The Innovation Trade-off of IP Box Regimes

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Abstract: We explore the effect of intellectual property (IP) boxes on the nature of firms' innovative activities. IP boxes offer a reduced tax rate on income generated from patents and other IP investments. We examine whether firms reallocate their innovation resources from basic research (i.e., production of scientific publications) to marketable research (i.e., patent production) in response to IP box incentives. Using a European cross-country setting and a stacked difference-in-differences design, we find that IP box adoption is associated with no change in R&D spending, but an increase in patents and a decrease in scientific publications over the next two- to four-year horizons. Results are strongest in IP box regimes with fewer restrictions and greater benefits, among financially constrained firms, and in tight labor markets. Post-IP box adoption, publications are more likely to be cited in subsequent patents. Finally, using individual-level author and inventor data, we find that the same individuals increase their patenting while reducing their publishing after IP box adoption.

JEL Classifications: H25, H26, H23

Keywords: *IP Box Regime; Tax Planning; Innovation; Patents; Publications; Open Science*

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I. INTRODUCTION

According to *Nature*, U.S. public companies produce around 30,000 peer-reviewed research publications each year (Owens 2025). In 2017, Google researchers published an article entitled "Attention is all you need" in *Advances in Neural Information Processing Systems*, which introduced the Transformer architecture, forming the foundation of the large language models that triggered the recent rapid advancements in AI (Vaswani et al. 2017). As of 2025, the article has been cited over 200,000 times. While an extreme example, this article illustrates the spillover benefits of firms' contributions to open science through research publications, which can lead to the diffusion of valuable knowledge and improvements in productivity and innovation across society. However, while overall research publications are increasing, firms' contributions have been declining over time (Arora et al. 2021; Hanson et al. 2024). We explore how certain innovation tax incentives can alter firms' incentives to participate in open science by producing publications.

To encourage innovation output, numerous countries have implemented intellectual property (IP) boxes, a policy that applies a lower tax rate to income derived from certain intellectual property, particularly patents (e.g., Cabral et al. 2023).[1,2] Existing research finds that the introduction of IP boxes is associated with an increase in patenting activity (e.g., Bradley et al. 2015; Altstadsaeter et al. 2018; Schwab and Todtenhaupt 2021; Bornemann et al. 2023).[3] As IP

[1] IP boxes are also referred to as patent boxes or innovation boxes or may have different names depending on the IP box regime. We use the term "IP box" to refer broadly to the tax policies implemented by various jurisdictions that offer a reduced tax rate on income generated by qualified intellectual property.

[2] Although the scope of qualifying income varies across jurisdictions, most regimes explicitly include patents, while some also extend benefits to trademarks, software, or other forms of IP. Regardless of the specific requirements, patenting helps firms obtain IP box regime tax benefits because they are easily verifiable and can be tied directly to firms' innovation efforts. Thus, patents should reduce the likelihood of disputes with tax authorities around IP regime benefits.

[3] Bornemann et al. (2023) find that Belgium's IP box led to more patent applications and grants, but lower patent quality. Their findings suggest that IP box regimes increase the after-tax return to patents, leading firms to green light less valuable patents after the introduction of the IP box regime.

boxes raise the returns to patenting, we expect firms to allocate their R&D resources, including human capital, toward generating more patentable technology in the face of financial and labor constraints.[4] We examine whether a heightened focus on patents comes at the expense of other innovative outputs that generate fewer tax benefits. Specifically, we test whether firms shift their resources from the production of scientific research publications to the production of patents following IP box adoption. Our analysis responds to the call from Lester and Olbert (2025) for research on the real effects of tax policy. We also complement research by Yang (2026) examining how firms alter the nature of innovation activities in response to tax incentives.[5]

Firms often contribute to open science through scientific research publications in peer-reviewed journals, which play an important role in diffusing knowledge and supporting future innovation (e.g., Hicks 1995; Simeth and Cincera 2016; Arora et al. 2018; Rotolo et al. 2022). Unlike publications by academic researchers, publications produced by companies are often associated with R&D developed for practical purposes, which can more readily be utilized for marketable applications and have a broader societal impact. In spite of proprietary costs of disclosing the results of their innovative activities (e.g., Glaeser and Lang 2023; Valentine et al. 2025), firms have various incentives to publish their research. First, firms may support publishing in scientific journals to attract and retain talent, since publishing is often important to highly skilled employees, especially PhD graduates who benefit from the reputational effects of these publications (Hicks 1995; Stern 2004; Sauermann and Roach 2013). Second, peer-reviewed publications can enhance the credibility and perceived quality of firms' products resulting from

[4] As Goolsbee (1998) emphasizes, the primary input into innovation is the time and effort of highly skilled workers, whose supply is relatively inelastic in the short run. Indeed, Chen et al. (2023) find that IP box adoption is not associated with total employment, consistent with firms reallocating the efforts of their existing workforce.
[5] While similar in spirit to the analysis in Yang (2026), our study focuses on changes in innovative investment in response to tax policy deliberately targeted at innovation (IP boxes) rather than bonus depreciation. Our analysis also focuses primarily on the effects of tax policy on research publications rather than the nature of patents.

their research (e.g., Huang 2017; Arora et al. 2021). For instance, clinicians may see medical devices associated with scientific studies as more credible. Research publications may also be used to protect a firm's IP and hamper competitors from obtaining patents on similar inventions (e.g., Lichtman et al. 2000; Della Malva and Hussinger 2012). Finally, evidence suggests that scientific research publications lead to higher quality patents (Fabrizio 2009) and increased market value (Simeth and Cincera 2016).

