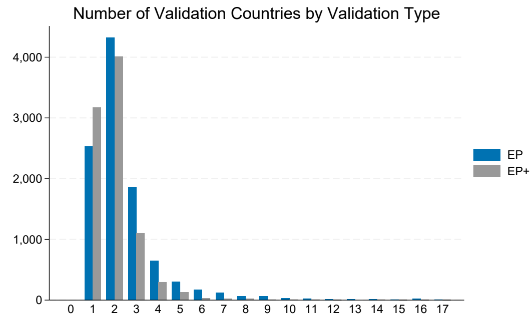
5.2 Where are EPs validated?



(a) Patent validation by country prior to the UP system



(b) Patent validation by country for EPs since June 2023



(c) Number of validation countries by validation route

Figure 3: Validation of European patents by (number of) countries.

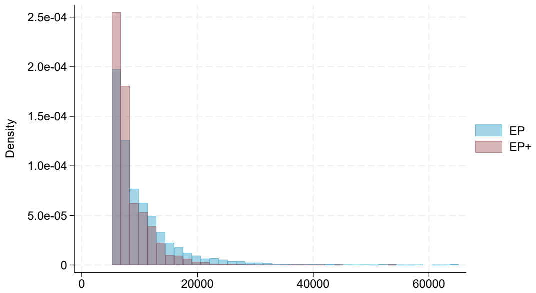
It is well known that most European patents are validated in a few countries only, and virtually no patent is validated in all available countries. Restricting attention to those countries where UP protection is available, panel 3a shows that more than 90% of EPs in the 20 years prior to the UP system were validated in Germany, around 75% in France, around one third in Italy, and just under a quarter in the Netherlands. This group of countries are followed by Belgium, Sweden, Austria and Denmark in terms of validation frequency. We see that country size is a near-perfect predictor of EP validation.

Validation data for the period from June 2023 onward is not available for all patents yet. This is partly due to the fact that validation is determined by the occurrence of renewal payments. Renewal payments are due within one year after the filing date, which is why we can only reliably analyze validation decisions for patent grants that were filed within the months of June-November. For this reason, changes in the height of specific bars between panels 3a and 3b should not be overemphasized. I assume, however, that the availability of validation information is independent of whether a patentee also opted out of the UPC. Differences in the height of the blue and gray bars are therefore meaningful.

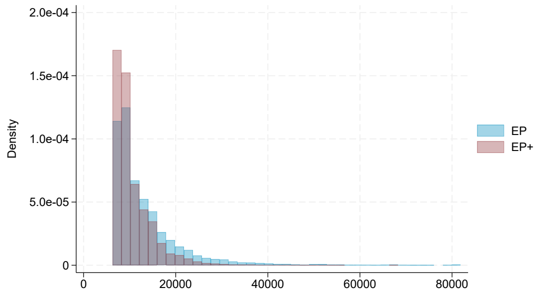
The figure shows that—with the exception of Germany—there are fewer EP+ validations than EP validations in each country. Panel 3c corroborates this finding by showing that the mean number of validation countries is lower for EP+

validations than for EP validations. This finding may indicate differences in the motivation behind validating as EP and EP+. Assuming that the reason to validate as EP is to avoid the UPC—patents that would have been cheaper to validate as UP but where the patentee does not want to take the risk of being subject to litigation at the UPC—then these patents will be validated in a large number of countries. On the other hand, the reason to validate as EP+ is to save costs compared to validation as UP, while either seeking or being indifferent to UPC jurisdiction, possibly due to the low patent value and corresponding probability of litigation involvement. These patents will therefore be validated in a few countries only.

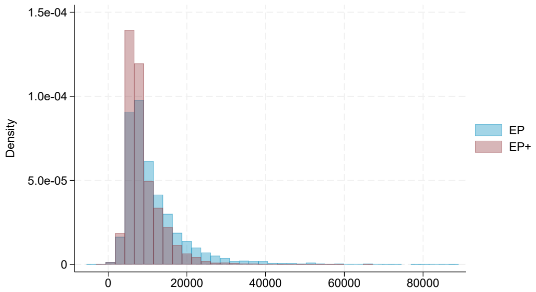
5.3 What fee savings are "left on the table"?



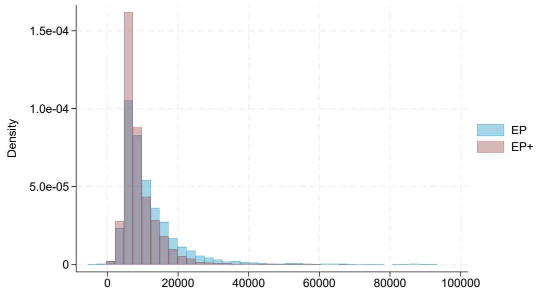
(a) Validation + translation costs



(b) Like (a) plus attorney costs for validation services



(c) Like (b) plus renewal fees based on a 10-year history



(d) Like (c) plus attorney costs for renewal services

Figure 4: Foregone cost savings by not validating as UP, separately for EP and EP+ routes.

The amount of calculated fees paid over what is necessary depends on what range of fees we include. Figure 4 compares EP and EP+ validation routes for four different sets of fees: only those paid directly to national patent offices plus the cost of translating a patent grant from English into the local language (panel 4a); the fees that a typical attorney charges to handle the validation and translation tasks (panel 4b); the annual renewal fees paid to national patent offices to keep the patent grant alive (panel 4c; here calculated for a period of 10 years after grant, without discounting); and the fees a typical attorney charges to handle the payment of renewal fees (panel 4d).

Firstly, since we already know that the majority of patents are only validated in a few countries, the fact that validation costs are highly skewed does not come as a surprise. Also directly connected to Panel 3c, a commonality between the four panels is that the distribution of the cost premium is more right-skewed for EP+ than for EP validations. Overall, patentees are willing to forgo higher cost savings when validating as EP than EP+, which indicates that shutting out the UPC entirely is worth more than merely keeping the door open to national courts.

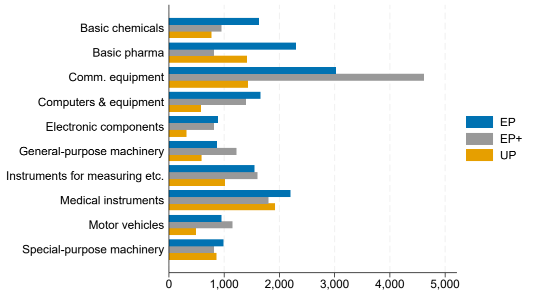
Using the cost definition of panel 4d, we can sum up $\Delta Cost$ over all patents to obtain an aggregate amount of "money left on the table". This yields a total amount of costs of 99.4m Euros paid for EP validations and of 63.5m Euros for EP+ validations. This amount corresponds to a cost premium of 9,816 Euros per validated EP grant and 7,283 Euros per EP+ grant. The average patentee was therefore willing to pay 25 thousand Euros in additional costs to obtain EP grants and 22 thousand Euros to obtain EP+ grants.

