

Unitary Patenting in the EU: A comparative study of population- and R&D-based efficiency indicators and procedural preference

Marek Beneš, Martin Hála, Robert K. MacGregor, Radka MacGregor Pelikánová

ABSTRACT

Objective: The article aims to identify, appreciate, and assess the human resources efficiency, cost efficiency, and procedural preferences of EU member states covering Unitary Patent registration via the Unitary Patent System (UPS) and enforcement before the Unified Patent Court of Appeal (UPCoA) in 2024 and 2025.

Research Design & Methods: Based on a robust framework, academic, and empirical background, we selected seven-years delay and identified and visualized data about inhabitants and Gross domestic expenditures on R&D (GERD) in EU member states in 2017-2024 along with data about Unitary Patents granted and litigated before the UPCoA in 2024 and 2025. Following the matrix triad – human resource efficiency, cost efficiency, and procedural preferences – we addressed eight research questions (RQ1-RQ8) based on data extracted from the Eurostat database, European Patent Office (EPO) dashboard, and UPCoA collection via descriptive analyses (RQ1-RQ4), regression analysis (RQ5-RQ6), and features, and thematic identification (RQ7-RQ8).

Findings: The cohorts of the most human resources efficient, and of the most cost-efficient traditional EU member states, in Unitary Patenting overlap and include Sweden, Denmark, Finland, and Italy. Belgium, France, and Spain record very low efficiency, France, and Spain, while EU members joining since 2024 perform poorly. Our micro-longitudinal study found no dramatic trend changes. Emerging procedural preferences favour larger subjects with individuals mastering English. The exploration of data about the first two years of Unitary Patenting points to the leading role of Scandinavia and leaving behind Mediterranean states, except Italy, and newer EU member states, in particular Romania, and Bulgaria. The position of Germany is precarious and that of France – definitely bad.

Implications & Recommendations: European competitiveness needs Unitary Patents, ideally as many as possible, at the lowest cost, and with robust enforcement. The EU member states that excel in this should be studied carefully to model the progress in other EU member states. Specifically, we should closely observe Scandinavia to learn how to do it, while Spain, France, and especially Bulgaria and Romania to learn how not to.

Contribution & Value Added: This pioneering multi-disciplinary, holistic, and complex study confirms the importance of patents and shows that trusting in the size of the gross domestic product (GDP) and population, albeit GDP per capita helps little to predict efficiency in receiving Unitary patents. The investing-inventing-patenting-innovating process entails many unpredictable factors and variables, and AI can only partially help with that, while we may still identify the best approaches. There are EU member states with a full UPS membership, with no agricultural focus, and with a lean, not overly regulatory, pragmatic, and responsible approach, in which the investing-inventing-patenting-innovating process developed uninterrupted but respected and driven by the private sector. The creative culture of these states stems from specific national mentality further supported by a good grasp of the English language.

Article type: research article

Keywords: Unitary patent; GERD; efficiency; patenting; enforcement; procedural preferences

JEL codes: K29, K 41, O32, O34, O44, O52, O57, Z13

Received: 2 March 2026

Revised: 5 May 2026

Accepted: 13 May 2026

Suggested citation:

Beneš, M., Hála, M., MacGregor, R.K., & MacGregor Pelikánová, R. (2026). Unitary Patenting in the EU: A comparative study of population- and R&D-based efficiency indicators and procedural preference. *International Entrepreneurship Review*, 12(2), 65-84. <https://doi.org/10.15678/IER.2026.1202.04>

INTRODUCTION

For over three decades, competitiveness, intellectual property (IP), and sustainable growth anchor the EU's top priorities (Rubáček & MacGregor Pelikánová, 2025). Both European Commissions led by Ursula von der Leyen understood that the prosperity and functioning of the single internal market depends on smart, sustainable competitiveness generated by innovations (Decyk, 2025), which requires investment (Das, 2020), external and internal knowledge (Zygmunt, 2025), and protection (Fedajev *et al.*, 2025). Consequently, the EU policies, and law championed investment in Research and Development (R&D) (MacGregor Pelikánová, 2019) and the protection of inventions by European patents (EP) granted, under the European Patent Convention (EPC), through the European Patent Office (EPO) (Nicolai, 1971; Potužáková & Öhm, 2018). However, the famous Paris convention on industrial property protection from 1883 allows and underpins not only the EPC but also other concurring treaties, such as the Patent Cooperation Treaty (PCT), which the World Intellectual Property Organization administers (WIPO).

After decades of struggles (Kaesling, 2013), the EU reached a milestone on 1st June 2023, by launching the Unitary Patent System (UPS), allowing for a multi-jurisdictional alternative to the continuation of EP – the Unitary Patents (UP) (MacGregor Pelikánová *et al.*, 2025). The UPS rests on (i) Regulation No 1257/2012 on the establishment of the unitary effect conferred by a EP; (ii) Regulation No 1260/2012 which governs linguistic and translation requirements and (iii) Agreement on a Unified Patent Court from 19th February 2013 (UPCA) establishing the Unified Patent Court (UPC), comprising the Court of First Instance with central, regional, and local divisions, and the Court of Appeal in Luxembourg (UPCoA) (MacGregor Pelikánová & Beneš, 2023).

From the substantive perspective, the Eurostat database, and EPO dashboard supply data about the annual total number of UP granted to subjects from each and every EU member state in 2024 and 2025 as well as data about the population, GDP, GDP per capita, and even Gross domestic expenditure on R&D (GERD) in these jurisdictions in 2017-2024. From the procedural perspective, the Unified Patent Court (UPC) judgments repository supplies data about final decisions regarding UP disputes by UPCoA, about *rei judicata* disputes important to parties, showing which disputes mattered most to the parties and how they ended.

Certainly, patents do not exclusively protect inventions destined to become innovations (Ashrafi & Easmin, 2023). At the same time, more than a century of experience confirms the relevance and significance of patent protection and the correlation between the number of patents and economic growth (MacGregor Pelikánová, 2019; Saikia *et al.*, 2023), competitive advantage (Garncarz & Michalik, 2025) arguably even the sustainable development (Decyk, 2025; Bieńkowska *et al.*, 2025) with value creation (Malla & Zdziarski, 2025), and even cultural particularities (Zygmunt & Dvouletý, 2024). Undoubtedly, the patent regime par excellence among EU subjects, above all EU businesses, remains the EP with its special 2023 extension, the UP. Therefore, if the EU intends to compete genuinely in the 21st century, then Europeans must engage aggressively, effectively, and efficiently in the invest-invent-patent-innovate process. This calls for deeper engagement regarding the understanding of the inventing-patenting dynamics, in particular the appreciation of the involved efficiency. Consequently, the objective of this study was to explore the European human resources efficiency, cost efficiency, and procedural preferences based on EP by projecting this triad onto eight intra-related research questions.

The uniqueness, novelty, and data transparency of UP creates an exceptional chance to fill the pre-existing gap, regarding the patenting efficiency, and particularism in general as well as in the context of the UPS with EP. Namely, we can exploit a completely new emerging opportunity in observing UPS operation, along with national preferences and performance. In particular, permitting us to identify, appreciate, and assess the human resources efficiency, cost efficiency, and procedural preferences of EU member states regarding the Unitary Patents registration via the UPS and their enforcement via the UPCoA in 2024 and 2025. It exposes how efficient EU member states prove in generating and defending UP, and where the concentration runs highest of UP (a lot of UP per million inhabitants, *i.e.* a low number of inhabitants per UP) at the lowest cost (low GERD per UP) and which UP spark serious legal battles. In this context, the term efficient means 'doing things right' as opposed to effect, which means 'doing right

things.’ Consequently, the starting point – our first premise – holds that obtaining UP proves positive, pro-competitive, and pro-sustainable to get as many UP as possible (because this is effective and *conditio sine qua non* for a large bulk of innovations), thus maximising the count per capita and per investment/cost (GERD) marks efficiency. Our second premise follows from the empirical observation that the investing–inventing–patenting–innovating process runs long (takes years) and risky (Asad *et al.*, 2024).

LITERATURE REVIEW

Nowadays, the investing-inventing-patenting-innovation line underpins progress (Decyk, 2025), development (Hall, 2024), and growth (De Rassenfosse *et al.*, 2013; De Rassenfosse & Palangkaraya, 2023), as revealed by history (Moser, 2013; Saikia *et al.*, 2023) and confirmed by the EU presence (Fedajev *et al.*, 2025) and emerging indices (Dziallas & Blind, 2019). Numerous publications refer to it, albeit often in a superficial manner, ignoring the patenting determination, significance, and justification in the context of various patent regimes entailing and demanding costs, disclosure, time, and more (Das, 2020). Plainly, prior studies are merely intuitively indicative and pass on a deeper exploration of patenting efficiency based on the labour and financial demands and costs with the inherent delay factor and particularism of national drives, preferences, and enforcement attitudes. However, there are new data to overcome such a pre-existing gap and address the mentioned key determinants, especially for UP within the UPS as an extension of the EP within the EPS, provided a proper conceptual and literature review is established. Such a review must address the patenting determination and significance, patenting justification, patenting regimes, and the built-in delay factor.

Patenting Determination and Significance

Human ideas about resolving various issues, overcoming obstacles, and doing new or better things (effective) in a new or better way (efficient) emerge from various products of human minds entailing various technological strategies (Beneito, 2023) such as creative works protected by copyright or confidential solutions protected by trade secret (Crass *et al.*, 2019). Although all these intellectual property assets stem from creative activities of the human mind, they differ in nature, and protection mechanisms (MacGregor Pelikánová, 2019). A significant subset comprises solutions of a technical problem called inventions, and they typically obtain a temporary, territorial monopoly protection title called patent (MacGregor Pelikánová, 2019). Namely, new inventive solutions of technical problems typically prove hardest to reach. Such inventions demand time, resources, and effort (Dvouletý & MacGregor Pelikánová, 2025) but also an out-of-the-box thinking and multi-disciplinary, cross-cultural, and sectorial collaboration (Van Tulder & Keen, 2018). Once achieved, patents protect them (De Rassenfosse *et al.*, 2013; De Rassenfosse & Palangkaraya, 2023) and turned into innovations (Ashrafi & Easmin, 2023).