Despite these advantages, firms facing an inelastic supply of patent inventors may shift their human resources away from research publications and toward patenting following the adoption of IP box regimes. While research publications and patents are often complementary, we expect that as the tax benefits of patenting increase, firms will face increasing pressure to expedite the patenting process by limiting the step of publishing the results of their R&D efforts. For resource constrained firms, we expect the shift in focus for firms' highly skilled employees to persist as firms prioritize patenting activity, which has an incrementally higher net present value due to the tax benefits of the IP box regime. In contrast, for less constrained firms, we expect that, to the extent research publications are complementary to the patenting process, we will either observe no change or an increase in publications post IP adoption.

We begin our analysis by obtaining data on research publications and patents from Clarivate's Web of Science (WoS) and Derwent Innovation Index (DII) databases, respectively. We then match the publication and patent data to consolidated firm-level data from Compustat Global for 17 European countries, including 8 countries with IP box regimes, resulting in a final sample of 2,520 firm-years that have publication and patent activity from the period 2000 through 2018.[6] Germany, a country that has never adopted an IP box regime, has the most matched research

[6] We conduct our analyses at the consolidated parent firm level rather than the affiliate level because we expect key investment and resource allocation decisions, including the decision to allocate firm resources to patenting or

publications with 27,237 publications matched to 877 firm-year observations. France is second with 1,853 publications matched to 39 firm-year observations.

We test whether the nature of firms' investments in innovation change with the adoption of IP box regimes in their home country. We implement a stacked cohort difference-in-differences design where we construct a cohort for each IP box regime adoption consisting of firm year observations within the adopting country from *t-3* through *t+3*, and all firm-year observations from countries without an IP box regime during that time frame. We then stack the IP box regime cohorts, omitting the adoption year to allow for transition costs. We estimate separate Poisson regressions with both firm and country level controls to test whether IP box regime adoption is associated with changes in research publications and patenting for the treatment firms.

Consistent with the findings in prior literature, we find significant increases in patents for treatment firms relative to control firms in cumulative windows of two-, three-, and four- years after the adoption of IP box regimes. Exploring the types of patents, we find that firms increase both incremental patents, as indicated by the presence of backward citations, as well as radical patents, which reflect more innovative research and do not contain backward patent citations. These results are consistent with firms expecting the benefits of IP box regimes to persist, so that

publishing, to be made by central management (e.g., Edwards et al. 2016; Amberger et al. 2021). Thus, we expect the implementation of an IP box regime in the country of the parent company will have the most pronounced effect on investment priorities, resulting in changes to support for patents and publications across the organization. In our sample, about 86 percent of patents are filed in the same country as the parent firm's headquarters, supporting the use of the parent location when linking firms to IP box regimes. Prior studies of the effect of IP box adoption on patenting examine patent activities in subsidiaries located in an IP box regime (e.g., Bornemann et al. 2023; Chen et al. 2023), which is appropriate because nexus requirements often require qualified IP to be developed within the IP box country, regardless of the location of the parent. The same constraints do not apply to publications. That is, the parent company could divert resources from open science projects across the organization to support patenting. In untabulated analyses, when we limit the number of publications to only publications produced by authors located within the country of the parent company, our inferences remain unchanged. Thus, the extent to which the effect is localized to subsidiaries within IP box regimes should bias against us finding results.

even radical patents, which may take longer to yield profits, will eventually be eligible for the preferred tax treatment.

Our main test examines the effect of IP box regime adoption on publication activity. We match publications to firms using the affiliation field in WoS following Arora et al. (2021) and supplemented with fuzzy matching.[7] Similar to Arora et al. (2021), we focus our analysis on scientific, applied publications,[8] since applied publications are more likely than basic research publications to be directly produced by firm employees rather than by public institutions affiliated with private firms (Bikard and Marx 2020). We find that treatment firms decrease their cumulative level of publications in the two-, three-, and four-year periods following the adoption of an IP box regime. In economic terms, firms in IP box adopting countries produce an average of 57% more patents and 50% fewer publications than firms in non-IP box adopting countries over the three-years after the regime is initiated. These findings suggest that firms substitute patenting for publishing in the presence of tax incentives to produce income-generating research outputs.

We then explore the effect of financial and labor market constraints on firms' patenting and publishing activities. Because the labor market for scientists is likely to be relatively inelastic, we expect financially constrained firms will shift the focus of existing researchers from publishing to patenting. Consistent with this notion, for our full sample analysis employment levels of scientists who both publish and patent remain constant before and after IP box adoption. However, in the absence of constraints, firms could increase overall innovative production rather than reallocating resources from publishing to patenting. We find that the substitution of patents for publications is

[7] See Appendix B for details of the data retrieval and matching processes.