Litigation costs are absent from the above cost comparisons. While they can easily reach hundreds of thousands of Euros (Harhoff, 2009) and therefore make the application and renewal fees seem irrelevant, only a highly selected sample of patents is ever subject to litigation. It is therefore not useful to simply add a general cost of expected litigation to each application. Instead, such an exercise requires first obtaining a patent- and patentee-individual probability of litigation. This is one of the avenues for further work summarized at the end of this paper.

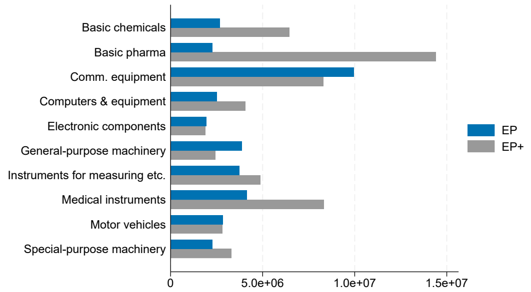
5.4 Which fields dislike UPs?

Differences in the suitability of different validation routes to specific industries or technological fields can help identify areas in which patentees are particularly prone to using or to avoiding a novel court. Figure 5 indicates substantial heterogeneity in the share of patents validated via each route as well as the amount of unrealized cost savings deemed acceptable. The cost savings in this section are those illustrated in panel 4d. The diagrams are restricted to the top-10 industries or fields based on the number of patents. Table 2 provides an overview of validation for all 35 technological fields. Allocation to 2-digit NACE industries and to WIPO technological fields is available in PATSTAT and based on concordance tables using the IPC technology classification.

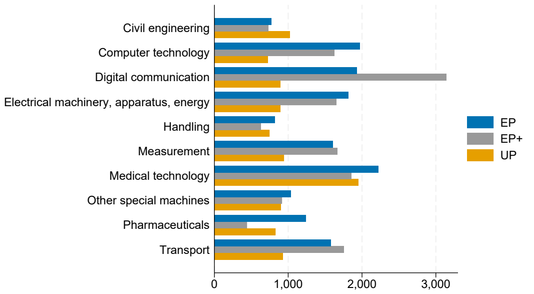
Interestingly, the substantial share of EP+ validations is strongly driven by patents in communication technology, which is also the industry with the relatively lowest usage of UPs. With the exception of civil engineering, no industry or field has yet adopted UPs as the modal validation route. Noteworthy are the large cost premia that firms in the pharmaceutical and medical instruments areas are willing to bear, which mirrors the importance of patents and their enforcement for those businesses. In Table 2, we find further evidence of technological factors driving the choice of validation route. EP+ validations are most popular in the electrical engineering sector (which includes the above-mentioned communications technology fields), while EPs are most frequently used for chemistry patents, including pharmaceutical ones.



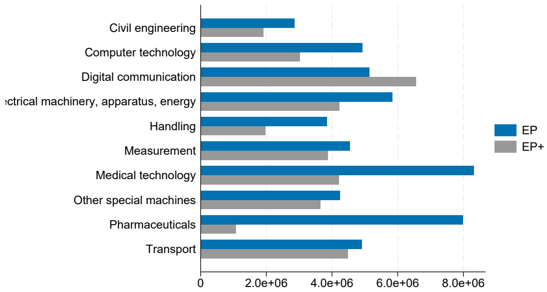
(a) Number of validations by industry



(b) Foregone cost savings by industry



(c) Number of validations by technological field



(d) Foregone cost savings by technological field

Figure 5: Validations and foregone cost savings by 2-digit NACE and WIPO technological field. Restricted to the 10 most frequent cases.

Table 2: Patent validation by technology

nr	tech field name	no. UP	no. EP+	no. EP	total	% UP	% EP+	% EP	tech sector
1	Electrical machinery, apparatus, energy	892	1649	1814	4356	0.20	0.38	0.42	Electrical engineering
2	Audio-visual technology	271	728	628	1627	0.17	0.45	0.39	Electrical engineering
3	Telecommunications	296	843	561	1700	0.17	0.50	0.33	Electrical engineering
4	Digital communication	895	3140	1932	5967	0.15	0.53	0.32	Electrical engineering
5	Basic communication processes	53	162	152	367	0.14	0.44	0.42	Electrical engineering
6	Computer technology	725	1622	1970	4317	0.17	0.38	0.46	Electrical engineering
7	IT methods for management	95	125	151	371	0.26	0.34	0.41	Electrical engineering
8	Semiconductors	169	491	502	1162	0.15	0.42	0.43	Electrical engineering
9	Optics	324	687	710	1720	0.19	0.40	0.41	Instruments
10	Measurement	944	1665	1602	4212	0.22	0.40	0.38	Instruments
11	Analysis of biological materials	177	156	197	529	0.33	0.29	0.37	Instruments
12	Control	333	507	497	1338	0.25	0.38	0.37	Instruments
13	Medical technology	1948	1853	2220	6021	0.32	0.31	0.37	Instruments
14	Organic fine chemistry	381	329	788	1498	0.25	0.22	0.53	Chemistry
15	Biotechnology	423	253	712	1388	0.30	0.18	0.51	Chemistry
16	Pharmaceuticals	830	443	1241	2514	0.33	0.18	0.49	Chemistry
17	Macromolecular chemistry, polymers	223	401	785	1409	0.16	0.28	0.56	Chemistry
18	Food chemistry	177	64	192	433	0.41	0.15	0.44	Chemistry
19	Basic materials chemistry	371	347	674	1391	0.27	0.25	0.48	Chemistry
20	Materials, metallurgy	332	395	431	1157	0.29	0.34	0.37	Chemistry
21	Surface technology, coating	251	306	421	978	0.26	0.31	0.43	Chemistry
22	Micro-structural and nano-technology	21	36	37	93	0.23	0.38	0.39	Chemistry
23	Chemical engineering	538	440	647	1624	0.33	0.27	0.40	Chemistry
24	Environmental technology	244	212	251	708	0.34	0.30	0.36	Chemistry
25	Handling	748	628	820	2196	0.34	0.29	0.37	Mechanical engineering
26	Machine tools	534	606	600	1740	0.31	0.35	0.34	Mechanical engineering
27	Engines, pumps, turbines	397	963	599	1959	0.20	0.49	0.31	Mechanical engineering
28	Textile and paper machines	269	354	475	1098	0.24	0.32	0.43	Mechanical engineering
29	Other special machines	901	917	1036	2854	0.32	0.32	0.36	Mechanical engineering
30	Thermal processes and apparatus	384	484	538	1407	0.27	0.34	0.38	Mechanical engineering
31	Mechanical elements	594	789	735	2118	0.28	0.37	0.35	Mechanical engineering
32	Transport	925	1755	1577	4256	0.22	0.41	0.37	Mechanical engineering
33	Furniture, games	541	471	496	1507	0.36	0.31	0.33	Other fields
34	Other consumer goods	506	607	761	1875	0.27	0.32	0.41	Other fields
35	Civil engineering	1022	730	774	2526	0.40	0.29	0.31	Other fields

6 Studying Drivers of the Validation Decision

6.1 A Model of Decision-Making at Patent Grant

In this section, I discuss factors that motivate the decision to follow the UP route over the EP route. Probably the most obvious factor is the *legal uncertainty*, broadly defined, that is mentioned in this paper's title and that arises from the mandatory exclusive jurisdiction of the UPC for all patents validated as UP. Let this legal uncertainty be represented by κ. In this notation it is identical for each patentee; optionally it can bear a subindex for the patentee (when analysis is at the patent level) or the patentee's industry. What precisely makes up this uncertainty depends on what other factors we explicitly account for.

