

Financial Law Review

No. 38 (2)/2025

UNIVERSITY OF GDAŃSK • MASARYK UNIVERSITY • PAVEL JOZEF ŠAFÁRIK UNIVERSITY
<http://www.ejournals.eu/FLR>

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PATENTS, PROFITS, AND MACHINES: HOW AI IS RESHAPING INNOVATION AND TAXATION

Abstract

Patents grant inventors exclusive rights, fostering innovation while playing a crucial role in global tax strategy. Multinational corporations often exploit patent-related tax advantages by shifting intellectual property to low-tax jurisdictions, raising concerns over tax base erosion. Patent boxes, used by countries like the UK and Netherlands, offer reduced tax rates to stimulate R&D but face scrutiny from international bodies like the OECD, which promotes tighter regulations through initiatives like the BEPS Action Plan. Transfer pricing of patents remains contentious due to the difficulty of valuing intangible assets. The emergence of AI in innovation introduces further complexity as AI systems increasingly meet patent criteria, challenging current legal definitions that restrict inventorship to humans. High-profile cases like DABUS underscore the urgency of updating legal frameworks to address AI-generated inventions.

Additionally, AI is transforming how patents are evaluated and enforced, enhancing efficiency while raising ethical concerns around transparency and accountability. These developments affect income attribution, valuation, and regulatory compliance.

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In order to address these shifts, policymakers must clarify inventorship laws, develop global standards, reform tax guidelines, ensure AI transparency, and empower regulatory agencies with AI tools. As AI reshapes innovation, the intersection of patent law and taxation must evolve to ensure fairness and effectiveness in this new landscape. Governments face significant challenges in addressing transfer pricing for AI-generated assets, particularly due to the risk of profit shifting by multinational companies to low-tax jurisdictions. To counter these issues, reforms are being proposed, including modernizing intellectual property tax rules to reflect the role of non-human creators and strengthening transparency requirements across AI-driven value chains.

Key words: patent, artificial intelligence, taxation, profit shifting, generative AI impact

JEL Classification: K34

1. Introduction

Intellectual property (IP) assets have become increasingly central to firms' economic value, representing a substantial and growing share of corporate revenue streams. As with profits derived from tangible assets, income generated through the exploitation of IP is subject to taxation. However, the unique characteristics of intangible assets, particularly patents, enable strategic income shifting that is less feasible with physical capital. Notably, patent law does not mandate that patents be domiciled in the same jurisdiction as the one where the underlying technology is developed or utilized. Instead, taxation is typically levied in the country where the IP is legally owned. This legal flexibility provides multinational enterprises with the opportunity to relocate patent ownership to low-tax jurisdictions, thereby minimizing their global tax liability [Dischinger, Riedel 2011; Karkinsky, Riedel 2012].

Patents constitute intellectual property that confer exclusive rights over technological inventions. Crucially, these rights are transferable, and their legal ownership is not fixed at the time of filing. Instead, patent location often evolves throughout the asset's lifecycle. Empirical evidence demonstrates the fluidity of patent ownership: approximately one-third of European Patent Office (EPO) patents change ownership at least once, and nearly 60% of these transfers occur during the pendency period—that is, before the patent has been officially granted [Ciaramella et al. 2017]. A similar trend is observed in the United States, where the share of pre-grant transfers has steadily increased [Graham et al. 2018].

Patent transfers can be broadly categorized into intra-group transfers and inter-group transfers. Intra-group transfers refer to changes in patent ownership occurring within the same multinational enterprise (MNE), i.e., among entities under common ultimate ownership. In contrast, inter-group transfers occur between independent, unrelated entities, often in the context of technology trade. Prior research indicates that over 20% of EPO patents are transferred within corporate groups, while the proportion of inter-group (i.e., market-based) transfers is slightly higher than 10% [Ciaramella et al. 2017]. In the U.S. context, 13–16% of patents are traded at least once [Akcigit et al. 2016; Serrano 2010].