The EU requires innovations grounded in inventions to secure sustainable prosperity and competitiveness, see Political Guidelines 2024-2029 with their European Prosperity Plan. Ursula von der Leyen opened her Political Guidelines 2024-2029 by stating that ‘Europe has always been a continent of industry, enterprise, and innovation’ (Political Guidelines 2024-2029, p. 6). She also stated that R&D requires financing (Nunes *et al.*, 2012), that we should measure innovation, and innovativeness by the number of patents granted (Prędkiewicz & Prędkiewicz, 2014), and that the EU needs a unified patenting regime (MacGregor Pelikánová *et al.*, 2025).

Therefore, following the logic triad investing-inventing-protecting (Koellinger, 2008), EU member states, and EU subjects must ensure that a sufficient share of their GDP and creative potential flows into R&D and that they deploy these efforts and funds effectively and efficiently to yield as many inventions as possible – inventions that attract patent protection which authors then convert into innovations (Barabino, 2019). Given the inherent risk features (Asad *et al.*, 2024), needed efforts, and financing requirements, and the length of the inventing-patenting process, only a few R&D endeavours produce patented inventions for transformation into innovations (Ashrafi & Easmin, 2023). However, innovations supply the key to competitive advantage (Garncarz & Michalik, 2025; Bigos & Wach, 2021), and sustainable progress. They reflect national, industrial, and even a firm’s culture (Zygmunt & Dvouletý, 2024) and can be pivotal for the ‘value proposition’ at the intersection of value creation, capture and

delivery (Malla & Zdziarski, 2025). Plainly, without investment, creative skills, and both internal and external knowledge (Zygmunt, 2025) no inventions arise and, without inventions, no patents appear and innovation cannot flourish. Hence, Europeans should engage in inventing, with both their skills and resources, and should patiently and systematically work towards patents and innovations (Barabino, 2019) and the EU policies that law should support (Rubáček & MacGregor Pelikánová, 2025).

Nevertheless, since the very beginning of the modern recognition of the significance of inventions for innovation and progress by Joseph Schumpeter, the visionary of creative destruction, Joseph Schumpeter (Schumpeter 1934 & 2003; Śledzik, 2013), and of the ‘change as opportunity’ entrepreneurship guru, Peter Drucker (Drucker, 2015), patent protection providing temporary, territorial exclusivity has drawn criticism. Such temporary, territorial monopolies arguably slow progress, lead to abuses, and breed massive unfairness. Therefore, for decades or even centuries, scholars have closely scrutinised patent justifications by drawing on various philosophical streams to assess the justice and justification regarding patents while national – often culturally based – approaches have evolved (MacGregor Pelikánová, 2019).

Patenting Justification

The discourse about the (lack of) justification for patents typically opens with Aristotle’s distributive (appreciative) justice, which advances the concept of deserved rewards, see diagonal conjunction positive justice for unequals – physicians versus farmers (Jagannathan, 2019). This generates the distinction between property in distribution and property in use, following Augustine, Gregory the Great and Thomas Aquinas, who recognise private property but reject its unjust use for one’s own benefit (Lopata, 1973). Hobbes’s social contract demands political consensus authority, see the Faustian deal for patent protection (Lopata, 1973). Locke’s labour theory explains the acquisition of exclusive title to property in the context of the natural law duty to preserve mankind, since the inventor must preserve himself and the results of his own exclusive work: patenting inventions (Lustig, 1991). Kant’s deontological approach does not perceive the human enjoyment as a justification, see Kant’s categorical imperative (Baynes, 1989). As a matter of fact, Hobbes, Locke, and Kant stand as contract theorists: for Hobbes, such consent rests on rational self-interest; for Locke, on a natural right to self-preservation and the guarantee of absolute property rights; and for Kant, on a moral obligation to institutionalise property rights (Baynes, 1989). Classical utilitarianism opposes classical contractarianism (Gourevitch, 1975), meaning that consequentialism pursues benefit maximisation, or as Bentham’s utilitarianism puts it: ‘The interest of the community then is, what? The sum of the interests of the several members who compose it’ (Gunn, 1968). This translates into the necessary incentive for R&D and planning with return of the interest via patents. In contrast, Hegel’s intellectual property theory views property as an extension of personality, see Hegelian personification and mirror dualism of the author and his work (Priya, 2008). The cooperation by even citizens within a ‘moral judgement in equilibrium’ (Gourevitch, 1975) leads to Rawls’s semi-egalitarian system, namely genuine cooperation (Fritsch *et al.*, 2020) and the political conception of justice for all, including inventors. Namely, Rawls’s social justice theory argues that individual’s views of justice in organizational contexts have a significant impact on both behaviours and outcomes (Beugr, 2002) and stresses the critical importance of fair reward allocation (Dahanayake *et al.*, 2018), *i.e.* organisational justice comprises distributive justice and procedural justice and shapes individuals’ motivation and perceived equity (Rahman, 2024), including inventors. In addition to these leading philosophical justifications, additional streams in ethics and legal science support patent protection – be it directly or indirectly – due to entrepreneurship (Drucker, 2015) and other concerns, including sustainability (Balcerzak & MacGregor Pelikánová, 2020). Recent justifications arise from the concept of sustainability complemented by particular inventions and innovations, the public interest technology (Abbas *et al.*, 2024) and convincing propositions about cross-sectorial collaboration and partnership (Van Tulder & Keen, 2018). This basically means solving public problems in the public interest (Michael & Abbas, 2020) while preserving resources and avoiding waste (Marikyan & Papagiannidis, 2024) and naturally such a pro-multi-stakeholder endeavour (Lashitew *et al.*, 2020;

MacGregor Pelikánová *et al.*, 2024) fully aligns with priorities advanced both by current policies and law (Marikyan & Papagiannidis, 2024).

Furthermore, these justifications face ongoing attack from the idea of abolishing private property entirely, including intellectual property assets such as patented inventions, which Karl Marx advanced through his surplus-versus-added-value approach (Marx, 1969), explained by the socialisation of the means of production and distribution of common goods on the basis of need (Lopata, 1973), which still surface in the 21st century. Despite all empirical experience, particularly the catastrophic economic record with the abolition of the patent protection (the Netherlands 1869-1912), voices still call for reducing or even eliminating the protection of R&D cooperation (Fritsch, 2020) and of resulting inventions. Nevertheless, the prevailing position remains clear: the law must protect inventions and the typical legal title for that temporary, territorial, negative-absolute monopoly remains the patent.

Patenting Regimes

A patent grants its holder a legal title to exclude others in the given jurisdiction from using the patented invention without the permission of the patent owner during a fixed time period, for up to 20 years. Consequently, every patent carries a temporary, territorial nature and demands a *sui generis* strategy (Appio *et al.*, 2022). Pursuant to the conventional approach, national law establishes a national patent regime that produces such national patents for transposition into national innovations (Dziallas & Blind, 2019). Since the 19th century, governments have facilitated the obtaining of more national patents via international patenting regimes. Hence, although a patent remains essentially national, valid in one jurisdiction (national patenting regime), through recognition and harmonisation under international treaties (international patenting regimes), applicants can co-ordinate the simultaneous acquisition of several national patents and so exploit the patents-innovation link (Moser, 2013). The most important international patenting regimes for Europeans are based on PCT and EPC.

The PCT was signed in 1970 in Washington and is administered by WIPO in Geneva, which now counts 157 member states. The EPC was signed in 1973 in Munich, and it operates under the Council of Europe, now counting 39 member states (Nicolai, 1971). All 27 EU member states belong to both the PCT and the EPC. The EPC and PCT systems compete with each other which, drawing from a national patent application and a 12-month national phase, permit an international examination and search phase of 18-24 months, which yields a title convertible into a bundle of mutually independent national patents which holders maintain and defend independently and separately.

Unitary Patents and Unitary Patent System: Seven Years Built-in Delay

For decades, the EU has pursued unified trademark and patent regimes (Kaesling, 2013; MacGregor Pelikánová & Beneš, 2023). In 2016, Regulation 2015/2424 delivered this for trademarks transforming the Community Trade Mark into a truly unified European Trademark. However, the original enthusiastic push for unified patents via the UPS collapsed, amid underestimated opposition driven by several factors (EU law reach, language regimes, judicial review, jurisdictions, fees and their distributions, etc.), which spawned several cases the CJEU decided. Spain launched the especially salient C-146/13 and C-147/13 seeking to annul both key UPS implementing regulations: (i) Regulation No 1257/2012 on the establishment of the unitary effect conferred by a EP and (ii) Regulation No 1260/2012 which governs linguistic administration and translation requirements. Their rejection sealed Spain's decision to stay out of the UPS as much as feasible (MacGregor Pelikánová & Beneš, 2023), *i.e.* not signing the UPCA. Ultimately, a less ambitious regime emerged, *i.e.* on 1st of June 2023, the EU launched the UPS as a sub-option, co-operating with the EPC, allowing an EP to become one UP valid across several jurisdictions, replacing a bundle of national patents (MacGregor Pelikánová *et al.*, 2025). The UPS streamlines complex registration and management procedures, removes validation, saves resources, and delivers uniform patent protection in 18 EU member states (UPS states).

Although both Regulations apply across the entire EU, the UPCA – the third EPS pillar – governs unified judicial enforcement, with the UPCoA at the apex, which 18 EU member states have signed and ratified (UPCA A states). Six states have signed it without ratifying (Cyprus, Czech Republic,

Greece, Hungary, Ireland, Slovakia – UPCA B states). Three states have not yet signed the UPCA (Croatia, Poland, Spain – UPCA C states).