[8] Scientific publications are defined as in Arora et al. (2021). Publications are categorized as "applied" if the publication's journal name, journal category, or Web of Science category contains the word "applied" or if the publisher is the Institute of Electrical and Electronics Engineers (IEEE), a publisher of engineering research (Breitzman 2009). In untabulated robustness tests, we use alternate definitions of "applied" publications, such as only publications whose journal category or WoS category contains the word "applied," and our main results remain unchanged. See Appendix C for more details about variable descriptions.

concentrated among firms with greater financial constraints, consistent with resource limitations prompting a reallocation of workforce efforts. Additionally, we examine whether the substitution effect is stronger when firms face a shortage of qualified workers. Using the unemployment rate and the education level of a country's workforce as measures of labor supply, we find that the substitution effect is concentrated in countries with a low unemployment rate and low education level, where the supply of qualified workers is low. These analyses provide evidence that firms shift their innovative activities from publishing to patenting in response to IP box incentives when faced with resource constraints.

Next, to corroborate our main analyses and provide context around our findings, we conduct several cross-sectional tests based on features of the IP box regime. Some regimes place a limit on the amount of IP-related income that qualifies for preferential tax treatment. Other regimes expand the benefits of IP boxes after their initial implementation. We find that the substitution between patents and publications appears strongest when IP box regimes do not limit IP box benefits, and in years when IP box regimes have expanded benefits. That is, when the tax benefits are most valuable, firms appear more likely to shift their efforts to patenting activity.

In additional analyses, we investigate changes in the quality and relevance of publications following IP box adoptions. We observe that publications produced after IP box adoption receive significantly more patent citations over a five-year period than those produced pre-adoption, indicating that publications produced during IP box regimes are more relevant to patenting. This increase in citation activity suggests that post-adoption research output is more technologically relevant and exerts greater influence on subsequent innovation. Moreover, while we find that a firm's publications post-adoption receive more citations by its own patents in the short run, they receive significantly more citations by other firms' patents in the long run. Citations of research by other firms is an example of the knowledge "spill-out" effect that eventually benefits other parties besides the firm (Arora et al. 2021). This finding suggests firms retain or continue to have employees work on publications that have the biggest impact both internally and eventually externally. We also examine the level of R&D spending around IP regime adoption. We find no change in cumulative R&D spending in the three- to five-year period following IP regime adoption. The lack of change in R&D spending is consistent with firms reallocating resources and redirecting employee efforts around innovation efforts rather than increasing their overall investment in innovation.

Finally, we supplement our firm-level results with individual patent inventor and publication author-level evidence of a substitution between patenting and publishing following IP box adoption. Among a sample of individuals who are both inventors and authors at the same firm, we find that patenting activity increases and publication production decreases following IP box adoption. That is, firm employees that engage in both patenting and publishing increase their proportion of patents relative to publications following IP box adoption. These results are consistent with our findings at the firm level, suggesting highly skilled workers redirect their efforts from open science to patenting following IP box adoption.

Our study contributes to the literature on the effects of innovation tax incentives by highlighting a potential unintended societal consequence of encouraging only output-driven innovation. Our finding that more resource constrained firms scale back research publications following IP regime adoption indicates a potentially significant societal cost. Existing research finds corporate publications generate benefits for not only the firm that produces the research, but also for competitors as well as researchers in public institutions (Arora et al. 2021). Our findings should be considered by policymakers when evaluating whether to adopt or expand IP box regimes as the societal cost of reductions in open scientific research can be significant. As of 2025, the Tax Foundation lists 18 countries with IP box regimes in Europe, including 13 of 27 EU member states (Mengden 2025). Thus, our findings should be of interest in evaluating the efficacy of fiscal incentives that are specifically designed to mitigate firms' tendency to underinvest in innovation and which, in fact, may only alter the nature of the innovation investments.

II. BACKGROUND AND PRIOR LITERATURE

2.1 Intellectual Property (IP) Box Regimes

Intellectual property (IP) box, also called innovation box or patent box, regimes offer preferential tax treatment for income generated by intangible, IP-related assets. While the features of specific regimes may differ, IP box regimes typically tax income derived from certain IP at a reduced rate relative to other forms of income.[9] Common eligible forms of IP are patents and software copyrights, and the income derived from those IP include rents and royalties, gross patent income, licensing fees, gains on the sale of IP, sales of goods and services that incorporate IP, and patent infringement lawsuit awards (Bunn 2022; Chen et al. 2023).[10] The goals of IP boxes are to promote local innovation, increase local investment and employment, and to attract and retain intangibles-based income (e.g., Evers et al. 2015; Bradley et al. 2021; Chen et al. 2023). Unlike other innovation tax incentives, such as R&D tax credits and deductions, IP boxes are "back-end"

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[9] Different jurisdictions may place various stipulations on IP in order to receive the tax benefits. For instance, some jurisdictions require that IP be developed within the IP box country to receive benefits (e.g., Netherlands, Portugal, Spain), some jurisdictions require IP to be newly developed (e.g., Belgium, Luxembourg, Portugal), and some jurisdictions do not extend benefits to acquired IP (e.g., Portugal, Spain) (e.g., Bradley et al. 2021; Chen et al. 2023; Mengden 2025). See Appendix A for IP box regime details.