The motivations underpinning patent transfers are diverse and depend on the nature of the transaction. For inter-group transfers, firms may seek to acquire externally developed patents to capitalize on comparative advantages in technology development, commercialization, or enforcement [Arora et al. 2007; Arora, Gambardella 1994]. Such acquisitions may also serve strategic purposes, such as gaining bargaining power in innovation markets or mitigating the risk of litigation, particularly in patent-dense industries where holdup problems are common (Sampat, Ziedonis, 2005).

In contrast, intra-group patent transfers serve both managerial and fiscal objectives. From a corporate governance perspective, they enable centralized or decentralized control over IP portfolios, aligning asset ownership with business functions or operational capabilities. From a fiscal standpoint, intra-group transfers present opportunities for international tax planning. Multinational firms may allocate ownership of high-value patents to affiliates in low-tax jurisdictions, allowing profits derived from licensing or exploitation to accrue where they are taxed most favorably. Such practices involve internal payments, including royalties, which must adhere to the arm's length principle—a standard requiring transactions between related parties to be priced as if conducted between unrelated entities (Karkinsky, Riedel, 2012). In many multinational enterprises (MNEs), they constitute a significant portion of the business's value. The intra-firm transfer pricing process for patent-related royalty payments is often highly intransparent, and patents thus represent a substantial source of profit-shifting opportunities between multinational entities. For both reasons, MNEs are incentivized to locate their patents at low-tax affiliates to minimize the corporate tax burden. The effect is quantitatively significant and robust to controlling firm size

and unobserved heterogeneity between the entities. The findings prevail if we account for royalty withholding taxes and binding 'Controlled Foreign Company' (Karkinsky, Riedel, 2012). However, the lack of comparable market-based transactions often opens room for transfer mispricing, allowing firms to shift profits without corresponding economic activity.

Although inter-group transfers do not offer the same degree of flexibility for income shifting, they may still be influenced by taxation. Firms located in low-tax jurisdictions may be willing to pay higher prices for externally acquired patents, thereby completing more transactions. This effect reflects the capitalization of tax benefits into acquisition prices, highlighting the indirect role of taxation even in market-based exchanges. A common rationale for intra-group patent relocations is tax rate arbitrage. Firms may react to changes in tax policy after a patent has been filed, moving ownership to optimize tax outcomes. Alternatively, such relocations may result from active management of intangible assets, whereby MNEs seek to allocate patents to affiliates best positioned to extract value. The allocation may include considerations such as expertise in R&D, patent prosecution, enforcement capabilities, or favorable legal and regulatory environments.

Importantly, decisions about patent location during filing are often made under considerable uncertainty. Firms typically lack information about the patent's commercial potential, legal strength, and enforceability. As these elements become clearer, often during the pendency period, firms may re-evaluate initial decisions and reallocate ownership to reflect newly acquired insights and comparative advantages.

Finally, firms may engage in strategic sequencing of tax incentives. A common approach involves initially locating the patent in a high-tax country to benefit from front-end incentives, such as R&D tax credits, and transferring the asset to a low-tax jurisdiction offering back-end incentives, such as patent boxes. This strategy enables firms to maximize tax benefits across different stages of the innovation lifecycle, enhancing the overall profitability of their IP portfolios [Modzelewski 2024].

In sum, the flexibility of patent ownership enables firms to adapt to changing legal, economic, and fiscal environments. The ability to transfer ownership post-filing provides powerful levers for strategic IP management,

with significant implications for international taxation, innovation policy, and the global allocation of intangible capital.

The article explores how the rapid development of artificial intelligence (AI) is reshaping the intellectual property (IP) landscape and creating new challenges for taxation regulation. As AI systems increasingly generate valuable assets such as inventions, artworks, and data sets, questions arise about who holds ownership rights and how these rights should be valued for tax purposes. Traditional frameworks for IP taxation, which rely on clear human authorship and invention, are being strained as AI blurs the lines of creative contribution. The article highlights how governments grapple with issues like transfer pricing for AI-generated assets, especially for multinational companies that may exploit legal ambiguities to shift profits to low-tax jurisdictions. It also discusses emerging proposals for reform, such as updating IP tax rules to account for non-human creators and enhancing transparency requirements for AI-driven value chains.