Procedurally, EPO keeps accepting requests based on national patent applications to move to the international phase, once the national phase concludes, and, if successful, grants the European Patent (MacGregor Pelikánová & Beneš, 2023). Importantly, the European Patent acts not as a patent per se but as a title issued by a centralised proceeding which lets the applicant, via validation, acquire a bundle of national patents. The UPS lets European Patent holders, instead of validating to obtain a bundle, request a truly regional patent, the Unitary Patent, automatically valid in 18 EU member states (EU member states enrolled in enhanced co-operation regarding Unitary Patents) and, and, hopefully, in the other six EU member states. Hence, after a two-to-four-year research process, the applicant files a national patent application that enters a national phase (12 months) and an international phase with the EPO (18-24 months). Thereafter, the successful applicant secures the European Patent and may either convert it into a set of separate national patents or opt for a Unitary Patent, requiring future payment of only one annual renewal fee and the management of only one regional patent covering (so far) 18 EU member states. Empirical observation and prior arguments confirm that, although the inventing-patenting length always remains individual and specific (Dvouletý & MacGregor Pelikánová, 2025), the process takes at least five years, and an invention rarely becomes a European Patent or Unitary Patent after more than nine years (the patent issues earlier or not at all) (MacGregor Pelikánová & Beneš, 2023; MacGregor Pelikánová *et al.*, 2025). We therefore adopt a 7-year delay, *i.e.* if successful, R&D – with its human-resource and cost demands – yields a Unitary patent after 7 years. We therefore match GDP, GERD, inhabitants, and other Y1 data against data on Unitary Patents granted in Y8 (Das, 2020).

RESEARCH METHODOLOGY

Drawing on the robust framework and the academic and empirical background, we extended the recently developed methodological approach to patenting efficiency using indices that involve GERD per capita and patent counts (Dzialis & Blind, 2019) with the seven-year delay (MacGregor Pelikánová *et al.*, 2025), and applied it to fresh data about UP granted for both completed UPS operating years, *i.e.* 2024 and 2025.

Namely, the data from Eurostat about the number of inhabitants in 2017 and 2018 and about GERD in 2017 and 2018 for all 27 EU member states we extracted, tabulated, recalculated, and further processed alongside data extracted from the EPO dashboard about UP granted in 2024 and 2025 to subjects from all 27 EU member states. These data target the human-resource efficiency and cost efficiency of EU member states and their subjects to get UP and we now complement them with a fresh set of data on all UPCA decisions.

This methodological framework necessarily remains complex and partly heterogenous given the inherent features of the investing–inventing–patenting–innovation process, the intangibility of involved assets, and the variability of the delay effect. Consequently, a snowball of intra-related dynamics affects the systematically employed battery of methodology tools as well as the data regarding the so far only two completed years of UPS.

Consequently, this methodology mirrors the available data and patenting particularism, and aligns with recent trends and innovation indices (Ujwary-Gil, & Florek-Paszkowska, 2025). These selected and processed data on inhabitants, GERD in EU member states in 2017-2024, along with data about UP granted and litigated before the highest UPS court, UPCA, in 2024 and 2025, support the matrix triad – human resource efficiency, cost efficiency and procedural preferences – which we projected onto eight research questions (RQ1-RQ8) and addressed through descriptive analysis with trends indications (RQ1-RQ4), regression analysis with cluster indications (RQ5-RQ6) and thematic analysis with procedural preferences indications (RQ7-RQ8). We add a gloss and comparison against AI findings. The dynamic juxtaposition and visualization of the processed data let us identify procedural preferences and even key features of EU member states belonging to the top cohort.

Descriptive Analysis of Human Resources and Costs Efficiency With Trends Indications

The EPO dashboard <https://www.epo.org/en/about-us/statistics/statistics-centre#/unitary-patent> is used to extract data about UP in 2024, in 2025 and in 2025 versus 2024 (Table 1) (EPO, 2026). The UPC overview (UPC, 2026) is used to indicate the UPS membership of each EU member state (A full – UPCA in force; B partial – UPCA to be ratified; C out – no UPCA signed) (Table 2). The data included in these two Tables, along with their per capita recalculation, allows one to address four research questions regarding the human resources efficiency and its development and regarding the cost efficiency and its development.

- RQ1:** What is the Unitary Patenting efficiency of EU member states, based on human capital, *i.e.* what is the Inhabitants/UP index in EU member states (human resources efficiency)?
- RQ2:** How has the Unitary Patenting efficiency of EU members, based on human capital, evolved in 2024-2025, *i.e.* how has the Inhabitants/UP index changed in EU member states from 2024 to 2025 (human resources efficiency)?
- RQ3:** What is the Unitary Patenting efficiency of EU member states, based on financial expenses, *i.e.* what is the GERD/UP index in EU members states (cost efficiency)?
- RQ4:** Who has the top Unitary Patenting efficiency of EU members, based on costs, evolved in 2024-2025, *i.e.* how the GERD/UP index has changed in EU member states from 2024 to 2025?

Related processing and response generating to each of these four research questions is visualized by graphs (Figures 1-4). Such a descriptive analysis with trends indications is further advanced by regression analysis.

Regression Analysis of Human Resources and Cost Efficiency With Cluster Indications

Recognizing the seven years delay effect and development 2017-2024 versus 2018-2025, we developed two separate linear regression models, while for each we used GERD in EUR per capita seven years earlier as the independent variable and UP per million inhabitants as the dependent variable. These models address the following two research questions (RQ5-RQ6).

- RQ5:** What is the linear regression model of Inhabitants/UP index (human resource efficiency) and GERD/UP index (cost efficiency) while considering Inhabitants and GERD from 2017 and UP from 2024?
- RQ6:** What is the linear regression model of Inhabitants/UP index (human resource efficiency) and GERD/UP index (cost efficiency) while considering Inhabitants and GERD from 2018 and UP from 2025?

The descriptive and regression analysis provides predominantly quantitative data on human-resource and cost efficiency but conceals the dynamics of daily operation and about the real interest and commitment.

Thematic Analysis With Procedural Preferences Indications and Further Gallops Indications With the AI Double check

An obvious litigation triage offsets this, *i.e.* Unitary Patents that pass full UPS judicial review and reach *rei judicata* at the UPCoA qualify as Unitary Patents that matter (RQ7). Such thematic analysis and exploration rest on objective data extracted from the mentioned database, such as the register number, the name of parties, and the proceeding language employed. Together with the propositions we generated for prior questions, (RQ1-RQ6), this yields not only procedural preferences, and specific indices but generally thematic features for the top cohort of the EU member states regarding Unitary Patenting (RQ8).

- RQ7:** What are the shared features of unitary patenting enforcement before the UPCoA?
- RQ8:** What are the shared features of Unitary Patenting efficiency and commitment leaders, *i.e.* what is common for the most human resources efficient, and most cost efficient and most enforcement commitment EU member states regarding Unitary Patenting?

RESULTS AND DISCUSSION

As suggested, we present the results and discussion in three batches – descriptive analysis with trends indications (RQ1-RQ4), regression analysis of human resources and cost efficiency with clusters indications (RQ5-RQ6) and thematic analysis with enforcement (and further) preferences, double-checked by AI, with further cluster indications.

Descriptive Analysis With Trends Indications

We begin by determining how many European Patents the EPO granted to subjects from each and every EU member state in each of the two full years of the UPS operation, in 2024 and 2025 (Table 1.).

Table 1. Unitary Patents in 2024, in 2025 and in 2025 as opposed to 2024

Unitary Patents	2024	2025	2025v2024
European Union – 27 countries (from 2020)	14760	16548	112%
Belgium	527	576	109%
Bulgaria	11	20	182%
Czechia	73	81	111%
Denmark	660	728	110%
Germany	5277	5951	113%
Estonia	28	32	114%
Ireland	246	279	113%
Greece	24	42	175%
Spain	463	554	120%
France	1895	2195	116%
Croatia	5	10	200%
Italy	1670	1869	112%
Cyprus	15	30	200%
Latvia	12	25	208%
Lithuania	19	38	200%
Luxembourg	64	58	91%
Hungary	36	44	122%
Malta	19	20	105%
Netherlands	952	1090	114%
Austria	710	722	102%
Poland	116	186	160%
Portugal	103	122	118%
Romania	10	12	120%
Slovenia	54	50	93%
Slovakia	24	24	100%
Finland	499	554	111%
Sweden	1248	1236	99%

Source: own study based on EPO dashboard.

Generally, Unitary Patents continue to gain popularity and the EU-wide annual increase from 2024 to 2025 reaches 112%. A radical increase appeared only among subjects from EU member states (Bulgaria, Greece, Croatia, Latvia) that recorded very low results in 2024, *i.e.* their elevated Unitary Patent count so far represents only a small correction of prior very poor results. No EU member state fell below 90% and so we can propose that no dramatic changes have emerged in the Unitary Patents subjects obtained in 2024 and 2025. Examining UPCA involvement (A, B, C) and the ratio of Unitary Patents in 2024 and 2025 against the population (inhabitants) and investment (GERD) seven years earlier, (2017 and 2018) yields more specific information on the relationship between Unitary Patents and available population and financial resources seven years ahead (Table 2).

Table 2. Inhabitants and GERD in 2017 and in 2018 v Unitary Patents in 2024 and in 2025

Country	A	B	C	2024UP	Inh2017/ UP2024	GERD2017/ UP2025	2025 UP	Inh2018/UP2024 in mill EUR	
European Union 27 countries (from 2020)				14 760			16 548		
Belgium	x			527	21 540	23	576	19 789	23
Bulgaria	x			11	622 683	35	20	337 871	21
Czechia		x		73	144 915	47	81	130 988	49
Denmark	x			660	8710	13	728	7941	12
Germany	x			5277	15 638	19	5951	13 912	18
Estonia	x			28	46 987	11	32	41 223	11
Ireland		x		246	19 509	15	279	17 404	13
Greece		x		24	448 675	85	42	255 742	52
Spain			x	463	100 426	30	554	84 197	27
France	x			1895	35 256	27	2195	30 536	24
Croatia			x	5	815 754	85	10	401 434	50
Italy	x			1670	35 968	14	1869	32 069	14
Cyprus		x		15	57 992	7	30	29 287	4
Latvia	x			12	162 510	11	25	77 375	7
Lithuania	x			19	150 478	20	38	74 374	11
Luxembourg	x			64	9229	11	58	10 379	12
Hungary		x		36	270 552	46	44	220 765	47
Malta	x			19	24 178	3	20	23 742	4
Netherlands	x			952	17 943	17	1090	15 762	15
Austria	x			710	12 356	16	722	12 219	16
Poland			x	116	327 353	42	186	204 176	32
Portugal	x			103	100 432	25	122	84 719	23
Romania	x			10	1 964 395	94	12	1 627 790	85
Slovenia	x			54	38 257	15	50	41 338	18
Slovakia		x		24	226 473	31	24	226 797	31
Finland	x			499	11 029	12	554	9951	12
Sweden	x			1248	8009	13	1236	8188	13

Source: own study based on Eurostat and EPO dashboard (EPO, 2026).