6.1.1 Costs of patent validation and maintenance

Providing a cost advantage over the established EP route was likely the most-advertised feature of the UP system at its introduction.[11] Hence, it is crucial to measure the amount of direct costs that a patentee will need to spend when validating a patent via each route $r \in \{EP, UP\}$ (the direct costs for EP and EP+ routes are identical). Let us therefore define

$$\begin{aligned} ValCost_i^r = &\text{ validation fees} + \text{translation fees} + \text{attorney fees} \\ &+ \text{exp. renewal fees} + \text{exp. attorney handling fees.} \end{aligned} \tag{1}$$

The values of the components of $ValCost_i^r$ used in the computation for each patent are reported in Tables A.1 and A.2.

The process of patent validation differs between countries.[12] Notably, the national patent offices of Belgium, France, Germany, Luxembourg and Malta do not have a validation requirement, and patents granted by the EPO are immediately valid in each of these countries. Moreover, they do not impose a translation requirement, no matter the language the patent document is granted in. The only cost arising in these countries at time of grant might be for a patent attorney registering a local address for possible communications from the national patent office, such as reminders for renewal fee payments, but this is not a requirement in either of these countries.

All other UP member countries have some sort of validation requirement, even though there is still significant heterogeneity. The largest portion of validation costs are made up of fees payable to obtain an official translation (van Pottelsberghe de la Potterie and Mejer, 2010), most commonly performed by a patent attorney. However, some countries such as Denmark and Finland require translating the claims only, while others such as Austria and Bulgaria require translating the whole patent document. Upon submission of the translated patent grant, a fee

[11] For reference, see the introductory brochures about the UP system offered by the EPO at https://www.epo.org/en/applying/european/unitary/unitary-patent/introductory-brochures.

[12] The EPO maintains a detailed summary of the national laws and regulations at https://www.epo.org/en/legal/national-law. For this study, the archived 21st and 22nd editions were used.

is payable directly to the national patent office, which can range from as low as EUR 16 in Italy to as high as EUR 430 in Finland.[13]

In addition to translation and validation fees, a few national offices require representation by a domestic patent attorney. For foreign applicants from the European Economic Area, this requirement applies in Austria and the Baltic states Estonia, Latvia and Lithuania, making these latter by far the most expensive countries to validate an EP in. Nonetheless, a patentee may decide to hire an attorney for handling of the validation process even if this is not legally required. Recent evidence shows that patents filed by attorneys are significantly more likely to be granted (De Rassenfosse et al., 2023; Klincewicz and Szumiał, 2022).

In each country that the patent has been validated, the owner then must pay annual renewal fees to keep the patent in force up until the maximum of 20 years since filing date. Countries also differ in their renewal fee schedules. For instance, the payment required for the tenth year of patent life ranges from as low as EUR 185 in Belgium to as high as EUR 522 in Austria. Moreover, an attorney may be hired to handle the renewal fee payments in each country. This may be especially useful for small firms to avoid the accidental loss of patent protection due to missed renewal deadlines (Drivas and Kolympiris, 2023).

Choosing the UP route comes at significantly lower cost. There is no validation fee to be paid, and only a single translation—of the whole patent document—must be submitted. Renewal fees are higher than in any single member country, but cheaper by a factor of about five compared to the sum of renewal fees in all member countries. Fees for attorney services will likely be considerably lower as well since the number of billable activities and transactions is greatly reduced.

The costs involved in obtaining and maintaining patents have been shown to matter for patentees. In their survey of this literature, de Rassenfosse and van Pottelsberghe de la Potterie (2013) distinguish between the impact of pre-grant and post-grant fees. At the time of their survey, the literature on the impact of the former was slightly more developed. Regarding the latter, van Pottelsberghe de la Potterie and François (2009) and van Pottelsberghe de la Potterie and Mejer (2010) compare post-grant fees per capita and demonstrate that these are considerably higher in Europe than in the US, and to a lesser extent Japan, making it easy to believe that they do matter in influencing patentee behavior. Harhoff et al. (2009), van Pottelsberghe de la Potterie and Mejer (2010), and Harhoff et al. (2016) specifically study validation and translation costs[14] for EPO grants and find substantial negative impact on validation behavior. Schankerman and Pakes (1986), Danguy and de la Potterie (2011), and Thompson (2017) show a small but significant impact of renewal fees on renewal decisions.[15] Using the results of Danguy and de la Potterie (2011), de Rassenfosse and van Pottelsberghe de la Potterie (2013) calculate that the price elasticity of patent renewal is very close to

[13]In addition, some national patent offices require payment of a fee prior to grant if the patentee seeks to obtain provisional protection in the country while the application is pending at the EPO.

[14]Post-grant translation costs are unique to the EPO. In other countries, patent applications must have been translated to the language of operation prior to filing, hence are entirely part of the pre-grant fees.

[15]For the literature building on this effect and using renewal decisions to proxy patent value see subsection 4.1.

zero in the first few years but increases exponentially in absolute value over time, up to -0.8 for the twentieth and last possible renewal.

Stevenson et al. (2023) build a theoretical model of the validation and renewal decisions of European patents. Using data on chemical patents granted by the EPO in the year 2000, they calculate that, based on validation and renewal fees alone, "essentially all inventors would have used UP had it been available". However, their study does not consider the fees for translating the patent, which, as mentioned above, makes up the largest share of post-grant cost for EPs. They also ignore the cost of using attorney representation and the cost of possible litigation, which I introduce in the following subsection.

6.1.2 Multiple parallel court proceedings

The next-most advertised advantage of the UP at its introduction—after the direct cost advantage—was the opportunity to avoid parallel legal proceedings at multiple national courts. With a single proceeding at the UPC, an infringer may now be stopped in their action throughout the whole UP territory. At the same time, however, losing that proceeding—or worse, even, losing a counter suit regarding patent validity—implies immediately losing patent protection in all UP countries. In essence, then, the UP route is riskier than the EP route.