2. Taxation challenges for patent shifting challenges

Patents represent a key class of intangible assets in modern multinational enterprises, often accounting for a substantial share of corporate profits. These assets are characterized by their high international mobility, enabling firms to allocate ownership across jurisdictions to minimize tax liabilities strategically. By locating patents in low-tax countries, MNEs can significantly reduce effective tax rates on intellectual property related income.

The firm-specific nature of IP presents an additional complication in regulatory oversight. Unlike tangible goods, for which market comparables are more readily available, arm's length pricing for intra-firm royalty payments and licensing fees is difficult to determine. This opacity facilitates strategic mispricing, allowing firms to shift profits artificially to low-tax jurisdictions under the guise of legitimate internal transfers [Bochańczyk-Kupka 2019].

Numerous high-profile cases, such as those of Microsoft, Apple, Starbucks, and Google, have brought public attention to the use of offshore patent-holding companies. These entities often reside in countries offering preferential tax treatment for IP income and are responsible for booking a disproportionate share of the MNE's global profits. While initially perceived

as isolated cases, a growing body of empirical research suggests that such practices are widespread [Čejková 2024].

Quantitative studies provide robust evidence of tax-motivated patent location decisions. For example, panel data from European MNEs show that the number of patent applications by foreign affiliates is highly responsive to corporate tax incentives [Karkinsky, Riedel 2012]. Further research indicates these dynamics using random coefficient models, which account for heterogeneity in tax responses across firms and countries [Griffith et al. 2014]. Subsequent studies conclude that firms sort high-value patents to jurisdictions with lower tax rates. The studies imply that tax sensitivity is even greater for patent income than for the mere number of patent applications [Dudar, Voget 2016].

Beyond location strategies, IP ownership also enables intra-firm transfer mispricing, particularly in firms with high research and development intensity. They demonstrate that such mispricing is concentrated in R&D-intensive sectors, where valuation uncertainties provide broader latitude for manipulating internal transaction prices [Liu et al. 2022].

These findings are corroborated by multiple studies, showing that mispricing is especially pronounced for differentiated goods, products whose inherent complexity and unique characteristics significantly limit direct comparability for tax assessment. This complexity hampers reliable transfer pricing benchmarks, making them vulnerable to manipulation. Moreover, substantial evidence of mispricing is also observed in the trade of services involving intellectual property, where valuation is inherently subjective and often opaque. Further documentation reveals patterns consistent with tax-induced distortions in IP-related service transactions, including artificial fragmentation of IP ownership across jurisdictions and the strategic use of licensing arrangements. One key conclusion drawn is that short-run international profit-shifting responses are predominantly implemented through adjustments in user fees for intangible assets. The user fee adjustments highlight IP's tactical importance in modern tax planning frameworks, where companies can rapidly shift reported profits without physically relocating operations.

The growing integration of artificial intelligence into IP-intensive sectors further complicates this landscape. AI accelerates the creation and utilization of intangible assets, such as proprietary algorithms, data processing models,

and automated decision systems, making the valuation of such assets even more elusive. These AI-generated intangibles often lack direct market analogs, weakening arm's-length pricing comparisons. Additionally, AI enables more sophisticated transfer pricing strategies by automating compliance, optimizing fee structures, and dynamically modeling tax scenarios across jurisdictions. The scenario analysis enhances firms' capacity to exploit tax differentials, intensifying the need for regulatory innovation and coordinated international oversight [Hopland et al. 2018].

Together, these findings underscore the strategic centrality of patents in international tax planning. The high mobility of IP, coupled with challenges in valuation and enforcement, enables MNEs to optimize their global tax positions. Consequently, patents drive innovation and competitive advantage and serve as vehicles for base erosion and profit shifting (BEPS). BEPS represents a central concern in contemporary international tax policy.

In response to the strategic mobility of patents and the profit-shifting opportunities they afford, governments have developed policy tools to attract and retain mobile intellectual property [IP] income, particularly from multinational enterprises. A key mechanism in this competition is the introduction of patent or IP box regimes, which offer preferential tax treatment for income derived from qualifying IP assets.