This focused overview shows that the Unitary Patenting efficiency, while considering the population (inhabitants) and financial investment (costs) at the estimated average beginning of the inventive process (seven years prior), remains broadly consistent within each state, yet dramatic differences appear between states, as prior similar studies on R&D versus patenting have suggested (Potužáková & Öhm, 2018; Ujwary-Gil & Florek-Paszowska, 2025). *Prima facie*, the largest bulk of population and investment per Unitary Patent appears in Romania, while the smallest bulk falls to the Scandinavian trio (Sweden, Denmark, and Finland) and in very small states with a high risk of statistics impairment, given the particularism of their economy coupled with their small size (Cyprus, Latvia, Luxembourg). Visualisation helps us appreciate the human resources efficiency of Unitary Patenting while linking 2017 inhabitants and 2024 Unitary Patents and 2018 inhabitants and 2025 Unitary Patents.

Figure 1 shows the index 'Inh versus UP' changes from 2024 to 2025, with states sorted from most to least efficient in 2024. Figure 1 confirms the Scandinavian trio's leadership followed by Austria and all European communities creating states – Germany, France, Italy, Benelux. EU member states with the lowest concentration of Unitary Patents per inhabitants lie among agriculture-oriented South-Eastern states – Romania, Croatia, Bulgaria, Greece, Poland, and Hungary (RQ1). *Prima facie*, no dramatic trend changes appear but, to double-check, we visualise the dynamics in Figure 2.

Comparing 2017-2024 versus 2018-2025, the human resources efficiency appears to be increasing for almost all states (blue) and generally no dramatic changes occur (RQ2). Namely the drop occurred only in Sweden, Luxembourg, Slovakia, and Slovenia (red), but did not exceed 20 %. In contrast, the

biggest increase in the human resources efficiency achieved 40-50%, and it was in the Southern and Eastern states with generally not impressive Unitary Patenting results. Plainly, trends remain and changes are rather moderate adjustments. This invites the consideration of cost efficiency (see Figure 3) and its development (see Figure 4).

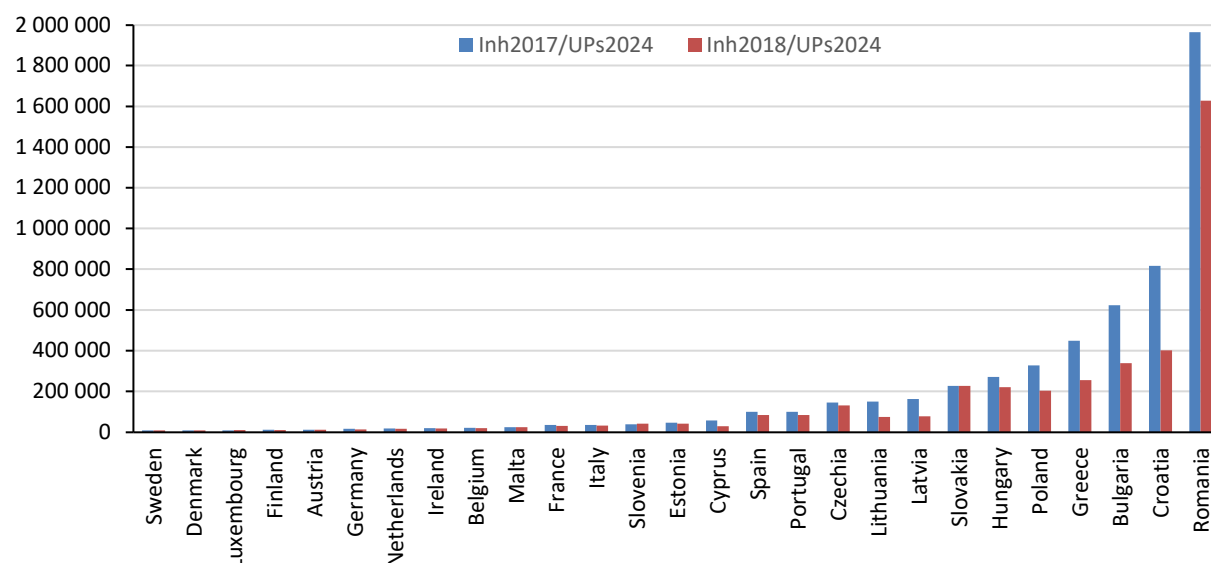


Figure 1. Human resource efficiency – Inhabitants 2017/2018 v Unitary Patents in 2024/2025 – static

Source: own elaboration based on Eurostat and EPO dashboard.

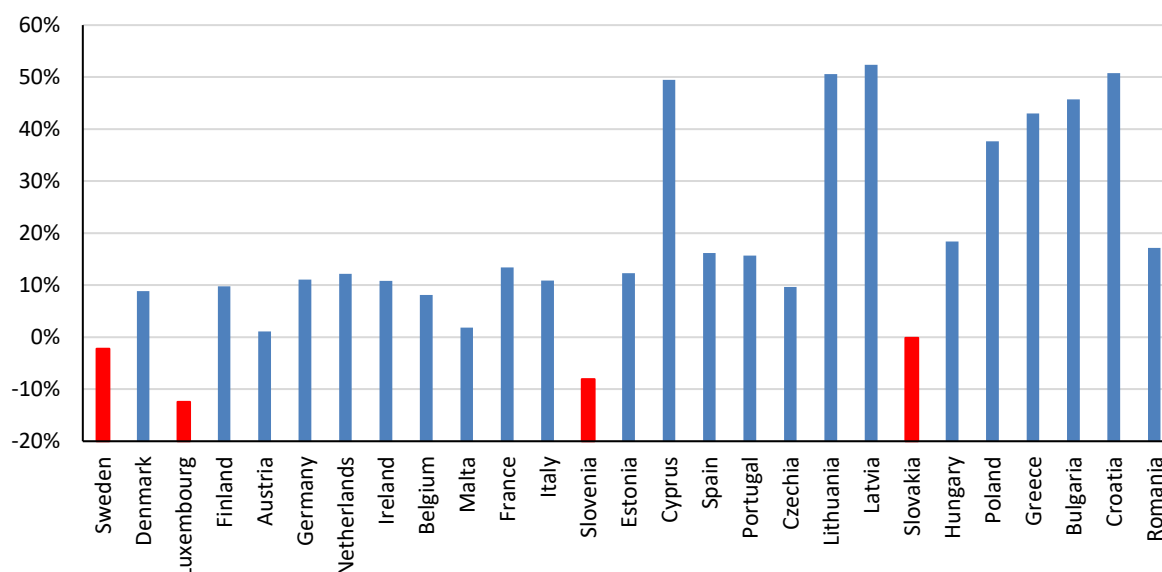


Figure 2. Human resource efficiency – Inhabitants 2017/2018 v Unitary Patents in 2024/2025 – trend dynamics aka Improvement in the Index Inhabitants v UP

Source: own elaboration based on Eurostat and EPO dashboard.

Figure 3 shows the index 'GERD versus UP' in 2024 to 2025. The EU member states are sorted from the most efficient to the least efficient one in 2024. Cost efficiency rises (*i.e.* the index decreased) in most countries. Furthermore, the lowest efficiency in both GERD 2017/UP2024 and GERD2018/UP2025 appears in Romania, fully matching prior studies on innovation differences among EU member states (Decyk, 2025). Moreover, the least cost-efficient EU member states – namely Czech Republic, Greece, Hungary, Slovakia, Croatia, Poland, Spain, and until 2024, Romania – neither hold full UPS membership nor have ratified the UPCA (RQ3). Therefore, we suggest that the starting cost-

efficiency stood markedly worse for reluctant, late, or non-joining UPS member states. And what about the development of cost efficiency, in particular in EU member states for which the literature expected or even proclaimed improvement, such as Slovakia, Romania, or Spain (Garncarz & Michalik, 2025)?

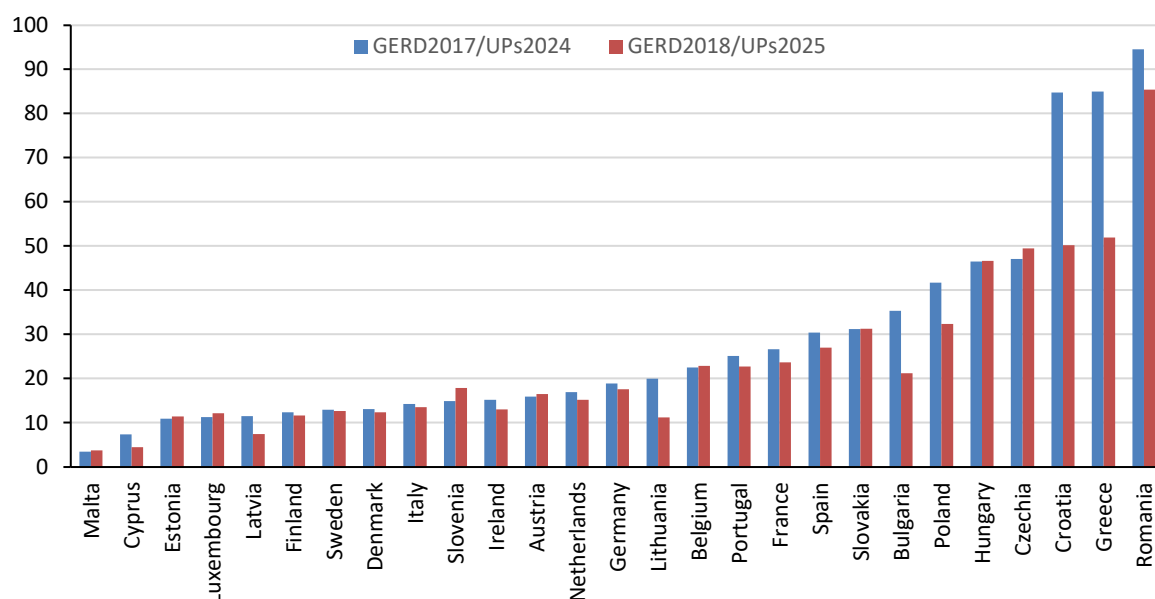


Figure 3. Cost efficiency – GERD 2017/2018 v Unitary Patents in 2024/2025; static

Source: own elaboration based on Eurostat and EPO dashboard.