[10] IP box regimes also differ on other dimensions, including whether they include "nexus" requirements that require the IP owners to have participated in the underlying innovation activity or that the innovation activity be conducted in the IP box country. Regimes without nexus requirements grant reduced rates on IP-related income even in cases where the IP owner was not involved in the IP development or when the IP was not developed in the local jurisdiction. In 2015, the OECD countries agreed on a modified nexus approach for IP box regimes as part of Action 5 of the BEPS initiative. This approach limits the scope of qualifying IP to certain assets and requires a geographic link between R&D expenditures, IP Assets, and IP income.

incentives. While R&D tax credits subsidize inputs into innovative activities ("front-end" incentives) by offering a tax credit for eligible spending regardless of the outcome of that spending, IP box benefits are based on the outputs of innovation. Consequently, IP box regimes subsidize only successful innovation outputs, creating incentives to develop income-generating patents.

Since 2000, a growing number of jurisdictions have adopted IP boxes as a policy tool to spur innovation. From 2007-2011 alone, seven countries within the European Union (EU) implemented IP boxes, and since then, other nations have followed suit. While we focus on European IP box regimes, numerous non-European nations have also adopted IP box regimes (e.g., Hong Kong, Israel, South Korea, Singapore) (Patent Box 2025). As of 2025, 24 countries have an IP box regime in place, including 13 EU member states (Mengden 2025; Patent Box 2025).

Multiple papers have examined the effect of IP box regimes on patenting, investment, and local economic and labor growth (e.g., Bradley et al. 2015; Alstadsaeter et al. 2018; Bradley et al. 2021; Bornemann et al. 2023; Chen et al. 2023). The extant literature finds that IP box regimes are associated with increased patenting activity (e.g., Bradley et al. 2015; Altstadsaeter et al. 2018; Bornemann et al. 2023), an increase in a highly-educated and highly-compensated local workforce (Bornemann et al. 2023; Chen et al. 2023), more cross-border M&A activity (Bradley et al. 2021) and greater local capital investment (Chen et al. 2023). Using a cross-country sample, Bradley et al. (2015) and Alstadsaeter et al. (2018) find that, consistent with its policy intent, IP box regimes are associated with an increase in patent applications. Bradley et al. (2015) find that the increased patent activity is related to domestic innovation while Alstadsaeter et al. (2018) find evidence of IP box regimes attracting foreign patents. Consistent with their evidence, Bornemann et al. (2023) focus on a single country, Belgium, and find that IP box adoption is associated with more patent applications and a more highly skilled workforce, but lower patent quality. Collectively, these studies find that IP boxes increase patent applications within a country, through both internal development and IP acquisition, and promote local investment and employment.

While prior studies use the increased patent activity as evidence of an increase in innovation, the prior literature does not consider the impact of IP boxes on other outcomes of R&D investment and the allocation of R&D efforts. Thus, we examine whether firms reduce other forms of innovative activities—specifically, publishing results of firms' research—in response to increased incentives to engage in more commercially focused patenting activities. Given the increasingly widespread adoption of IP boxes, understanding its effect on the outcomes of R&D and investment allocation decisions is especially relevant and important.

2.2 Research Publications

Prior literature in economics and management documents that many firms publish their R&D outcomes in scientific journals, in spite of knowledge spillovers that could erode firms' private benefits from their research (e.g., Simeth and Cincera 2016; Arora et al. 2018; Rotolo et al. 2022). Although the prevalence of overall firm publishing has diminished over the past few decades as firms turn to more commercially-oriented research activities (i.e., patenting) (Arora et al. 2018), many sectors, particularly in technology and defense, continue to see robust growth in firm publishing (e.g., Pellens et al. 2018; Sachini et al 2020, Hartmann and Henkel 2020).

Firms invest in the production of scientific publications for a variety of reasons (Rotolo et al. 2022). First, firms may produce scientific publications to access external knowledge and resources through collaborations with public institutions (e.g., Almeida et al. 2011; Simeth and Cincera 2016). Since many public institutions, such as universities and national labs, value publishing, firms can partner and publish with those institutions to gain access to cutting edge research. Second, firms can provide support for publishing to attract and retain researchers, who critically contribute to firm R&D capabilities and often find publishing "intrinsically rewarding," especially if they have an academic background (Hicks 1995). Third, firms can support their IP strategies through strategic, defensive publishing to establish property rights over their own IP and pre-empt competitors in a patent race (e.g., Lichtman et al. 2000; Baker and Mezzetti 2005; Della Malva and Hussinger 2012). Firms can also build their reputation by publishing in high profile journals and signaling their undisclosed research competencies (e.g., Almeida et al. 2011; Arora et al. 2018). Finally, publishing in peer-reviewed journals supports firms' commercialization strategies by providing credible signals about the quality of the products generated by their research (e.g., Huang 2017; Arora et al. 2021).