The trend began modestly, with Ireland pioneering the concept in 1973, but the Netherlands' implementation in 2007 marked a turning point, catalyzing broader adoption. Numerous European countries, including Belgium, Cyprus, France, Hungary, Ireland, Luxembourg, Malta, Portugal, Spain, Switzerland, and the United Kingdom, operate some form of patent box [AlAzzawi 2011].

Patent box designs vary significantly across jurisdictions. Differences pertain to the effective tax rate applied to qualifying income and the types of IP eligible (e.g., patents, software, trademarks). Additionally, the presence or absence of a development condition, often called the nexus requirement, mandates that the IP must be at least partially developed within the benefiting jurisdiction.

Empirical studies provide strong evidence that patent boxes influence the location of patent ownership. For instance, data on major R&D-intensive firms can be used to find significant tax elasticities in patent location decisions in response to these regimes. Their estimates suggest semi-elasticities

ranging from -0.6 to -1.9 , with the most pronounced effects observed for high-value patents and regimes with broad IP coverage. However, their results indicate that patent boxes tend to attract legal IP ownership rather than real economic activity, especially without nexus requirements. This finding suggests that patent boxes may primarily facilitate profit shifting without development conditions rather than spur additional R&D investment.

In contrast, regimes incorporating nexus provisions show more promising effects on real R&D activities [Chen et al. 2017; Gaessler et al. 2019]. Studies such as these confirm the positive impact of patent boxes on attracting mobile IP income. However, the effect on real R&D investment remains contested. Some analyses report neutral or even negative effects, underscoring the critical role of policy design in determining the economic efficacy of patent box regimes.

While patent box regimes can attract mobile profits and R&D activities, their net effect on national welfare is ambiguous. Countries may benefit from increased tax revenues, knowledge spillovers, and local employment. However, these gains can be offset by revenue losses from infra-marginal R&D investments that would have occurred even without such tax incentives. Indeed, evidence suggests that patent boxes in Switzerland and the UK may have negative fiscal consequences, as they reduce tax collection without significantly boosting marginal R&D [Bradley et al. 2015].

In addition, patent boxes can trigger harmful spillovers to neighboring countries by prompting IP and R&D outflows. In response, affected countries might retaliate by enacting their regimes, leading to a “race to the bottom” in corporate tax rates, where equilibrium tax levels become inefficiently low. This scenario aligns with classic theoretical tax competition [Davies et al. 2020].

However, these adverse effects on neighboring economies are not guaranteed. Multinational firms often decouple profit location from R&D activity, retaining or expanding fundamental R&D in high-tax countries while shifting IP income abroad. For example, this suggests aggregate R&D may increase despite profit shifting while finding many patents owned in low-tax jurisdictions protect technologies invented in high-tax countries. In addition, it shows that the tax sensitivity of real investments declines when firms have opportunities for profit shifting. These findings highlight the complexity of assessing welfare

outcomes, as tax base erosion may be partially offset by increased innovation and employment in high-tax jurisdictions [Brauner 2008].

3. Anti-Avoidance Measures for Profit Shifting

Countries have developed anti-tax avoidance tools to mitigate the downsides of IP-related profit shifting. These fall into three broad categories. The first is source-based Measures, where governments can withhold taxes or similar levies on outbound IP-related payments such as royalties and license fees, discouraging aggressive base erosion. The second category is residence-based Measures. Headquarters countries may tax foreign IP income, especially if earned in low-tax jurisdictions, using controlled foreign corporation rules, minimum tax regimes, or global intangible low-taxed income (GILTI) rules. The final category is transfer Pricing Enforcement, where Governments can strengthen efforts to prevent mispricing of intra-firm royalty and licensing agreements, ensuring these transactions reflect arm's length principles. However, due to IP's firm-specific and intangible nature, determining fair market value remains challenging [Baharad et al. 2024].