To the extent that we can consider business enterprises as neutral to risk, this feature of the UP system would not impact the decision. If the single proceeding is, however, cheaper than conducting multiple parallel national proceedings, then having to sue only once would, all else equal, tilt the scale towards the UP, and more so the higher the number of validation countries. However, clearly, this argument would only be important for patents for which the patentee anticipates a realistic probability of them being subject to litigation.

Let us represent the probability of litigation of patent i by ρ_i and the (expected average) litigation costs associated with each route as $LitCost^r$. Just as with validation costs, countries differ in the cost of patent litigation. In contrast to validation costs, though, litigation costs are hard to predict and are to some extent in the control of the patentee (but constrained by the actions of the opposing party). It is therefore not possible to calculate a reliable proxy ex-ante, and litigation costs therefore have to be estimated. For simplicity, I do not distinguish between infringement and validity suits, and I do not explicitly consider the possibility that litigation happens multiple times during a patent's lifetime. The occurrence probability of patent litigation is also assumed independent of the validation route.

One could add further structure to the cost of litigation. It could consist of a fixed portion and a variable portion that increases with patent value.[16] Additionally, both portions could increase in the number of validation countries for the EP route.[17] However, for now, I restrict myself to an estimate of cost differences

[16]For instance, contest theory shows that the effort increases linearly in the value at stake (e.g., Plott, 1987; Farmer and Pecorino, 1999).

[17]It is ex-ante unclear what would be the most representative structure of litigation on the EP route. The importance of multi-fora litigation depends on whether patentees will indeed file suit in multiple jurisdictions simultaneously or if they will restrict themselves to a suit in the largest

that is agnostic as to how the cost difference comes into being. Some sources (e.g., Veugelers and Harhoff, 2023) argue that litigation at the UPC may be more costly than national litigation, even though Harhoff (2009) estimates that a single patent court would have produced savings in private litigation cost between EUR 148 and 289 millions. This seeming discrepancy implies that a single proceeding at the UPC is more costly than any national proceeding, which could be explained by the higher stakes, but the EP route via national courts ends up more expensive due to multi-fora litigation. It will be interesting to see if patentees share this view in the aggregate.

6.1.3 Belief about litigation outcomes at the UPC

The cost difference discussed in the preceding section does not consider that the ex-ante probability of prevailing may differ between courts. At first sight, this may be a permissible simplification given that the UPC recruits its judges from the UP member countries. However, for patentees focusing on protection in a particular (and possibly non-modal) set of countries, the expected outcome at the UPC may differ from that at the relevant national court(s).[18]

But even for patentees focusing on the most important countries there may be significant differences in expected outcomes. Consider the fact that the UPC maintains subsidiaries in Germany, France and Italy, the largest UP countries, and let us assume that the majority of judges is hired from these three countries. Then, a patentee from either of these three countries may first file a suit in their home country to benefit from a possible "home-court advantage" (Choudhury et al., 2025). Moreover, there may be differences in the way in which each national court—and their respective legal tradition—treats patent disputes in certain industries or technologies. The introduction of the UPC may now remove a patentee's ability to forum shop and strategically pick the jurisdiction that is ex-ante most favorable to their point of view. If nothing else, randomly drawing a judge from a French/German/Italian legal background at the UPC could change the expected payoff from litigation (Zhang et al., 2018).

Let θ^{EP} represent the patentee's probability of prevailing in national litigation (again not distinguishing between suits over infringement—as plaintiff— and invalidity—as defendant) and θ^{UP} the corresponding probability of prevailing at the UPC. It may be possible to calibrate θ^{EP} using historical litigation data in each validation country, but this then requires aggregating this information into a single parameter.[19] So for now I consider the expected litigation outcomes as

jurisdiction first. Then, they could either file the next suit with updated beliefs about prevailing, or outright accept that judgment for the remaining jurisdictions. Wang et al. (2023) provide evidence of such litigation strategies. In these case, the cost advantage of the UPC route could be lower or even negative. However, the direction of the effect is essentially an empirical question that will be uncovered as part of the present investigation.

[18] A further aspect that is not considered here is that within nine months of the grant, other parties can file an opposition to a granted patent at the EPO. When the patent is validated via the EP route, such oppositions can be filed also or alternatively in all national patent offices that offer this possibility (Van Pottelsberghe de la Potterie, 2009).

[19] One way to accomplish this would be to weigh each national θ_c^{EP} with that same country c's market size, assuming that this market size relative to the size of the market of all UP countries is an

parameters to be estimated.

However, the probability of winning in court only affects expected profit if the protection granted by the patent is actually valuable. If the patent has no value,[20] then a patentee may not consider it important to uphold it in court. Similarly, if the underlying technology is very hard to imitate even absent patent protection, then losing the patent is not of too great concern. Such patents may be filed for other reasons than to rely on the legal protection they confer. For this reason, we need to define the value of the patent when it is in force, V_i, and when it is invalidated, I_i. While the literature has thought of proxies for patent value for a long while already (e.g., Schankerman, 1998), no such immediate proxy exists for I_i. It could therefore be useful to simply define it as $I_i = \alpha V_i$, potentially letting α vary by technology.

6.1.4 Geographically limited patent licensing

One benefit that may be unique to the EP route could lie in the patentee's licensing strategy. If the patentee gives out exclusive licenses that are supposed to be geographically limited to the country of the licensee, this can be accomplished for a UP via a specific clause in the licensing contract. Enforcement then takes place by the patentee enforcing their licensing contract.

If the licensed patent is a national validation of an EP, however, the geographical limitation—at least within the EU—comes additionally from the fact that by practicing the patent in a different EU country, the licensee will infringe the national patent in that country that may have been licensed to a different firm. IN this case, even the licensee in that country can contribute to enforcing the geographical limitation of the license by suing for patent infringement.[21]

For the average patentee, this argument may be of limited importance, but it may be very important to some patentees. Let us represent this advantage by $LitAdv$, which possibly may be a function of the number of validation countries and additionally industry or technology characteristics.

6.1.5 The decision between validation routes

Combining all of the above aspects, we obtain two (expected) patent-specific profit functions, one for each validation route:

$$\pi_i^{UP} = ValCost_i^{UP} + \rho_i \left[\theta^{UP}(V_i - I_i) - LitCost^{UP}\right] - \kappa, \tag{2}$$

$$\pi_i^{EP} = ValCost_i^{EP} + \rho_i \left[\theta^{EP}(V_i - I_i) - LitCost^{EP}\right] + \mathbb{1}_L LicAdv. \tag{3}$$

Note that $LitCost^r$, θ^r and $LitAdv$ do not carry an i subscript as they will be estimated at the sample average only (or lower levels of aggregation in a later

appropriate proxy for the value of winning or losing litigation in country c. However, this approach would become much more complicated once we consider the possibility that litigation outcomes are correlated between countries, and that firms may not file all possible suits simultaneously.