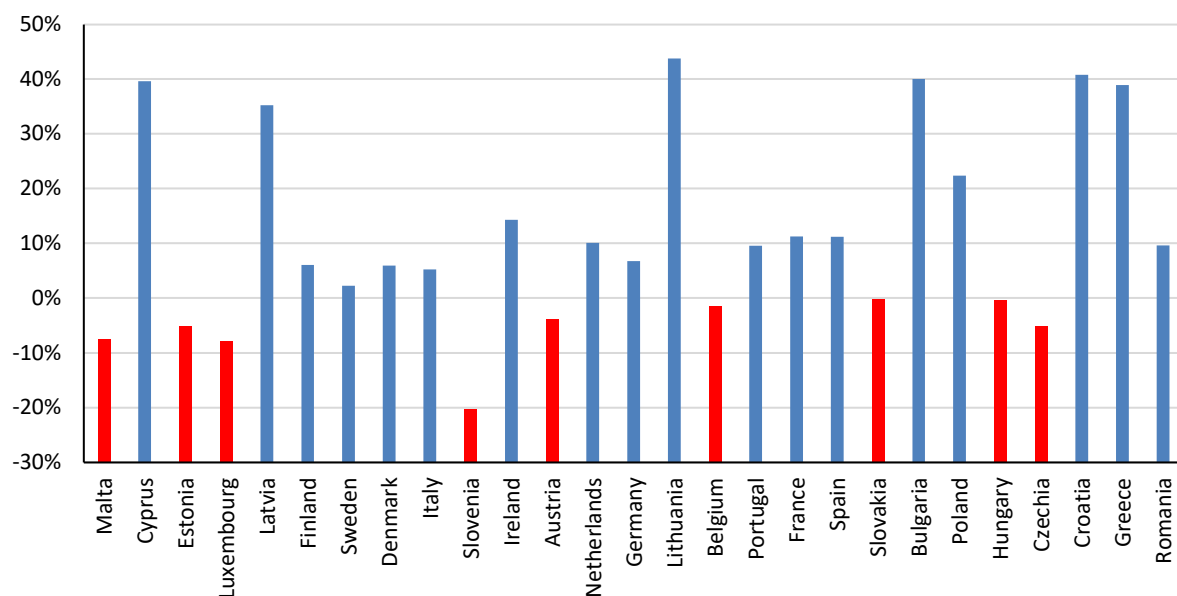


Figure 4. Cost efficiency – Inhabitants 2017/2018 v Unitary Patents in 2024/2025 – trend dynamics aka Improvement in the Index GERD v UP

Source: own elaboration based on Eurostat and EPO dashboard.

Figure 4 shows the percentage changes in this efficiency. EU member states where cost efficiency rose appear in blue again and, where it fell, in red. Improvements arose predominantly in smaller EU member states with unimpressive cost efficiency, *i.e.* they fell by up to 30% and rose by up to 45% (RQ4). This descriptive analysis grounds the following regression analysis.

Regression Analysis With Cluster Indications

We developed two linear regression models separately, for both 2017-2024 and 2018-2025. We used GERD in EUR per capita seven years earlier as the independent variable. and UP per million inhabitants as the dependent variable. Both models prove highly statistically significant. The R-squared of the first model exceeds 90%, while the second model falls just below this benchmark, see Figure 5 for RQ5 and Figure 6 for RQ6.

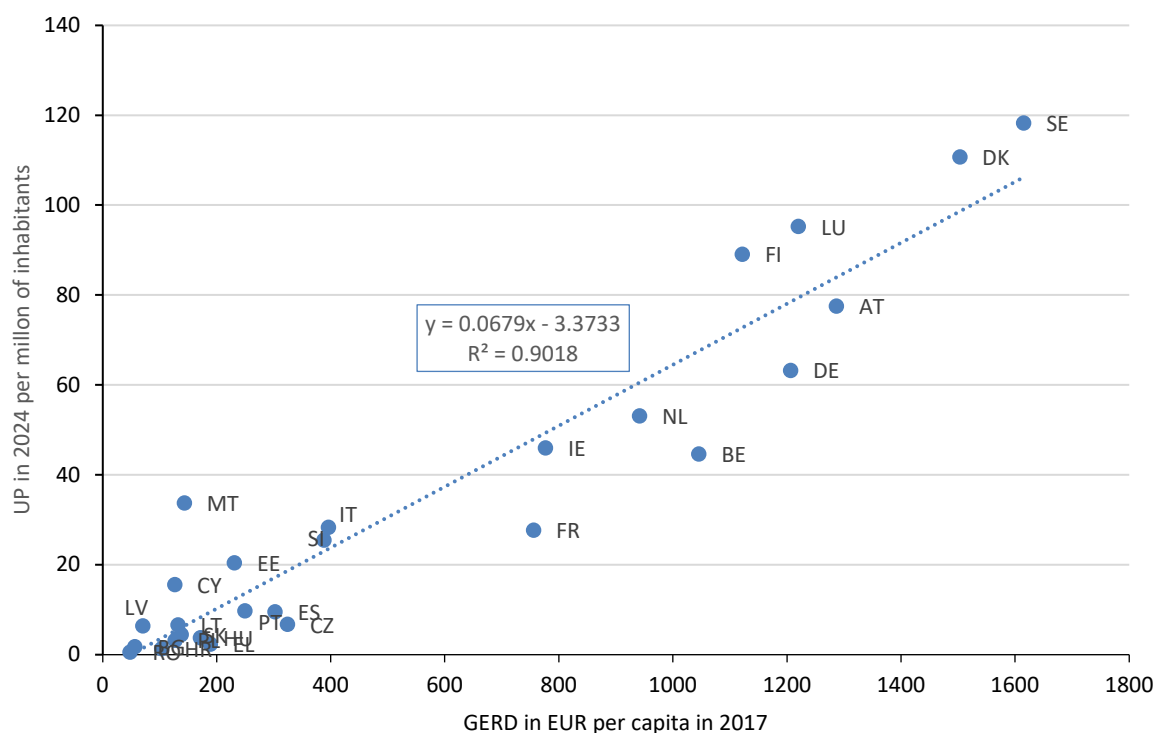


Figure 5. Linear regression model: UP in 2024 per million of inhabitants v GERD in EUR per capita in 2017

Source: own elaboration based on Eurostat and EPO dashboard.

The first linear regression model of combined human resources and cost efficiency for Unitary patenting 2017v 2024, *i.e.* Inhabitants 2017/UP 2024 index (human resource efficiency) and GERD 2017/UP 2024 index (cost efficiency) confirms Scandinavia's leadership, followed by Austria and, partly, the original six EC states, as France, and Belgium underperform while Italy outperforms them (RQ5) (see Figure 5). This aligns with prior studies (Scellato, 2007). For comparison, we should now examine the second linear regression model (see Figure 6).

The second linear regression model of combined human resources and cost efficiency for Unitary patenting 2018 versus 2025, *i.e.* Inhabitants 2018/UP 2025 index (human resource efficiency) and GERD 2018/UP 2025 index (cost efficiency), reconfirms Scandinavia's leadership followed by Austria and only partly the original six EC states, as France and Belgium underperform while Italy outperforms them (RQ6) (see Figure 6).

However, we argue that Unitary Patenting must move beyond plain numbers and recognise the dramatic differences between Unitary Patents: some patents prove critical for innovations while others lie forgotten and unused at the bottom of a desk drawer. A key indicator of truly valuable and innovation-driving patents lies in the determination to protect and enforce them by litigating until the *rei judicata* decision by the top instance – the UPCoA. These procedural preferences form an integral part of the Unitary Patenting efficiency assessment.

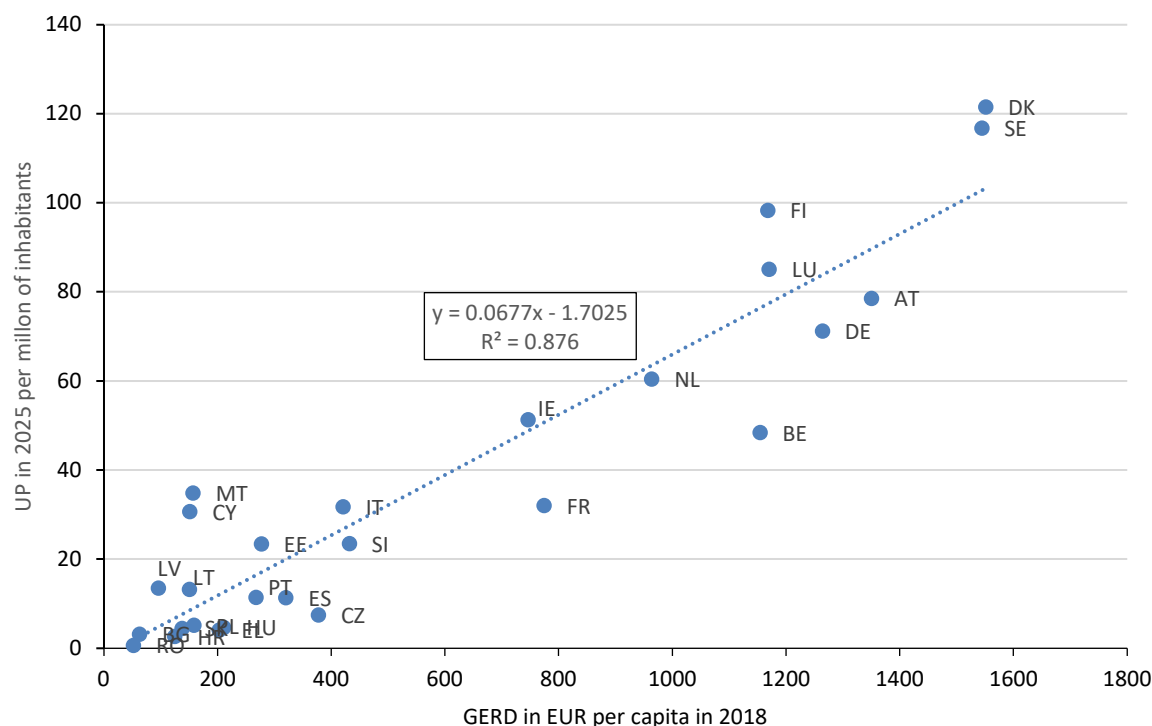


Figure 6. Linear regression model: UP in 2025 per million of inhabitants v GERD in EUR per capita in 2018

Source: own elaboration based on Eurostat and EPO dashboard.