These tools represent key policy levers in balancing tax competition with fiscal integrity, especially in the face of increasing IP mobility and strategic tax planning by multinationals. One approach to curbing IP-related income shifting is through source country taxation, where the country where the royalty or license payment originates [the "source"] imposes taxes on those outflows. This is an effective mechanism when outflows are destined for low-tax jurisdictions [Shapiro & Lemley, 2019].

Countries like Germany and Austria have implemented deduction restrictions, denying firms the ability to deduct royalty and license payments made to low-tax countries from their taxable income. This effectively taxes those payments at the domestic corporate rate, discouraging profit shifting. These advantages target the tax base directly and ensure IP-related payments face the same treatment as domestic profits. There are several drawbacks, such as the risk of double taxation and potentially capturing legitimate business transactions, not just shifting behavior.

The Netherlands recently introduced a conditional withholding tax on royalties to low-tax destinations. This method imposes a tax directly on the payment flow rather than on the deductibility at the payer level. The key difference

is that the Deduction limits use the standard corporate tax rate, where the withholding taxes can differ. Furthermore, the scope for Double Taxation, where the Withholding taxes might create more opportunities for overlapping tax claims unless mitigated by tax treaties. And finally, the anti-avoidance scope, as these regimes must also account for indirect payment structures, where firms route royalties through intermediary jurisdictions. An example is the rare empirical evaluation of Austria's 2014 reform [which denied deductions if the recipient country taxed royalties below 10%], which showed a 50% drop in royalty payments to affected countries. This dramatic decline suggests substantial curtailment of IP income shifting, although further research is needed to assess the possible relocation of real investments out of Austria as a side effect [Hemmerich 2019].

The U.S. introduced a more comprehensive measure via the Base Erosion and Anti-Abuse Tax (BEAT). This source-country minimum tax returns certain intra-firm payments (royalties, interest, service payments) into a "modified taxable income" base. Firms then pay the higher BEAT-calculated tax or their regular corporate tax. The Key Feature is that BEAT targets a broader range of shifting mechanisms, including payments that extend beyond IP-related transactions. The objective is to ensure a minimum level of tax is always paid, regardless of internal pricing strategies or payments to low-tax jurisdictions.

While initial evidence supports the effectiveness of source-based taxation in reducing IP-related profit shifting, several questions remain. These are about the long-term effects on real economic activity, such as R&D and employment, and whether these measures trigger relocation of MNE activities or simply re-routing payments. Finally, how can countries minimize double taxation and unintended deterrence of legitimate investments [Hemmerich 2019].

Countries often implement Controlled Foreign Company legislation to curb IP-related profit shifting to low-tax countries. These laws make the passive income of multinational enterprises earned in low-tax jurisdictions taxable in the parent company's country.

CFC rules are designed to prevent multinational firms from shifting passive income (including IP-related income) to subsidiaries in low-tax jurisdictions. This allows the parent country to tax that income as if it were earned domestically, even if generated abroad. Over the past few decades, many countries have enacted CFC legislation, and efforts have been made to coordinate

these laws internationally through frameworks like BEPS and the EU's Anti-Tax Avoidance Directive (ATAD). Empirical studies consistently show that CFC rules reduce profit shifting to low-tax jurisdictions. Even when considering IP-related income, the presence of CFC legislation significantly reduces such shifting behaviors. Notably, these laws were effective even after the Cadbury-Schweppes ruling in 2006, reducing their applicability within the EU [Hovenkamp 2018].

The OECD has proposed a system where parent countries would impose a minimum tax on income earned by their foreign affiliates. If the effective tax rate on foreign income falls below a set minimum, the parent country will impose a tax equal to the difference between the local tax rate and the minimum rate. While this proposal aims to limit the erosion of tax bases, it introduces complexity to an already intricate set of anti-tax avoidance rules. A key challenge will be integrating these new rules to avoid double taxation and reduce the administrative burden on multinational firms [Białowska 2023].

Transfer pricing regulations require MNEs to document their transfer prices and adhere to arm's length principles. The goal is to prevent firms from mispricing intra-firm transactions, such as royalty payments or sales of intellectual property, to shift income to low-tax jurisdictions.