[20]It is well known that the distribution of patent value is highly skewed (**add reference**).

[21]Indeed, patent infringement can not only be claimed by the owner of a patent but also by the owner of an exclusive license (**Add reference!**).

revision). We now assume that a patentee will choose that validation route r that yields the greater expected profit. We are therefore interested in

$$\begin{aligned}\Delta\pi_i &= \pi_i^{UP} - \pi_i^{EP} \\ &= \underbrace{\Delta ValCost_i}_{\text{fees}} + \underbrace{\rho_i\left[\delta_\theta(1-\alpha)V_i - \Delta LitCost\right]}_{\text{litigation}} - \underbrace{\mathbb{1}_L\delta_{lic}}_{\text{licensing}} - \kappa, \end{aligned} \tag{4}$$

where I defined $\delta_\theta = \theta^{UP} - \theta^{EP}$ and $\delta_{lic} = LicAdv$ for sparser notation and to emphasize their nature as differences between UP and EP routes (where Δ denotes differences measured in Euro values and δ represents differences in intangible or probability parameters). Additionally, $\mathbb{1}_L$ is a dummy indicating that the patentee is active in exclusive licensing.

In this specification, κ is left to represent all aspects of "legal uncertainty" that are not explicitly captured elsewhere. One could think of different aspects that contribute to κ that are however hard to further empirically disentangle,[22] which is why for now I am interested in estimating κ as is. We could now add an error term η_i to eq. (4) and assume it to follow a Type I extreme-value distribution, which would allow us to derive the probability of the above equation being positive to be represented by the logistic distribution function. Before moving to the empirical implementation, I briefly mention technology- and firm-specific aspects that influence the decision between the validation routes.

6.1.6 Features of the patented technology

There may be certain features of a patented technology that are not captured in the specification above but that impact the decision between the validation routes. As long as these do not vary substantially within a technology, one may be able to capture them by technology fixed effects λ_j. If they do vary within technology, they may be captured by V_i if they are correlated with patent value.

6.1.7 Features of the patent owner

Similarly, there may be characteristics of the patentee that bias their decision towards one route or the other. Here, firm-fixed effects μ_f should be able to reliably capture these given that the time dimension is very short (6 months). Alternatively, in a future revision it may be interesting to specifically consider size (which correlates with the availability of in-house legal counsel and sufficient liquidity for legal battles) and patenting experience (age of the firm or since first patent filing; number of annual patent filings).

[22] Such aspects included in κ might include unfamiliarity with the court's mode of working (the "true" legal uncertainty); differences in time to judgment between courts; differences in the nature of the judgment (e.g., size of damage awards; inclination to grant injunctions); firm-specific UPC aversion that may depend on size or litigation experience, and possibly on the distance between a patentee and the UPC seat, both in geographic and cultural terms.

6.2 Empirical Specification

The conceptual model developed in the preceding subsection directly maps into the following regression specifications:

$$\text{logit}\left[P(\Delta\pi_i > 0)\right] = \beta_0 + \beta_1 \Delta ValCost_i + \beta_2 \rho_i + \beta_3 \rho_i (V_i - I_i) - \beta_4 \mathbb{1}_L, \quad (5)$$

where the estimated coefficients can be interpreted as follows:

β_0 $= -\kappa$;

β_1 as the impact of a one-Euro increase in the cost difference on the log-odds of choosing UP over EP, which allows us to express the other parameter estimates in Euro values, too;

β_2 $= \Delta LitCost$;

β_3 $= \delta_\theta (1 - \alpha)$; and

β_4 $= \delta_{lic}$.

Having one variable in eq. (5) that is measured in Euro values allows converting all other coefficient estimates to the same scale by dividing them by β_1. Fixing $\beta_1 = 1$ would follow directly from the theory summarized in eq. (4) and imply that all other coefficient estimates are directly interpretable in Euro values.

7 Results

7.1 What compensation is required for choosing UP?

	(1)	(2)	(3)	(4)	(5)	(6)
ΔCost	-6.06e-05***	-1.63e-04***	-8.00e-05***	-8.74e-05***	-1.86e-04***	-1.84e-04***
	(3.86e-06)	(7.50e-06)	(9.81e-06)	(1.14e-05)	(2.19e-05)	(2.67e-05)
Constant	-0.396***	-0.878***	-0.331***	0.412***	0.177***	0.164***
	(0.0102)	(0.0150)	(0.0202)	(0.0349)	(0.0465)	(0.0569)
Observations	45,260	29,475	10,386	7,420	4,448	2,908
Required compensation:	6,535	5,405	4,139	-4,709	-955	-888

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Estimation by logit. The dependent variable is a dummy for validation as UP, with zero representing validation as EP in columns (1)-(3) and as EP+ in columns (4)-(6). Columns (2) and (5) additionally restrict to patentees with at least 15 observed validations in the years 2003-2018. Columns (3) and (6) additionally restrict to domestic patentees. The required compensation is calculated as β_0/β_1, which is equal to $\Delta Cost$ for a log odds of zero.

Table 3: Logistic regression using pre-UP validation data of experienced patentees

The investigations to this point were based on simply aggregating the number of observed validations since start of the UP system. In this section, instead, I use data on not only the historic renewal payments per observed validation country (as I did in the previous sections) but additionally base a patentee's post-UP validation behavior on their observed pre-UP mean validation country set. This means restricting attention to patentees with a long-enough history of frequent patenting at the EPO. The upside is that this way it is possible to estimate an EP validation cost even for patents validated as UP, and for those validated as EP but where validation data are not yet available in PATSTAT/INPADOC.

In Table 3 I regress a dummy indicating validation as UP on the calculated cost savings for each patent grant from choosing UP instead of the EP route as well as a constant:

$$logit(UP_p) = \beta_0 + \beta_1 \Delta Cost_i, \tag{6}$$

where UP_p is a patent-level indicator taking value 1 when the patent grant is validated as UP and zero if it is validated as EP (or EP+ in columns 4-6). For a log-odds of zero, implying indifference between the UP and EP routes, $\Delta Cost_i = \beta_0/\beta_1$, which allows us to attach a Euro value to this state of indifference. In other words, what is the amount of cost savings that makes the patentee indifferent between UP and EP routes?

The bottom row of the table collects this simple statistic for each column. It takes a considerably high positive values of between 4,000 and 6,000 Euros for patents validated as EP, i.e., those that are out of reach of UPC jurisdiction. For patents validated as EP+, instead, the value is lower in absolute values but negative, which demonstrates the fundamentally different incentives for validating as EP+ compared to EP. Without a cost difference, validation as UP is more attractive to the sample patentees that choose the EP+ route, represented by the positive estimates of the constant, equivalent to a positive κ. However, as indicated previously, EP+ patents are, on average, validated in considerably fewer countries than EP patents. At the same time, these patentees chose the jurisdiction of the UPC as an option, hence likely seeing a value in exposure to this court instead of a cost.