Accordingly, prior literature finds that firm involvement in scientific publishing is positively received by firm stakeholders. Simeth and Cincera (2016) find that scientific publications are positively associated with market value, particularly high-quality publications. Their findings suggest that investors value active involvement in scientific research as evidenced by disclosure through the publication process, consistent with the signaling effect of publishing. Arora et al. (2021) also find a positive association between firm publications and market value, which is stronger when the publications are cited by a firm's own patents and weaker when a firm's publications are cited by peer firms. These results provide evidence that investors place greater value on publications that support a firm's IP development than publications that benefit rivals. Building on this perspective, Valentine et al. (2025) document that firms alter their scientific disclosure behavior in response to changes in proprietary costs, suggesting that the decision to publish reflects both disclosure incentives and innovation considerations.

2.3 Hypothesis Development

While IP box regimes encourage patenting, they can potentially impact firms' other innovative activities, such as the production of research publications, if firms shift resources to patenting. Using a cross-country sample, Chen et al. (2023) find that, although IP box adoptions are associated with higher compensation for workers, they are not associated with an overall increase in employment. Their findings suggest that firms may alter the constitution of their workforce, but not invest in additional workers to generate patents in response to IP box incentives. Additionally, the supply of skilled workers who are qualified to develop patents is likely inelastic, at least in the short run. Therefore, firms with highly skilled employees engaging in applied research by producing scientific publications may instead redirect the attention of those employees to patent-related work. As a result, we expect firms would reduce their production of scientific publications as patents become more valuable, leading to our first hypothesis:

H1: *IP box adoption is associated with a reduction in scientific research publications.*

However, our hypothesis is not without tension. Firms often invest in producing publishable research because it supports their patent development process, often occurring at the earlier stages of R&D. By publishing the findings from their R&D efforts, firms can pre-emptively protect their own patents in the event of a patent race or challenge (e.g., Lichtman et al. 2000; Della Malva and Hussinger 2012; Rotolo et al. 2022). Thus, if patents become more valuable following IP box adoption, firms may increase their production of research publications as well. Thus, IP box adoption may not result in a decrease in scientific research publications.

Given the benefits of publishing, firms may not need to reallocate the efforts of their existing workers if they possess sufficient resources to acquire additional qualified workers and have access to an adequate supply of workers that can engage in patenting. Examining the effect of only the Belgian IP box regime, Bornemann et al. (2023) document an increase in highly skilled employment, controlling for total employment. Their findings suggest that firms can increase their overall workforce of highly skilled labor to develop patents in the presence of sufficient capital resources and a sufficient supply of skilled labor. Thus, we expect that the trade-off associated with IP box adoption will particularly affect firms that face financial and labor resource constraints. These expectations lead to our second set of hypotheses:

> ***H2a:*** *The effect* of *IP box adoption on scientific research publications is more negative for financially constrained firms.*

> ***H2b:*** *The effect* of *IP box adoption on scientific research publications is more negative for firms facing labor market constraints.*

III. RESEACH DESIGN AND SAMPLE

3.1 Data Sources

We obtain data for scientific research publications and patents from Clarivate's Web of Science (WoS) and Derwent Innovation Index (DII) databases, respectively. WoS is a comprehensive database of published research in journals and conference proceedings from major publishers and focuses primarily on scientific and applied research. WoS has been used in the prior literature as a reliable source of information on research publications (e.g., Arora et al. 2021). DII is an extensive database of patents from over forty global patent issuing authorities, including from the European Patent Office (EPO). We manually collect data on publications and patents from WoS and DII, respectively, and match them to firms in our sample based on the parent company name. See Appendix B for a detailed description of the publication and patent collection and matching processes.

We obtain firm-level financial statement information from Compustat Global, global corporate statutory tax rates from the Tax Foundation, and other country-level data from the World Bank and European Commission. We collect information about IP box regimes and R&D credit regimes from various sources, including from prior literature (e.g., Alstadsaeter et al. 2018; Bradley et al. 2021; Chen et al. 2023). See Appendix C for the source used in the measurement of each variable in our analyses.

3.2 Empirical Model

Our primary research question investigates whether the adoption of an IP box regime alters the nature of firms' investments in innovation and results in a substitution between publishing and patenting activity. To test our question, we employ a stacked cohort difference-in-differences model using a cross-country sample of consolidated firm-year observations from 17 European countries, including 8 regimes that have adopted an IP box. We examine the effect of IP box adoption by the country of the consolidated parent company, rather than by the country of firm subsidiaries, because we expect investment priorities, such as the allocation of resources between patenting or publishing, to be decided by central management absent agency frictions (e.g., Edwards et al. 2016; Amberger et al. 2021).[11] We use a stacked cohort design due to concerns about biased estimators in staggered difference-in-differences designs (e.g., Baker et al. 2022; Chen et al. 2023). We construct a cohort for each IP box adoption consisting of firm-year observations within the adopting country (treatment firms) from *t-3* to *t+3* around the adoption year, and all firm-year observations from countries that have not adopted an IP box during the same time frame (control firms) (e.g., Chen et al. 2023). We then stack or append all of the IP box adoption cohorts to obtain a full sample of treatment and control observations, omitting the adoption year from each cohort to account for transitioning costs. Thus, treatment observations