Transfer pricing rules mitigate profit shifting by ensuring that intra-firm transactions are priced fairly based on what unrelated parties agree upon. Despite these rules, recent studies suggest that transfer pricing regulations may not effectively curb income shifting related to IP. For example, The absence of a clear market price for patents or intellectual property makes enforcing arm's length pricing difficult. The unique nature of IP means that firms can still misprice intra-firm royalties and other IP-related transactions, even with documentation requirements in place [Baumann 2024].

While CFC legislation effectively reduces the ability to shift profits to low-tax jurisdictions, it adds complexity and potential for double taxation, mainly when foreign affiliates are located in multiple jurisdictions with varying tax rates.

Even though transfer pricing documentation is mandatory in many countries, the mispricing of IP-related transactions remains a loophole for firms. Addressing this would require better methods for assessing the fair market value of IP, along with more vigorous enforcement of arm's length principles.

The OECD's minimum tax proposal and the international coordination of CFC rules are positive steps toward reducing profit shifting. However, care must be taken to minimize the administrative burden and ensure that companies are not subject to excessive taxes, which could discourage investment and innovation [Nafarrate 2021].

In addition to unilateral efforts to combat IP-related profit shifting, countries have collaborated globally through frameworks like the OECD's BEPS initiative and the EU's ATAD. These frameworks aim to coordinate tax avoidance measures, focusing on intellectual property income shifting to low-tax jurisdictions. OECD's BEPS process and the EU's ATAD seek to limit international profit shifting by implementing various measures, some of which target shifting IP-related income to low-tax entities [Blair-Stanek 2015].

MNEs must provide detailed information about taxable income and the allocation of real activity across their affiliates in different countries. This measure has shown preliminary effectiveness in improving transparency and reducing profit-shifting activities [Gaessler et al. 2019]. This action defines nexus requirements for patent box regimes, which are designed to ensure that tax benefits from patent boxes are linked to real economic activity (e.g., actual R&D). This measure is expected to reduce patent shifting to low-tax jurisdictions, although it might lead to shifts in the location of real R&D activities instead [Crivelli et al. 2016].

While ATAD and BEPS are still being evaluated, the preliminary evidence indicates that these coordinated efforts are potentially effective in reducing IP-related income shifting. However, as many of these measures were only implemented recently (since 2016 for ATAD and ongoing for BEPS), longer-term studies will be needed to assess their impact fully.

While it is still early to make definitive conclusions, preliminary data does not yet show a significant reduction in IP-related user fee inflows to tax haven countries due to BEPS and ATAD. This suggests that these measures have not yet fully curtailed IP income shifting. However, as more countries adopt these frameworks, their impact on reducing such shifts will likely become more apparent in the coming years.

Empirical evidence underscores that IP-related income shifting to low-tax jurisdictions is a quantitatively significant phenomenon. The existence

of patent boxes and other tax incentives has led to considerable shifts in patent ownership and related profits across borders [Saunders 2001].

While various anti-avoidance tools, such as transfer pricing laws, have been found to have a limited impact on curbing profit shifting, more targeted measures like deduction limits and CFC regimes have more potent effects in reducing IP-related shifting. Despite their potential to curb shifting activities, the welfare implications of these anti-avoidance measures remain uncertain. While profit shifting may be reduced, countries could face more tax-sensitive decisions regarding the location of real activities, potentially leading to intensified tax competition and further complications in global tax policy. In conclusion, the effectiveness of coordinated measures like BEPS and ATAD is still being evaluated. Though they show promise, the long-term impacts on global tax competition and welfare remain to be seen. As these frameworks evolve and take effect in more countries, their ability to curb IP-related profit shifting will likely become clearer [Nafarrate 2021].

4. The impact of AI on profit shifting related to patents

Patents confer exclusive rights to inventors, enabling them to commercialize their innovations and prevent unauthorized exploitation. Beyond their legal and economic functions, patents are increasingly recognized for their implications on taxation. Multinational corporations strategically use patents to optimize tax liabilities by locating intellectual property in low-tax jurisdictions—a phenomenon often called “tax base erosion.” In parallel, the rise of AI presents unprecedented challenges and opportunities in the domain of patent law. As machines increasingly participate in innovation, existing legal frameworks face pressure to adapt. The confluence of AI with patent regimes will necessitate comprehensive regulatory updates that intersect with international tax policy [Corbett 2022].