In the following, I restrict attention to those patentees choosing either UP or EP, as for those the decision is akin to that represented by equation (4).

7.2 Considering the risk of patent litigation

In this and the following subsections I gradually unpack the cost captured by κ in the subsequent regression table. First, I add a measure of patent litigation risk, which is expected to be a main driver of a firm's attitude towards a novel court. If a patent faces no risk of litigation, then the nature of the court system associated with each route should not influence the validation decision.

The results reported in Table 4 come from estimating the following specification:

$$logit(UP_p) = \beta_0 + \beta_1 \Delta Cost_i + \beta_2 \rho_i. \tag{7}$$

In equation (4), ρ_i is multiplied with $\delta_\theta(1-\alpha)V_i - \Delta LitCost$, which is how the estimate of β_2, reported in the middle row in Table 4, should be interpreted. While there are a number of parameters in this expression, it essentially represents the expected net benefit from switching from national courts to the UPC. This estimated net benefit is positive in columns 1, which includes occasional patentees for which the historic validation behavior may not be very reliable, and column 6, which compares UP and EP+ routes. For the latter sample of patentees, validating as EP+ instead of EP is the optimal thing to do if they expect the UPC to yield a higher net benefit.

ρ varies by:	(1)	(2) technology	(3)	(4) country	(5) tech × country	(6) tech
ΔCost	-5.72e-05***	-1.67e-04***	-8.88e-05***	-8.67e-05***	-1.00e-04***	-3.87e-04***
	(3.87e-06)	(7.82e-06)	(1.03e-05)	(8.65e-06)	(9.85e-06)	(1.48e-05)
litigation probability ρ	3.305***	-2.350***	-5.090***	-493.2***	-3,189***	5.113***
	(0.486)	(0.688)	(1.071)	(45.36)	(358.1)	(1.189)
Constant	-0.574***	-0.753***	-0.0586	1.091***	0.160***	-0.399***
	(0.0281)	(0.0404)	(0.0608)	(0.131)	(0.0580)	(0.0668)
Observations	45,260	29,475	10,386	10,377	10,377	10,808
Required compensation:	10,032	4,507	660	-12,589	-1,595	1,032
Value of a 1-sd increase in litigation risk:	-1,156	282	1,146	31	22	-238

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Estimation by logit. The dependent variable is a dummy for validation as UP, with zero representing validation as EP in columns (1)-(5) and as EP+ in column (6). All but column (1) restrict the sample to patentees with at least 15 observed validations in the years 2003-2018, and all but columns (1) and (2) additionally restrict to domestic patentees. The monetary values are calculated as ratios of the coefficient estimates and β_1. Litigation probability ρ is proxied by the frequency of EPO opposition proceedings by 2-digit NACE industry as calculated by Martinelli et al. (2024) in columns 1, 2, 3, and 6; as the frequency of domestic court litigation based on data in Harhoff (2009) in column 4, and as the product of the two in column 5.

Table 4: Logistic regression including a measure of patent litigation risk

For columns 2 through 5, increased litigation risk instead drives patentees away from the UPC. Since the range of values that the proxy for ρ takes decreases from column 3 through 5, values associated with absolute increases are not reasonably comparable between columns. Therefore, I report the value of an increase in the proxy by 1 standard deviation in the bottom row of the table. These values represent the additional compensation required for the patentee to be indifferent between UP and EP routes.

Due to the more reliable and conceptually sound construction of the technology-based litigation probability, this is the preferred proxy which I will mostly use in the following. Incidentally, it is the measure that in the preferred specification (3) yields a non-significant estimate for the constant parameter, implying that conditional on litigation risk, the "residual" uncertainty about the UPC does not significantly affect the choice between UP and EP routes. Analogously, in columns 4 and 5, the positive constant implies that litigation risk is indeed the only reason for patentees to choose EP over UP.

7.3 Considering patent value

The importance of patent litigation in deciding between courts also depends on the difference in firm profit between winning and losing in court. In the extreme case in which losing in court does not affect the private value of the patent (i.e., $\alpha = 1$), then it is only the cost of using the respective court that matters. However, for more realistic values of α between 0 and 1, the validation decision may well depend on the value of the patent at hand.

Regressions reported in Table 5 distinguish between the stand-alone impact of ρ and its effect in interaction with patent value V. The former is the (fixed) net cost of engaging in patent disputes at the UPC compared to (possibly multiple) national courts, $\Delta LitCost = LitCost^{UP} - LitCost^{EP}$; the second is the net benefit

Value proxy:	(1) pre-grant citations	(2)	(3) family cits.	(4) family size	(5)	(6) claims	(7) pre-gr. cits.
ΔCost	-8.77e-05***	-8.77e-05***	-8.93e-05***	-9.91e-05***	-9.73e-05***	-8.78e-05***	-3.87e-04***
	(1.03e-05)	(1.03e-05)	(1.04e-05)	(1.07e-05)	(1.07e-05)	(1.03e-05)	(1.48e-05)
litigation probability ρ	-4.907***	-4.936***	-4.929***	-2.536**	-3.052**	-8.280***	5.180***
	(1.076)	(1.077)	(1.083)	(1.292)	(1.291)	(1.607)	(1.191)
$\rho \times V$	-1.586***	-585.9***	-0.0348	-0.360***	-0.276***	0.235***	-0.631*
	(0.432)	(153.9)	(0.0338)	(0.104)	(0.0989)	(0.0862)	(0.365)
Constant	-0.0491	-0.0470	-0.0591	-0.0855	-0.0803	-0.0478	-0.395***
	(0.0613)	(0.0614)	(0.0609)	(0.0614)	(0.0614)	(0.0612)	(0.0669)
Observations	10,386	10,377	10,386	10,386	10,386	10,386	10,808
Required reimbursement absent patent litigation:	556	535	662	863	826	544	1,022

The dependent variable is the UP vs. EP dummy in all but column 6, where it is the UP vs. EP+ dummy. The sample is restricted to the preferred specification, excluding patentees with fewer than 15 observed validations in the years 2003-2018, and patentees from non-UP countries, in all columns. Patent value V is approximated by the number of citations received by the pending application until its grant date in columns 1, 2, and 7; by the number of citations received by the patent family over all years since the priority year in column 3; as the number of patent offices at which at least one patent family member was filed in columns 4 and 5; and as the number of claims (independent and dependent) of the application in column 6. ρ is represented by the technology measure from Martinelli et al. (2024) in all columns but 2, where it is the product of the technology and country litigation probabilities.

Table 5: Logistic regression including a measure of patent value

of prevailing times the net probability of doing so, $\delta_\theta(1-\alpha)$.