Thematic Analysis With Procedural Preferences Indications and AI Double Check

Table 3 summarises all final judgements by the appeal instance of the UPS, *i.e.* the UPCoA, until the 9th of January 2026, and shows that only two of these 82 proceedings did not run in English, see Table 3.

Table 3 reveals not only English language's total dominance but also German language's clear second position – with 30 out of the 82 proceedings – along with the absence of any clear third position. Specifically, based on the data available so far, patent holders enforce Unitary Patents in English, German, and occasionally in Italian, Danish, and Dutch – with the same litigants often appearing, with typical plaintiffs (JUUL Labs, Volkswagen AG) and typical defendants emerging (NJOY Netherlands B.V., Xiaomi). Recalling the principal controversies around the UPS, this delivers a clear answer: subjects insist on enforcing Unitary Patenting in English and German. Thus, it obviates any third language and makes the entire debate about French, Italian, and Spanish appear obsolete (RQ7).

From this emerges a proposition on shared features Unitary Patenting efficiency and commitment leaders, *i.e.* the descriptive analysis, regression analysis and thematic procedural exploration imply that subjects managing to get the most Unitary Patents while having the lowest human resources and cost demands are typically from EU member states which (RQ8):

1. are full UPS members (category A);
2. have consistently recognized the importance of innovations and justification of patents;
3. take the lean, consistent and not over-regulatory approach;
4. leave the R&D and patenting predominantly to private parties with a minimal involvement of the state;
5. are not focusing on agriculture;
6. have joined the EU before 2004;
7. their population masters English and German.

These propositions echo prior studies on the importance of proper framework, attitude, and financing (Appio *et al.*, 2022; Beneito, 2023; Decyk, 2025; MacGregor Pelikánová *et al.*, 2025), while foregrounding the predominance of private patenting, the negative impact of a stronger state involvement, and the lin-

guistic primacy of English and German, *i.e.* signalling the growing redundancy of the French-Spanish patenting discourse and other ‘historical-cultural’ disputes (MacGregor Pelikánová & Beneš, 2023). Such propositions carry very serious consequences at the state level, for policy, and at the business level, for managerial strategy, naturally inviting further verification, development, and refinement.

Table 3. UPCoA final judgments until 9th January, 2026

DateSort ascending	Registry number/Order reference	EN	DE	Oth
09 January 2026	UPC_CoA_328/2025, APL_16780/2025	1	0	0
09 January 2026	UPC_CoA_237/2025, APL_13193/2025	1	0	0
09 January 2026	UPC_CoA_257/2025, APL_14348/2025	1	0	0
29 December 2025	APL_4383/2025, UPC_CoA_71/2025	1	0	0
24 December 2025	App_20809/2025, UPC_CoA_523/2024	1	0	0
23 December 2025	UPC_CoA_691/2025	1	0	0
22 December 2025	UPC-COA-0000886/2025	1	0	0
19 December 2025	App_35643/2025	1	0	0
09 December 2025	APL_366/2025	1	0	IT
27 November 2025	UPC_CoA_70/2025	0	1	0
27 November 2025	PC-CoA-001/2025	0	1	0
25 November 2025	UPC_CoA_528/2024	1	0	0
25 November 2025	UPC_CoA_529/2024	1	0	0
25 November 2025	UPC_CoA_464/2024, UPC_CoA_457/2024...	1	0	0
05 November 2025	APL_64022/2024	1	1	0
05 November 2025	APL_64706/2024	1	1	0
03 October 2025	UPC_CoA_19/2025	1	1	0
03 October 2025	UPC_CoA_683/2024	1	1	0
03 October 2025	UPC_CoA_534/2024	1	1	0
02 October 2025	UPC_CoA_774/2024	1	1	0
02 October 2025	UPC_CoA_764/2024	1	1	0
01 October 2025	UPC_CoA_681/2025	1	0	0
13 August 2025	APL_24205/2025	1	0	0
12 July 2025	APL_55849/2024	1	0	0
09 July 2025	APL_23093/2025	1	0	0
09 July 2025	APL_23095/2025	1	0	0
03 July 2025	APL_12280/2025	1	0	0
03 July 2025	APL_8639/2025	1	1	0
26 June 2025	APL_36389/2024	1	0	0
23 June 2025	APL_14947/2025	1	0	0
20 June 2025	APL_20694/2025	1	0	0
06 June 2025	APL_57918/2024	1	1	0
04 June 2025	APL_13146/2025	1	0	DK
02 June 2025	APL_8790/2025	1	1	0
30 May 2025	APL_68523/2024	1	1	0
01 May 2025	APL_64374/2024	1	0	0
14 April 2025	APL_8326/2025	1	0	0
11 April 2025	APL_9191/2025	1	0	0
26 March 2025	APL_31428/2024	1	1	0
04 March 2025	APL_51115/2024	1	0	0
14 February 2025	APL_39664/2024	1	0	0
12 February 2025	APL_58177/2024	1	0	0
10 January 2025	APL_54646/2024	1	0	0
09 January 2025	APL_46747/2024	1	0	0
20 December 2024	APL_40470/2024	1	0	0
20 December 2024	APL_40553/2024	1	0	0
10 December 2024	APL_593120/2023	1	1	0

DateSort ascending	Registry number/Order reference	EN	DE	Oth
03 December 2024	APL_32012/2024	1	1	0
21 November 2024	APL_50205/2024	1	0	0
21 November 2024	APL_44633/2024	1	0	NL
12 November 2024	APL_596007/2023 & APL_596892/2023	1	0	0
12 November 2024	APL_596007/2023	1	0	0
04 October 2024	APL_83/2024	1	1	0
25 September 2024	APL_21143/2024	1	1	0
25 September 2024	APL_21143/2024	1	1	0
24 September 2024	APL_32350/2024	1	1	0
24 September 2024	APL_32345/2024	1	1	0
24 September 2024	APL_32347/2024	1	1	0
18 September 2024	APL_30169/2024	1	1	0
18 September 2024	APL_30168/2024	1	0	0
18 September 2024	APL_38206/2024	1	0	0
18 September 2024	APL_38948/2024	1	0	0
17 September 2024	APL_25919/2024	1	0	0
17 September 2024	APL_26889/2024	1	0	0
17 September 2024	APL_25922/2024	1	0	0
16 September 2024	APL_33746/2024	1	0	0
05 September 2024	APL_24598/2024	1	1	0
05 September 2024	APL_12739/2024	1	1	0
03 September 2024	APL_21943/2024	1	1	0
06 August 2024	APL_21602/2024	1	0	0
06 August 2024	APL_10370/2024	1	1	0
06 August 2024	APL_24585/2024	1	1	0
23 July 2024	APL_20002/2024	1	0	0
04 June 2024	APL_9578/2024	1	0	0
28 May 2024	APL_3507/2024	1	0	0
13 May 2024	APL_8/2024	1	1	0
17 April 2024	APL_12116/2024	1	1	0
03 April 2024	APL_588422/2023	1	0	0
03 April 2024	APL_588425/2023	1	0	0
03 April 2024	APL_588423/2023	1	0	0
03 April 2024	APL_588420/2023	1	0	0
03 April 2024	APL_588426/2023	1	0	0
Total		80	30	

Source: own study based on UPCoA collection.

To complement these propositions, and as we previously discussed in similar cases (Balcerzak, & Valaskova, 2024; Rubáček & MacGregor Pelikánová, 2025), we placed RQ8 as a prompt to AI – ChatGPT – which produced the following suggestions:

- early ratification and political commitment to the UPC/UP system;
- high innovation capacity and frequent patent use;
- legal and administrative readiness, including professional ecosystems that support cross-border patent management;
- economic incentives to reduce costs and complexity;
- policy alignment with broader EU IP objectives.

To elicit an even more specific AI answers, comparable to our findings above, we asked AI to identify the most efficient states, which led to the following:

- Nordic countries (Denmark, Sweden, Finland) show above-average uptake relative to population, indicating efficient use of the UPS;

- large EU innovators (Germany, Netherlands) generate high absolute volumes and also show solid relative performance;
- smaller states with strong innovation ecosystems often convert a higher share of their European patents into Unitary Patents, reflecting effective utilisation.

These replies do not contradict our propositions above yet remain markedly more superficial and partly misleading, see, for example, the overstatement of Germany, the neglect of France's poor position, and the disregard of Italian particularities (Scellato, 2007) and high success rates (MacGregor Pelikánová *et al.*, 2025; Rubáček & MacGregor Pelikánová, 2025).

CONCLUSIONS

Unitary Patents continue to gain ground steadily across the EU, in particular in the 18 full UPC member states (UPCA category A) yet dramatic differences persist in human-resource efficiency and cost efficiency among EU member states, while GDP and population size, on their own, do not matter.