Patent boxes, or innovation boxes, are special tax regimes that provide reduced corporate tax rates on income derived from qualifying patents and intellectual property. Countries like the United Kingdom, the Netherlands, and Luxembourg have implemented these schemes to attract R&D activities and stimulate domestic innovation. While such regimes incentivize technological advancement, they also invite scrutiny from international bodies such as the Organization for Economic Co-operation and Development, which aims to curtail base erosion and profit shifting. The OECD’s BEPS Action Plan,

particularly Action 5, promotes the “nexus approach” that requires a direct link between the income benefiting from tax relief and the underlying R&D activities.

Patents present complex transfer pricing challenges—the rules governing cross-border intra-group transactions. Assigning appropriate arm’s length prices to patent royalties is difficult due to such assets’ unique and intangible nature. Disputes often arise over how to value patents, especially those newly developed or not yet generating revenue [Fujii, Managi 2018].

The manipulation of patent valuation can significantly alter a corporation’s taxable income, which makes it a focal point for tax authorities worldwide. A core debate in contemporary patent law revolves around whether AI systems can be recognized as inventors. Traditional frameworks presuppose human creativity; however, AI systems. Those employing deep learning can increasingly produce novel, non-obvious, and practical innovations that satisfy patentability criteria.

Jurisdictions such as the United States and the European Union currently mandate that inventors must be natural persons. Nevertheless, cases like the DABUS patent applications have initiated global conversations about redefining the inventor concept. A legal shift recognizing AI as a contributor or co-inventor would necessitate an overhaul of existing frameworks, with cascading effects on patent ownership and revenue attribution.

AI is also revolutionizing how patents are examined and enforced. Machine learning tools can streamline patent searches, prior art analysis, and patentability assessments. Such tools reduce the burden on patent offices and improve examination efficiency, but they also raise questions about transparency, bias, and accountability [Damioli et al. 2024].

In the enforcement realm, AI-powered tools are being deployed to monitor infringement, analyze litigation risks, and even draft legal documents. As these tools become more sophisticated, they may disrupt the traditional legal services industry and reshape the economics of patent litigation.

Integrating AI into innovation ecosystems alters the economic value and tax implications of patents in multiple ways. The first is the attribution of income. If AI contributes to an invention, how should the income from such patents be allocated for tax purposes? This challenge is compounded by AI often

operating within a corporate infrastructure with diffuse human oversight. The second one focuses on patent evaluation models. AI can enhance the accuracy of patent valuation through predictive analytics. While this may reduce disputes in transfer pricing, it also necessitates new standards for using algorithmic valuation in tax assessments. Another challenge is BEPS compliance. AI-enabled patent generation could be strategically deployed in low-tax jurisdictions, reviving concerns over profit shifting. Policymakers must anticipate how AI might be used to circumvent nexus requirements or complicate the traceability of innovation activities.

To navigate these emerging challenges, policymakers and legal institutions should consider clarifying legal definitions. This requires updated patent laws to address the status of AI-generated inventions and clearly define inventorship, ownership, and rights attribution. Furthermore, the next step is to develop global standards and Promote international consensus on AI and patents through bodies such as the World Intellectual Property Organization and the OECD. Additionally, tax guidelines have to be reformed. This requires the revision of transfer pricing rules and tax regulations to reflect the new realities of AI-driven innovation and ensure transparency in patent valuation.

Furthermore, the use of AI has to be made more transparent, and disclosure of AI usage in patent applications and tax filings must be mandated to improve regulatory oversight and minimize manipulation. Finally, regulatory agencies have to make more significant investments in AI. This necessitates equipping tax authorities and patent offices with AI tools to level the playing field against corporate actors utilizing advanced technologies.