[11] That is, the implementation of an IP box regime in the country of the parent company will likely have the most pronounced effect on funding for patents and publications across the organization. If the effect of IP boxes is limited only to subsidiaries that are located within IP box regimes, we are unlikely to find results at the consolidated parent level. In untabulated analyses, we limit the number of publications to only those produced by authors in the parent company country, rather than all publications produced by the firm, and results remain unchanged.

consist of firm-year observations in countries that have ever implemented an IP box during the sample period. Control observations include firm-year observations in countries that do not have an IP box regime in place during the six-year period (*t-3* to *t+3*) around the adoption year in their respective cohort.

Because our dependent variables are counts of publications and patents, we test H1 using the following Poisson regression model with fixed effects and the stacked cohort sample:

$$\begin{aligned} &NumPubs3/4/5_{i,t} \text{ or } NumPatents3/4/5_{i,t} = \beta_0 + \beta_1 IPBox \times Post_{i,t} + \beta_2 Size_{i,t} + \beta_3 Ptroa_{i,t} + \beta_4 Leverage_{i,t} \\ &\quad + \beta_5 Log(R\&Dstock)_{i,t} + \beta_6 GDPgrowth_{i,t} + \beta_7 Corptaxrate_{i,t} \\ &\quad + \beta_8 R\&Dcredit_{i,t} + Cohort\text{-}Country\ FE + Cohort\text{-}year\ FE + \varepsilon_{j,t} \qquad (1) \end{aligned}$$

where *i*, and *t* index the firm and year, respectively. *NumPubs3/4/5* is the total number of publications published by firm *i* from years *t* to *t+2*/*t+3*/*t+4*, which includes publications produced in the consolidated parent company's country as well as publications produced in subsidiaries' countries. Similarly, *NumPatents3/4/5* is measured as the total number of patents published by firm *i* from years *t* to *t+2*/*t+3*/*t+4*. The variable of interest, *IPBox* × *Post*, is the interaction of treatment observations (*IPBox*) with an indicator for firm-years following the IP box adoption year (*Post*). Because of the high dimensional fixed effects structure, the main effect of the treatment country (*IPBox*) and year (*Post*) are absorbed. If IP box adoption is associated with an increase in patenting activity and decrease in publishing activity, we expect β_1 to be positive when the dependent variable is *NumPatents3/4/5* and negative when the dependent variable is *NumPubs3/4/5*, consistent with a substitution of applied publications for patents.

We include a vector of controls at the firm and country levels that affect incentives to engage in innovative activities. At the firm level, we include controls for firm size (*Size*), pre-tax profitability (*Ptroa*), and leverage (*Leverage*). We also control for a firm's existing R&D stock (*Log(R&Dstock)*), which prior literature finds is associated with publishing (Arora et al. 2021). At the country level, we control for GDP growth (*GDPgrowth*), the statutory corporate tax rate (*Corptaxrate*), and whether a firm is in a country with an R&D credit regime (*R&Dcredit*) to account for country-level incentives to engage in innovative activities. Lastly, we include cohort-country and cohort-year fixed effects to account for country-specific or year-specific shocks. To reduce the effect of outliers and increase the comparability of treatment and control groups, we winsorize continuous variables at the 1st and 99th percentiles and entropy-balance treatment and control observations by cohort.[12]

3.3. Sample

We begin our sample with publicly traded firms incorporated in European countries from 2000-2023 that have had any R&D expense during our sample period.[13] Since the decision to publish is idiosyncratic and potentially endogenous (e.g., Arora et al. 2021), we require the firms in our sample to engage in publishing activity. Thus, we exclude firms that have no publications identified in WoS during the sample period. To improve comparability in publishing incentives across countries, we also omit countries that have fewer than 10 total publications and omit firm-years in Ireland, which has a unique IP box implementation situation and very few publications.[14] These restrictions yield a sample of 18,787 unique firm-year observations of publishing firms.

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[12] Specifically, we entropy balance treatment and control observations on the first moment of non-binary control variables by cohort. Entropy balancing reweights observations to achieve covariate balance between treatment and control groups, increasing comparability (e.g., Hainmueller and Xu 2013).
[13] We limit our sample to only European firms to increase the comparability of country-level institutional features within the sample.
[14] Ireland implemented its first IP box regime in 1973, which provided a full exemption on income generated from patents and was eliminated in 2010 (Brown 2012). In 2016, Ireland reinstated a new IP box (called a Knowledge Development Box) imposing a reduced tax rate on qualified IP-related income that complies with the OECD's Base Erosion and Profit Shifting (BEPS) goals.