The descriptive analysis reveals that the Unitary Patenting efficiency of EU member states, based on human capital (human-resource efficiency), has shifted little (RQ2) and points to the leadership of the Scandinavian trio followed by Austria and all six states creating originally European communities: Germany, France, Italy, Benelux. Meanwhile, the EU member states with the lowest concentration of Unitary Patents per inhabitants lie among agriculture-oriented South-Eastern states such as Romania, Croatia, Bulgaria, Greece, Poland, and Hungary (RQ1). Results regarding Unitary Patenting efficiency among EU member states, based on financial expenses (cost efficiency), look very similar: no dramatic change has emerged so far (RQ4) and the cost-efficiency leaders broadly match those as in the case of human resources efficiency (RQ3).

What confirms Scandinavia's leadership followed by Austria and only partly the original six EC states (RQ5, RQ6) are regression analyses of human resources efficiency and cost efficiency with two separate linear models for Unitary Patenting 2017 versus 2024 – *i.e.* the Inhabitants 2017/UP 2024 index (human resource efficiency) and the GERD 2017/UP 2024 index (cost efficiency) – and for Unitary Patenting 2018 versus 2025, *i.e.* the Inhabitants 2018/UP 2025 index (human resource efficiency) and the GERD 2018/UP 2025 index (cost efficiency). Notably, France and Belgium underperform as Italy outperforms them, while most non-full UPCA members trail far behind. Both models reach high statistical significance and confirm that no dramatic changes have emerged in the longitudinal perspective and that broadly the same EU member states excel in both human-resources and cost efficiency (RQ5, RQ6).

The thematic analysis regarding enforcement before the UPCoA shows a strong commitment to enforcing Unitary Patents by large businesses (often the same) preferring English and German proceedings and showing no interest in any other languages, including French (RQ7). An advanced analysis, AI-double-checked, suggests the features of Unitary Patenting efficiency leaders and absolute size (population and GDP) clearly does not matter. Instead, seven features characterise Unitary Patenting efficiency leaders: full UPS membership (1), consistent patent justification and recognition (2), lean approach (3), private-party-led with minimal state involvement (4), industrial rather than agricultural focus (5), membership in the EU before 2004 (6), and mastering English and German languages (7).

Naturally, this study faced two principal inherent limitations. Firstly, the investing-inventing-patenting-innovation dynamics are extremely challenging for the selection and employment of conventional methodology tools. Consequently, the employed matrix triad and implied research questions built upon recently established methodologic strategies, but certainly are not conclusive and require further testing and improving, in particular regarding new patenting indexing and modelling. Secondly, due to the existence of the UPS only since 2023, the full annual data sets regarding Unitary Patents cover only 2024 and 2025. Naturally, in the future this limitation should be overcome with data about Unitary Patents in the following years. Furthermore, this improved and extended data set could help with the double checking of the appropriateness of the use of the seven-years delay and with the refinement of the indication of the efficiency leaders, which should definitely be respected and followed by other EU member states that should inspire future EU as well as national policies and law.

REFERENCES

- Abbas, R., Michael, K., Davlembayeva, D., Papagiannidis, S., & Pitt J. (2024). Public Interest Technology for Innovation in Global Development: Recommendations for Launching PIT Projects. *IEEE Transactions on Technology and Society*, 5(1), 14-23. <https://doi.org/10.1109/TTS.2024.3375431>
- Appio, F. P., Baglieri, D., Cesaroni, F., Spicuzza, L., & Donato, A. (2022). Patent design strategies: Empirical evidence from European patents. *Technological Forecasting and Social Change*, 181, Article 121776. <https://doi.org/10.1016/j.techfore.2022.121776>
- Asad, A. I., Popesko, B., & Damborský, M. (2024). The nexus between economic policy uncertainty and innovation performance in Visegrad group countries. *Oeconomia Copernicana*, 15(3), 1067-1100. <https://doi.org/10.24136/oc.2804>
- Ashrafi, D.M., & Easmin, R. (2023). The Role of Innovation Resistance and Technology Readiness in the Adoption of QR Code Payments Among Digital Natives: A Serial Moderated Mediation Model. *International Journal of Business Science and Applied Management*, 18(1), 19-45. <https://doi.org/10.69864/ijbsam.18-1.169>
- Balcerzak, A., & MacGregor Pelikánová, R. (2020). Projection of SDGs in Codes of Ethics – Case study about Lost in Translation? *Administrative Sciences*, 10(4), 1-18. Paper 95. <https://doi.org/10.3390/admsci10040095>
- Balcerzak, A. P., & Valaskova, K. (2024). Artificial intelligence: Financial management under pressure of transformative technology. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 19(4), 1127-1137. <https://doi.org/10.24136/eq.3394>
- Barabino, G. (2019). Reframing innovation. *Technology & Innovation*, 20(4), 361-366. <https://doi.org/infodroje.czu.cz/10.21300/20.4.2019.361>
- Baynes, K. (1989). Kant on Property Rights and the Social Contract. *The Monist*, 72(3), 433-453. Retrieved from <http://www.jstor.org/stable/27903149> on February 1, 2026.
- Beneito, P. (2023). Choosing among alternative technological strategies: An empirical analysis of formal sources of innovation. *Research Policy*, 32(4), 693-713. [https://doi.org/10.1016/S0048-7333\(02\)00079-3](https://doi.org/10.1016/S0048-7333(02)00079-3)
- Beugr, C. D. (2002). Understanding organizational justice and its impact on managing employees: an African perspective. *The International Journal of Human Resource Management*, 13(7), 1091-1104. <https://doi.org/10.1080/09585190210131311>
- Bieńkowska, A. ., Tworek, K. ., Voropai, O. ., & Zimmer, J. (2025). Human-centric approach to creating sustainable innovation in the context of Industry 5.0. *Entrepreneurial Business and Economics Review*, 13(3), 115-134. <https://doi.org/10.15678/EBER.2025.130306>
- Bigos, K., & Wach, K. (2021). Product innovation as the cause for export propensity in the Caucasus: Empirical evidence for Armenia, Azerbaijan and Georgia. *Central Asia and the Caucasus*, 22(2), 90-100. <https://doi.org/10.37178/ca-c.21.2.08>
- Crass, D., Garcia Valero, F., Pitton, F., & Rammer, C. (2019). Protecting Innovation Through Patents and Trade Secrets: Evidence for Firms with a Single Innovation. *International Journal of the Economics of Business*, 26(1), 117-156. <https://doi.org/10.1080/13571516.2019.1553291>
- Dahanayake, P., Rajendran, D., Selvarajah, C. and Ballantyne, G. (2018). Justice and fairness in the workplace: a trajectory for managing diversity. *Equality, Diversity and Inclusion*, 37(5), 470-490. <https://doi.org/10.1108/EDI-11-2016-0105>
- Das, R.C. (2020). Interplays among R&D spending, patent and income growth: New empirical evidence from the panel of countries and groups. *Journal of Innovation and Entrepreneurship*, 9(18). <https://doi.org/10.1186/s13731-020-00130-8>
- De Rassenfosse, G., Dernis, H., Guellec, D., Picci, L., & de la Potterie, B. V. P. (2013). The worldwide count of priority patents: A new indicator of inventive activity. *Research Policy*, 42(3), 720-737. <https://doi.org/10.1016/j.respol.2012.11.002>
- De Rassenfosse, D., & Palangkaraya, A. (2023). Do patent pledges accelerate innovation?. *Research Policy*, 52(5), 104745. <https://doi.org/10.1016/j.respol.2023.104745>
- Decyk, K. (2025). Innovation activity in European Union service sector: Similarities or differences?. *International Entrepreneurship Review*, 11(2), 135-154. <https://doi.org/10.15678/IER.2025.1102.08>
- Drucker, P.F. (2015). *Innovation and Entrepreneurship*. London and New York, Routledge Classic.