Patents sit at the crossroads of innovation, legal rights, and fiscal policy. As artificial intelligence continues to redefine what constitutes an invention and who qualifies as an inventor, the implications for patent law and taxation are profound. The global legal community must proactively adapt to this new paradigm, balancing promoting technological advancement with the imperative of maintaining a fair and equitable tax system.

5. Conclusion

Patents grant inventors exclusive rights to commercialize their innovations and protect against unauthorized use. While their primary role has traditionally

been legal and economic, patents now carry significant implications for international taxation. Multinational corporations often exploit intellectual property [IP] to minimize tax obligations by strategically locating patents in low-tax jurisdictions, a practice known as tax base erosion. Tax base erosion has prompted heightened global scrutiny, especially as artificial intelligence [AI] begins to transform both patent creation and taxation landscapes. Patent boxes, preferential tax regimes in countries like the UK, Netherlands, and Luxembourg, offer reduced tax rates on income derived from qualifying IP. Designed to encourage domestic innovation and attract R&D investment, these regimes have also raised concerns about enabling profit shifting. The OECD's Base Erosion and Profit Shifting [BEPS] initiative, particularly Action 5, introduced the "nexus approach," requiring that tax benefits be tied directly to substantive R&D activities conducted within a jurisdiction. Cross-border transactions involving patents also pose challenges under transfer pricing rules. Assigning arm's length prices to royalties for intangible assets like patents is notoriously difficult due to their uniqueness, uncertainty in valuation, and variable market relevance. Disagreements frequently arise, particularly when valuing newly developed or non-revenue-generating patents. Artificial intelligence adds complexity to this equation.

AI systems, especially those using machine learning or generative algorithms, are increasingly capable of producing novel, practical, and non-obvious inventions—fulfilling key criteria for patentability. Yet, patent laws in jurisdictions like the U.S. and EU require inventors to be natural persons. Cases like the DABUS applications have sparked a global debate about whether and how AI should be recognized as an inventor or co-inventor. A shift toward recognizing AI as an inventor would necessitate major legal reforms, including new frameworks for ownership, rights allocation, and income attribution. Simultaneously, AI is revolutionizing patent systems operationally. Patent offices now employ AI to assist in prior art searches, evaluate novelty, and streamline examination processes. While these tools enhance efficiency, they also raise concerns about bias, transparency, and algorithmic accountability. AI also reshapes patent enforcement. Legal teams are deploying AI to monitor for IP infringement, assess litigation risks, and draft legal filings. As these tools become more powerful, they could disrupt traditional legal practice and shift the economics of patent litigation. Economically, AI-driven inventions complicate the attribution of income. If a machine contributes to or entirely generates a patent, how should the resulting income be taxed—mainly

if the AI functions across borders or within distributed corporate systems? AI can also assist in valuing patents using predictive analytics, offering more precise pricing for transfer pricing purposes. However, reliance on algorithmic valuation models demands regulatory safeguards to avoid manipulation. Furthermore, AI-facilitated IP creation may be used to game tax systems. By generating patentable innovations in favorable jurisdictions, firms might circumvent BEPS rules or complicate compliance with the nexus approach.

In response to these emerging challenges, governments and international institutions must take proactive steps:

- **Clarify Legal Definitions:** Patent law must evolve to define inventorship and ownership in the context of AI-generated innovation.
- **Establish Global Norms:** International consensus, led by organizations like WIPO and the OECD, is critical to harmonizing AI and IP treatment.
- **Modernize Tax Regulations:** Transfer pricing and IP-related tax rules must be updated to address the valuation and attribution complexities introduced by AI.
- **Increase Transparency:** Firms should be required to disclose AI use in patent filings and related tax claims to support regulatory oversight.
- **Equip Regulators with AI:** Patent offices and tax authorities need access to cutting-edge AI tools to monitor compliance and detect abuse effectively.

As artificial intelligence reshapes the boundaries of invention and innovation, its integration into patent systems presents profound legal and fiscal implications. The convergence of AI, IP law, and international tax policy demands coordinated global responses to ensure fairness, compliance, and continued technological progress.

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