We then implement a stacked cohort design by identifying cohorts of treatment and control observations for each IP box adoption during the period 2000-2023.[15] For each cohort of IP box adopters, we include only control observations in countries that do not have an IP box in place in the three years around the IP box adoption date, dropping the adoption year. Aggregating all cohorts results in a stacked sample of 30,628 firm-year observations. From here, we limit the sample to observations with three years of patenting and publishing activity (*t* to *t+2*) because we require firms to actively engage in both patenting and publishing activity in order to discern whether a substitution between the activities exists. This restriction also avoids comparisons involving firms that engage in only one output channel. Finally, we exclude observations without sufficient data for all control variables. These restrictions result in a final sample of 2,520 firm-year observations consisting of 181 treatment observations and 2,339 control observations from 2000-2018.[16] Table 1 presents the sample derivation process.

IV. RESULTS

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for our final sample and variables. Panel A shows the full summary statistics of the variables used in our primary analyses, while Panel B shows the summary statistics for treatment and control groups pre-IP box and post-IP box adoption. As displayed in Panel A, treatment observations comprise 7.2% of total observations. The average three-year total publications (patents) produced by firms in our sample is nearly 40 (400),

[15] IP box regimes adopted during this period that were excluded from our sample due to a lack of sufficient treatment observations (primarily due to insufficient publication activity) include Cyprus, Hungary, Liechtenstein, Lithuania, Malta, Poland, Portugal, and Slovakia.
[16] We end the sample in 2018 because the final IP box adoption year in our sample is 2015 by Italy, and we restrict the post period for each cohort to the three years after adoption year. See Appendix A for details about IP box regimes.

indicating that firms engage is far more patenting than publishing. However, the median number of publications (patents) is just 3 (13), respectively, suggesting skewness in the distribution, consistent with the heavy-tailed nature of innovation outputs documented in prior work.

In Panel B, we observe that, although the average number of publications and patents increase for treatment firms after IP box adoption, the increase is not statistically significant. We also observe that control firms exhibit a statistically insignificant decline in publications post-IP box adoption, consistent with the overall trend of declining firm publications documented in Arora et al. (2021). Significantly more treatment firms are located in a country that offers R&D credits following IP box adoption, which we address by controlling for the presence of an R&D credit regime.

Panel C shows the distribution of observations in our stacked sample as well as the number of publications and patents by country. Our stacked sample of 2,520 firm-year observations represents 32,502 total publications and 365,183 patents. Note that, due to the stacked cohort design, the number of patents and publications do not represent only unique patents and publications since control observations can be included in the sample multiple times.

4.2 Empirical Results

4.2.1 Results—Test of H1: Main Effect

In our test of H1, we examine the effect of IP box adoption on investments in patenting and publishing activity. Table 3 presents the results of estimating Eq. (1). Consistent with expectations and prior literature, IP box adoption is associated with a significantly higher number of patent filings over three to four years (e.g., Bornemann et al. 2023; Chen et al. 2023). Consistent with our hypothesis, we find a significant decline in publications for treatment firms following IP box adoption over three to five years. In economic terms, firms in IP box adopting countries produce an average of 57% more patents and 50% fewer publications than firms in non-IP box adopting countries over three years.[17] This pattern persists over at least a four-year period, with the increase in patents dissipating over a five-year horizon. These results are consistent with a substitution of patents for publications due to IP box regimes incentivizing patent development by reducing the tax rate on intangible-produced income.

Table 4 Panels A and B provide details about the effect of IP box adoption on the types of patents and publications produced, respectively. Panel A compares the effect for incremental and radical patents. Incremental patents are defined as patents with backward citations to other patents, while radical patents do not contain backward patent citations (e.g., Goldman et al. 2024). The results reveal that IP box adoption is associated with an increase in both incremental and radical patents, but the magnitude of the increase in radical patents is greater. That is, IP box adoption is associated with a 55% increase in the production of incremental patents and a 119% increase in the production of radical patents over a three-year period. This result is consistent with firms accelerating the patenting process and patenting cutting edge research rather than publishing such research in scientific journals.

Panel B of Table 4 shows the effect of IP box adoption on engineering publications, which tend to be widely used and cited by patents, and other forms of publications (Breitzman 2009). The results suggest that the significant decline in applied publications following IP box adoptions are concentrated among non-engineering publications. This finding suggests that firms did not significantly reduce production of publications that are most likely to lead to patents (i.e.,

[17] Poisson regression coefficients represent the change in the log of expected counts for a unit change in the independent variable. Economic magnitudes are computed by exponentiating the coefficient on the variable of interest to determine the incidence ratio, which shows the expected rate change in the count variable for a one-unit increase in the variable of interest (*IPBox* × *Post*). For instance, in Table 3 column (i), $e^{(0.454)}$ = 1.57 - 1 = 0.57 indicates that a one-unit increase in the independent variable is associated with a 57% increase in patent counts. In column (iv), $e^{(-0.689)}$ = 0.50 – 1 = -0.50 indicates that a one-unit increase in the independent variable is associated with a 50% decrease in publication counts.

engineering publications) but did reduce production of other publications to pursue patenting activities.