β_1 is significantly different from zero in all specifications and negative when the alternative is EP, and positive when it is EP+, indicating that for patentees going for EP instead of UP expect disputes at the UPC to be more costly, while those going for EP+ expect the opposite. The sign of β_2 is negative in all but specifications 6, indicating that all patentees, including those going for EP+, on average expect a lower probability of prevailing at the UPC compared to *the average* national court. Only using the number of claims as the measure of patent value yields an apparent advantage of the UPC, though my inability of distinguishing between independent and dependent claims renders this the least reliable proxy of patent value.[23]

After accounting for expected litigation costs and outcomes, the average patentee's residual legal uncertainty requires a reimbursement of between EUR 500 and 800 per patent to be indifferent between the UP and EP routes, though the estimated parameter is not statistically significantly different from zero. It is noteworthy that the only specification in which it is significant is that comparing UP to the EP+ route, where now the residual uncertainty also disfavors UP. In other words, at least in this specification, patentees have a significant willingness to pay to keep the route via national courts open.

7.4 Considering patent licensing

The last element from equation (4) whose impact on the validation route choice was not yet estimated is the licensing dummy $\mathbb{1}_L$. Regressions containing it are reported in Table 6, allowing us to estimate the importance of planned licensing activities in affecting the choice of validation route.

[23] Arguably, patent value increases in the number of independent claims, but might be either neutral to or even decrease in the number of dependent claims (Angenendt, 2020; Marco et al., 2019).

	(1)	(2)	(3)	(4)	(5)	(6)
ΔCost	-8.37e-05***	-9.21e-05***	-8.34e-05***	-8.89e-05***	-8.87e-05***	-0.000386***
	(1.03e-05)	(1.07e-05)	(1.02e-05)	(1.06e-05)	(1.05e-05)	(1.49e-05)
ρ	-4.972***	-4.704***	-4.999***	-4.915***	-4.910***	5.176***
	(1.077)	(1.075)	(1.077)	(1.075)	(1.076)	(1.192)
$\rho \times V$	-1.575***	-1.577***	-1.578***	-1.578***	-1.580***	-0.639*
	(0.429)	(0.433)	(0.429)	(0.432)	(0.432)	(0.365)
licensing dummy $\mathbb{1}_L$	-0.219***	0.161***	-0.229***	0.0442	0.0350	-0.0951*
	(0.0560)	(0.0490)	(0.0550)	(0.0414)	(0.0415)	(0.0551)
Constant	-0.0123	-0.0953	-0.00756	-0.0740	-0.0691	-0.381***
	(0.0618)	(0.0625)	(0.0619)	(0.0654)	(0.0655)	(0.0675)
Observations	10,386	10,386	10,386	10,386	10,386	10,808

The regressions specification is identical to that of column 1 in Table 5, with the addition of a dummy variable indicating the following activities recorded in INPADOC legal events data in the five years (10 years in column 2) prior to June 2023: patent licensing (columns 1, 2, and 6), patent licensing and patent pledging (i.e., using the patent as loan collateral; column 3), transfer of patent ownership (column 4), and licensing and transfer of ownership combined (column 5).

Table 6: Logistic regression including a dummy for technology transfer

β_4, representing the benefit from one validation route over the other in terms of commercializing the patented knowledge by making it available to other parties, is significant only when the dummy is restricted to licensing. Including transfer of ownership does not yield precise results.[24] Noteworthily, licensors seem to also prefer the EP+ route over the UP route, even if less strongly so.

The residual average legal uncertainty, not reported since none of the estimates are significantly different from zero, is now just short of EUR 150 in the preferred specification 1, but still at almost EUR 1000 for the corresponding specification 6. For the *average* patentee deciding between UP and EP routes, the four modeled factors seem to capture the decision making relatively well.

7.5 Country-specific estimates

Until now, we have treated all patentees to be motivated to the same extent by equation (4) and therefore only considered mean values across all observations. However, it may well be that a patentee's country of origin influences their attitude towards the UPC, e.g., due to differences in efficiency between national judicial systems and a country's influence on the working of the UPC.

Table 7 reveals substantial heterogeneity between firms from different UP member countries. Patentees from Norther European countries appear to have a high expected baseline benefit from the novel UPC system, while countries from Central Europe seem to experience a baseline net cost. Firms from Luxembourg have the strongest UPC aversion, but it is noteworthy that Italian firms follow with the second-strongest aversion (not counting Lithuania due to the very small number of observations). Firms from Malta, Portugal and Slovenia also have a baseline preference for the UPC, which may stem both from inefficiencies in the domestic judicial system and from the fact that for these patentees, most cases of

[24]Given the high share of 40% of patents with transfer of ownership, it is possible that I included cases of re-assignment within the same firm in this measure, whose feasibility should be unaffected by the choice of validation route.

	regression	country-specific κ	required reimbursement
ΔCost	-9.28e-05***		
	(1.12e-05)		
ρ	-4.280***		
	(1.099)		
$\rho \times V$	-1.424***		
	(0.375)		
$\mathbb{1}_L$	-0.111*		
	(0.0583)		
Country dummies:			
Belgium	0.126	-0.142	1,534
	(0.142)	(0.122)	
Germany	0.0892	-0.180***	1,935
	(0.0984)	(0.069)	
Denmark	1.001***	0.732***	-7,894
	(0.134)	0.113)	
Finland	1.054***	0.785***	-8,465
	(0.167)	(0.157)	
France	0.314***	0.046	-493
	(0.105)	(0.076)	
Italy	-0.182	-0.451***	4,863
	(0.122)	(0.097)	
Lithuania	-0.282	-0.551	5,939
	(1.196)	(1.194)	
Luxembourg	-1.010***	-1.279***	13,785
	(0.309)	(0.302)	
Malta	1.008**	0.739*	-7,965
	(0.411)	(0.405)	
Netherlands	-0.141	-0.409***	4,412
	(0.118)	(0.098)	
Portugal	1.619***	1.350**	-14,551
	(0.552)	(0.549)	
Sweden	0.728***	0.460***	-4,953
	(0.118)	(0.086)	
Slovenia	1.675**	1.406*	-15,156
	(0.814)	(0.811)	
Constant	-0.269**		2,897
	(0.110)		
Observations	10,386		

The dummy for Austria is excluded, which implies the constant represents the estimated value of κ for Austria. The country dummies indicate the country of origin of the owner of a patent. Patents with multiple owners are included as many times as there. are assignees

Table 7: Logistic regression including country fixed effects

patent disputes take place in foreign courts. From that perspective, the UPC may be considered more of a home court than the national court of other UP countries.