- Dvouletý, O., & MacGregor Pelikánová, R. (2025). Relationship between patenting and economic development - message implied by the Czechoslovakian experience from 1918 to 1991. *Innovation: The European Journal of Social Science Research*, 1-12. <https://doi.org/10.1080/13511610.2025.2591053>
- Dzallias, M., & Blind, K. (2019). Innovation indicators throughout the innovation process: an extensive literature analysis. *Technovation*, 80, 3-29. <https://doi.org/10.1016/j.technovation.2018.05.005>
- EPO (2026). EPO Dashboard Unitary Patent Statics. Retrieved from <https://www.epo.org/en/about-us/statistics/statistics-centre#/unitary-patent>. on 1 June 2026.
- Fedajev, A., Kojić, M., Mitić, P., & Radulescu, M. (2025). Drivers of entrepreneurship in Europe: The role of digitalization, innovation, capital investments, unemployment, and sustainability. *European Journal of Innovation Management*. <https://doi.org/10.1108/EJIM-04-2024-0497>
- Fritsch, M., Titze, M., & Piontek, M. (2020). Identifying cooperation for innovation—a comparison of data sources. *Industry and Innovation*, 27(6), 630-659. <https://doi.org/10.1080/13662716.2019.1650253>
- Garncarz, J., & Michalik, A. (2025). The role of innovation in the internationalisation process of Slovakian businesses. *International Entrepreneurship Review*, 11(2), 71-81. <https://doi.org/10.15678/IER.2025.1102.04>
- Gourevitch, V. (1975). Rawls on Justice. *The Review of Metaphysics*, 28(3), 485-519. Retrieved from <http://www.jstor.org/stable/20126667> on February 1, 2026.
- Gunn, J.A.W. (1968). Jeremy Bentham and the Public Interest. *Canadian Journal of Political Science / Revue Canadienne de Science Politique*, 1(4), 398-413. <http://www.jstor.org/stable/3231517>
- Hall, B. H. (2024). Patents, innovation, and development. *International Review of Applied Economics*, 38(1-2), 17-42. <https://doi.org/10.1080/02692171.2021.2022295>
- Jagannathan, D. (2019). Aristotle's Legal and Social Philosophy. In Sellers, M., & Kirste, S. (Eds.) *Encyclopedia of the Philosophy of Law and Social Philosophy*. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-6730-0_411-1
- Kaesling, K. (2013). The European patent with unitary effect – A unitary patent protection for a unitary market?. *UCL Journal of and Jurisprudence*, 2(1), 87-111. <https://doi.org/10.14324/111.2052-1871.004>
- Koellinger, P. (2008). The relationship between technology, innovation, and firm performance – Empirical evidence from e-business in Europe. *Research Policy*, 37(8), 1317-1328. <https://doi.org/10.1016/j.respol.2008.04.024>
- Lashitew, A.A., Bals, L. & van Tulder, R. (2020). Inclusive Business at the Base of the Pyramid: The Role of Embeddedness for Enabling Social Innovations. *Journal of Business Ethics*, 162, 421-448. <https://doi.org/10.1007/s10551-018-3995-y>
- Lopata, B. B. (1973). Property Theory in Hobbes. *Political Theory*, 1(2), 203-218. Retrieved from <http://www.jstor.org/stable/191194> on February 1, 2026.
- Lustig, B.A. (1991). Natural Law, Property, and Justice: The General Justification of Property in John Locke. *The Journal of Religious Ethics*, 19(1), 119-149. Retrieved from <http://www.jstor.org/stable/40015119> on February 1, 2026.
- MacGregor Pelikánová, R. (2019). R&D expenditure and innovation in the EU and selected member states. *JEMI – Journal of Entrepreneurship, Management and Innovation*, 15(1), 13-33. <https://doi.org/10.7341/20191511>
- MacGregor Pelikánová, R., & Beneš, M. (2023). A Turbulent Pathway to Uniform Patent Protection in the EU. *Roma Tre Law Review*, 2, 39-60. Retrieved from <https://romatrepress.uniroma3.it/libro/roma-tre-lawreview-02-2023/> on February 1, 2026.
- MacGregor Pelikánová, R., Hála, M., & Beneš, M. (2025). Unitary Patent System and innovation dynamics in the European Union: The role of economic resources and R&D investments. *JEMI – Journal of Entrepreneurship, Management and Innovation*, 21(2), 98-115. <https://doi.org/10.7341/20252126>
- MacGregor Pelikánová, R., Sani, M., Rubáček, F. (2024). Sustainable And Responsible Creation Of Shared Values In The Fast Fashion Industry – I Will Believe It When I See It. *Visions for Sustainability*, 21, 8873, 1-29. <https://doi.org/10.13135/2384-8677/8873>
- Marx, K. (1969). *Theories of surplus value*. London: Lawrence & Wishart London.
- Malla, B., & Zdziarski, M. (2025). Sustainable business models in small and medium-sized enterprises: State of the art and future research directions. *International Entrepreneurship Review*, 11(4), 21-35. <https://doi.org/10.15678/IER.2025.1104.02>
- Marikyan, D., & Papagiannidis, S. (2024). Exercising the "Right to Repair": A Customer's Perspective. *Journal of Business Ethics*, 193, 35-61. <https://doi.org/10.1007/s10551-023-05569-9>

- Michael, K., & Abbas, R. (2020). What is public interest technology? International Symposium on Technology and Society [online]. Retrieved from <https://attend.ieee.org/istas-2020> on February 1, 2026.
- Moser, P. (2013). Patents and Innovation: Evidence from Economic History. *The Journal of Economic Perspectives* 27(1): 23-44. Retrieved from <https://www.aeaweb.org/articles?id=10.1257/jep.27.1.23> on February 1, 2026.
- Nicolai, T.R. (1971). The European Patent Convention: A Theoretical and Practical Look at International Legislation. *The International Lawyer*, 5(1), 135-164. <http://www.jstor.org/stable/40704650>
- Nunes, P. M., Serrasqueiro, Z., & Leitão, J. (2012). Is there a linear relationship between R&D intensity and growth? Empirical evidence of non-hightech vs. high-tech SMEs. *Research Policy*, 41(1), 36-53. <https://doi.org/10.1016/j.respol.2011.08.011>
- Potužáková, Z., & Ůhm, J. (2018). R&D investments. EPO patent applications and the economic heterogeneity within the EU. *Review of Economic Perspectives*, 18(2), 177-191. <https://doi.org/10.2478/revecp-2018-0010>
- Prędkiewicz, K., & Prędkiewicz, P. (2014). The Patents and Financial Performance of Firms – Evidence From Polish Manufacturing Companies. *Journal of Entrepreneurship, Management and Innovation*, 10(4), 115-141. <https://doi.org/10.7341/20141045>
- Priya, K. (2008). Intellectual Property and Hegelian Justification. *NJUS Law Review*, 359(1).
- Rahman, M.S. (2024). The Interplay among Distributive Justice, Procedural Justice, Self-Efficacy, and Career Satisfaction: A Cross-Sectional Study. *International Journal of Business Science and Applied Management*, 19(1), 30-46.
- Rubáček, F., & MacGregor Pelikánová, R. (2025). Top innovation EU member states based on European patenting: Politicians, academia and AI got it wrong?. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 20(3), 953-997. <https://doi.org/10.24136/eq.3883>
- Saikia, M., Das, P., & Neog, D. (2023). Evolution of growth theory: From Harrod to Romer. *Theoretical and Applied Economics, Volume XXX*, 2(635), 125-138.
- Scellato, G. (2007). Patents, firm size and financial constraints: An empirical analysis for a panel of Italian manufacturing firms. *Cambridge Journal of Economics*, 31(1), 55-76. <https://doi.org/10.1093/cje/bel006>
- Schumpeter, J.A. (1934). *The theory of economic development*. Cambridge: Harvard University Press.
- Schumpeter, J. (2003). Theorie der wirtschaftlichen Entwicklung. In Alois Schumpeter & Joseph Backhaus (Eds.), *The European Heritage in Economics and the Social Sciences* (pp. 5-59). Boston: Springer.
- Śledzik, K. (2013). Schumpeter's view on innovation and entrepreneurship. *SSRN Electronic Journal*, 89-94. <https://doi.org/10.2139/ssrn.2257783>
- Ujwary-Gil, A., & Florek-Paszkowska, A. (2025). Introduction to the innovability Index: More than the fusion of innovation and sustainability. *Journal of Entrepreneurship. Management and Innovation*, 21(2), 5-14. <https://doi.org/10.7341/20252121>
- UPC (2026). Unified Patent Court Overview. Retrieved from <https://www.unifiedpatentcourt.org/en/organisation/upc-member-states>. on June 1, 2026.
- Van Tulder, R., & Keen, N. (2018). Capturing Collaborative Challenges: Designing Complexity-Sensitive Theories of Change for Cross-Sector Partnerships. *Journal of Business Ethics*, 150, 315-332. <https://doi.org/10.1007/s10551-018-3857-7>
- Zygmunt, A. (2025). Enhancing the relationship between firm's green innovation and external knowledge flows: A review and research agenda. *International Entrepreneurship Review*, 11(1), 37-56. <https://doi.org/10.15678/IER.2025.1101.03>
- Zygmunt, A., & Dvouletý, O. (2024). Firm's innovation culture and external collaboration: Mapping the state of research. *Entrepreneurial Business and Economics Review*, 12(3), 161-184. <https://doi.org/10.15678/EBER.2024.120309>

Authors

The contribution share of authors amounted to 30% to Marek Beneš (MB), 30% to Martin Hála (MH), 30% Radka MacGregor Pelikánová (RMP), and 10% Robert Kenyon MacGregor (RKM). MB – research, drafting; MH – conceptualisation, methodology, calculation, statistics; RMP – research framework and literature review; RKM – discussion, drafting.

Marek Beneš

Senior academic lecturer and researcher at Metropolitan University Prague, Department of Legal Specialisations and Public Administration, Czech Republic. His research interests include legal aspects of innovations, copyright and the public dimension of the intellectual property.

Correspondence to: Marek Beneš, Department of Legal Specialisations and Public Administration, Metropolitan University Prague, Dubečská 900/10, 110 00 Prague 10 – Strašnice, Czech Republic, e-mail: marek.benes@mup.cz

ORCID  <https://orcid.org/0000-0002-6541-9676>

Martin Hála

Senior academic lecturer and researcher at Metropolitan University Prague, Department of International business, Czech Republic. His research interests include statistics, innovations and methodology development.

Correspondence to: Martin Hála, Department of International business, Metropolitan University Prague, Dubečská 900/10, 110 00 Prague 10 – Strašnice, Czech Republic, e-mail: martin.hala@mup.cz

ORCID  <https://orcid.org/0000-0003-4535-0330>

Radka MacGregor Pelikánová (corresponding author)

Senior academic lecturer and researcher at Metropolitan University Prague, Department of Financial management, Czech Republic. Her research interests include intellectual property, EU law and policy, and sustainability.

Correspondence to: Radka MacGregor Pelikánová, Department of Financial management, Metropolitan University Prague, Dubečská 900/10, 110 00 Prague 10 – Strašnice, Czech Republic, e-mail: radkamacgregor@yahoo.com

ORCID  <https://orcid.org/0000-0001-9628-7146>

Robert Kenyon MacGregor

Lecturer and writer at Metropolitan University Prague, Department of Financial management, Czech Republic. His research interests include US and EU policy, common law, and innovations.

Correspondence to: Robert Kenyon MacGregor, Department of Financial management, Metropolitan University Prague, Dubečská 900/10, 110 00 Prague 10 – Strašnice, Czech Republic, e-mail: robertkmacgregor@yahoo.com

ORCID  <https://orcid.org/0000-0003-2888-3880>

Acknowledgements and Financial Disclosure

This article is the result of Metropolitan University Prague research project no. 110-2 'Economic studies, International Business and Financial Management' (2026) funded by the Institutional Fund for the Long-Term Strategic Development of Research Organisations.

Use of Artificial Intelligence

We prepared the manuscript without the use of any AI/GAI.

Conflict of Interest

The authors declare that they conducted the research without any commercial or financial relationships that could imply a potential conflict of interest.

Copyright and License

This article is published under the terms of
the Creative Commons Attribution (CC BY 4.0) License
<http://creativecommons.org/licenses/by/4.0/>

Published by Krakow University of Economics – Krakow, Poland