8 Discussion and Outlook

8.1 Implications of Results Obtained

The findings of this paper provide direct evidence of the economic costs firms are willing to incur to avoid legal uncertainty. The introduction of the Unified Patent Court created ambiguity regarding procedural outcomes, jurisdictional reach, and enforcement consistency. In response, firms demonstrated a certain preference for the traditional European patent system even at a considerable financial cost. This suggests that legal predictability is an economic asset, with firms effectively paying a premium for stability. More broadly, these results underscore the importance of institutional trust in affecting firm behavior. The persistence of parallel litigation across Europe resulting from the continued popularity of the EP system implies that the full benefits of patent system harmonization may remain unrealized unless the UPC establishes a track record of consistency and reliability. Beyond the patent system, the study highlights a broader economic insight: when regulatory frameworks introduce uncertainty, firms actively seek mechanisms to insulate themselves from unpredictable legal environments, even at a measurable cost. This has implications for policy design, emphasizing the need for gradual transitions as well as clear procedural guidelines and mechanisms to build legal confidence when introducing major institutional reforms.

8.2 Limitations and Possible Extensions

This study has several limitations that are worth discussing. First, it does not consider strategic interaction as a motivation behind the choice of filing strategies. The focus on patentees' decisions in the months immediately after the UP system came into force implicitly assumes that, just as patentees are uncertain about the future working of the UPC, they are unaware of opportunities for strategic interaction. Such motivations may well become more widely taken up when the UP system matures.

The probability of patent litigation is proxied using patent opposition frequency at the technology level. While this measure is readily available, a more precise approach could aim to predict the risk of litigation at the level of the individual patent.

Validation and translation costs are calculated based on a number of randomly selected European patents. A future revision could use full text patent data to more precisely calculate these cost types that depend on the length of the patent document.

Lastly, the presented estimates are sample averages, and there is likely substantial heterogeneity between technologies and between different patentee types yet to be uncovered.

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A Tables

Table A.1: Costs of patent validation and maintenance

Cost component	AT	BE	BG	DE	DK	EE	FI	FR	IT	LT	LU	LV	MT	NL	PT	SE	SI	UP
Validation fee	166	0	63.91	0	268.06	45	430	0	16	46	0	50	0	25	58.97	217.50	100	0
Variable fee components?	yes	no	yes	no	no	no	no	no	no	yes	no	no	no	no	no	no	no	no
Provisional protection fee	166	0	23.01	0	0	32	0	36	0	46	14	50	0	0	58.97	43.5	0	0
Mean translation cost (East)	1630	0	1,430	0	230	1,450	150	0	1,900	130	0	170	0	220	1,510	190	150	1,584
Attorney fees for validation (E)	240	99	190	99	190	190	290	99	290	190	99	190	99	290	240	190	240	190
Mean translation cost (West)	2410	0	2,020	0	637	2,020	150	0	1,520	190	0	210	0	230	710	180	210	1,736
Attorney fees for validation (W)	600	200	415	160	838	415	350	160	410	415	160	415	350	340	305	535	300	375
Attorney cost for renewal	60	60	200	60	80	190	60	60	100	180	60	190	150	60	150	80	120	60
Attorney services dummies:																		
required for provis. protection?	1	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0
required for validation?	1	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0
required for renewals?	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
recommended for validation?	1	0	0	0	1	1	0	0	1	1	0	1	0	1	1	1	1	0
recommended for renewals?	0	1	0	1	1	1	0	1	1	1	1	1	0	1	0	0	1	0

Notes: This table reports the values used to calculate the validation costs in sections 5 and 7 ($ValCost_i^r$), with the exception of annual renewal fees which are reported in Table A.2. The final column "UP" reports the values used for the case of validation as Unitary Patent. All monetary values are stated in Euros. Fees to the PTOs of Bulgaria, Denmark and Sweden must be paid in the respective national currency; the fees have been converted to Euros using the official exchange rate as of 1 June 2023. The validation costs for Portugal indeed have two non-zero decimal digits. The data on attorney fees and whether their use is recommended is obtained from the websites of professional patent attorney firms. Translation fees have been calculated based on a random sample of 51 granted European patents. For the UP validation route, translation costs are calculated as the average of the costs for all countries that require translation of the full patent document for validation. Attorney costs are calculated as the average of over all EP countries, except for handling renewal services where the lowest value was used.

Table A.2: Annual patent renewal fees

year	AT	BE	BG	DE	DK	EE	FI	FR	IT	LT	LU	LV	MT	NL	PT	SE	SI	UP
1			20.45		71.83	26												
2			20.45		71.83	26		38										35
3		40	20.45	70	71.83	64	135	38		81	33	90	34.94		0	128.81	30	105
4		55	20.45	70	159.78	77	160	38		92	41	120	46.59	40	0	137.39	34	145
5		75	71.58	100	181.26	96	210	38	60	115	52	140	58.23	100	58.16	154.57	42	315
6	104	95	92.03	150	202.75	120	240	76	90	139	66	160	69.88	160	87.21	171.74	50	475
7	208	110	112.49	210	232.29	135	270	96	120	162	82	180	81.53	220	116.29	188.91	60	630
8	313	135	138.05	280	261.83	155	320	136	170	185	99	220	93.17	280	174.45	223.26	70	815
9	417	165	194.29	350	297.41	180	375	180	200	208	115	270	104.82	340	348.87	249.02	80	990
10	522	185	255.65	430	333.66	205	430	220	230	231	131	320	116.47	400	407.03	274.78	110	1,175
11	626	215	306.78	540	370.59	245	480	260	310	289	148	320	128.12	500	407.03	309.13	154	1,460
12	731	240	357.91	680	406.84	285	535	300	410	289	165	320	139.76	600	465.16	343.48	200	1,175
13	835	275	409.04	830	443.09	320	590	350	530	289	180	320	141.41	700	523.31	386.42	234	2,105
14	940	320	460.17	980	480.02	360	640	400	600	289	198	320	163.06	800	581.47	420.76	274	2,455
15	1,044	360	511.30	1,130	523.65	405	700	460	650	289	213	320	174.10	900	639.59	455.11	310	2,830
16	1,148	400	562.43	1,310	567.29	450	750	520	650	347	230	420	186.35	1,000	639.59	489.46	390	3,240
17	1,253	450	613.56	1,490	610.93	495	800	580	650	347	246	420	198.00	1,100	755.89	523.81	510	3,640
18	1,357	500	664.69	1,670	655.24	540	860	650	650	347	262	420	209.64	1,200	755.89	558.16	654	4,055
19	1,566	555	766.95	1,840	698.20	585	910	730	650	347	281	420	221.29	1,300	814.04	592.50	870	4,455
20	1,775	600	869.21	2,030	741.84	630	965	800	650	347	300	420	232.94	1,400	814.04	626.85	1,100	4,855

Notes: This table reports the values used to calculate the expected renewal fees component of validation costs in sections 5 and 7 ($ValCost_i^r$). The final column "UP" reports the values used for the case of validation as Unitary Patent. All monetary values are stated in Euros. Fees to the PTOs of Bulgaria, Denmark and Sweden must be paid in the respective national currency; the fees have been converted to Euros using the official exchange rate as of 1 June 2023. The renewal costs for Malta and Portugal indeed have two non-zero decimal digits.