4.2.2 Results—Test of H2a: Financial Constraints

Our main prediction in H1 that firms divert resources from publishing to patenting assumes that firms face some resource constraints. In the absence of constraints, firms can simply increase their investment in patenting, such as by hiring additional researchers and inventors, without reducing other innovative activities such as publishing. In H2a, we expect that the substitution between patenting and publishing is more pronounced for financially constrained firms than for financially unconstrained firms. We define a firm as being financially constrained if it has an above-median level of leverage in the year before IP box adoption (*HighLev*), and as being unconstrained otherwise (*LowLev*).[18] We then estimate the following Poisson model, introducing interactions for each subsample of financially constrained and financially unconstrained firms:

$$NumPubs3/4/5_{i,t} \text{ or } NumPatents3/4/5_{i,t} = \beta_0 + \boldsymbol{\beta_1\, IPBox \times Post \times HighLev_{i,t}} + \boldsymbol{\beta_2\, IPBox \times Post_{i,t} \times LowLev_{i,t}} + \Sigma_k Controls_{i,t} + \text{Cohort-Country FE} + \text{Cohort-year FE} + \varepsilon_{j,t} \quad (2)$$

where *i*, and *t* index the firm and year, respectively. *NumPubs3/4/5* and *NumPatents3/4/5* are defined as in Eq. (1). We include the same control variables as in Eq. (1) as well as the main effect of *HighLev*.

The variables of interest are *IPBox* × *Post* × *HighLev*, which shows the effect of IP box adoption on patents and publications for firms with high financial constraints relative to the baseline of control observations, and *IPBox* × *Post* × *LowLev*, which shows the effect of IP box adoption on patents and publications for firms with low financial constraints relative to the baseline

[18] We use leverage as a measure of financial constraints because it is easily interpretable and widely available for our sample of European firms. Alternative metrics of financial constraints such as the KZ Index (Kaplan and Zingales 1997) and WW Index (Whited and Wu 2006) were estimated and constructed based on samples of U.S. firms and, thus, may be well-defined for international firms.

of control observations. We present interactions for both *HighLev* and *LowLev* subsamples rather than presenting the incremental effect of *HighLev* for ease of interpretation and to allow comparison between groups. As in Eq. (1), the main effect of *IPBox* and *Post* are absorbed by fixed effects. If IP box adoption is associated with a stronger substitution between patents and publications for more financially constrained firms, we expect β_2 to be more positive than β_1 when the dependent variable is *NumPatents3/4/5* and more negative than β_1 when the dependent variable is *NumPubs3/4/5*.

Table 5 displays the results. As expected, we observe a significant increase in patents over a three-year period and a significant decrease in publications over a three- to five-year period for only financially constrained firms following IP box adoption. This pattern is consistent with financially constrained firms shifting resources from publishing to patenting when the benefits of IP boxes increase the value of patents. For unconstrained firms, we find a positive but insignificant increase in patenting and publishing. Although statistically insignificant, this pattern is consistent with patents and publications playing a complementary role, suggesting that, without financial constraints, firms potentially respond to IP box adoption by engaging in more innovative activities.

4.2.3 Results—Test of H2b: Labor Constraints

In addition to financial constraints, firms can also face labor market constraints that limit their ability to hire additional researchers to develop patents rather than reassigning existing researchers. In our test of H2b, we examine whether the substitution between patenting and publishing is more pronounced when a firm faces greater labor market constraints. We proxy for labor market supply using two measures: (1) the unemployment rate and (2) the population of educated individuals in a country in the year before IP box adoption. Firms in countries with a low unemployment rate likely face a tight labor market and greater difficulty hiring. Likewise, firms in countries without a highly educated workforce likely face a short supply of qualified workers. Thus, we define *HighUnemployment* as an indicator equal to one for firms in countries with an above-median unemployment rate in the year before IP box adoption, and *LowUnemployment* as the opposite. We set *HighlyEducated* equal to one for firms in countries with an above-median population of educated workers (i.e., with a postsecondary education) in the year before IP box adoption and define *NotHighlyEducated* as the opposite. We then re-estimate Eq. (2), replacing *HighLev* with *HighUnemployment* (or *HighlyEducated*) and *LowLev* with *LowUnemployment* (or *NotHighlyEducated*), respectively. We include the same control variables as in Eq. (1). The main effects of *IPBox* and *Post* are subsumed by fixed effects, as are the main effects of the country-level employment variables. If IP box adoption is associated with a stronger substitution between patents and publications for firms facing greater labor supply constraints, we expect β_2 to be more positive than β_1 when the dependent variable is *NumPatents3/4/5* and more negative than β_1 when the dependent variable is *NumPubs3/4/5*.

Table 6, Panel A shows the results with the unemployment rate as a proxy for the labor supply, while Panel B shows the results using education level. Across both panels, F-tests reveal that the difference in publishing is significantly different between subsamples, but the difference in patenting is not. In Panel A, we find that the results we document in H1 are primarily concentrated among firms in countries with a low unemployment rate, consistent with firms reallocating the efforts of their existing workers when the labor supply is tight. Similarly, in Panel B, we observe that the substitution effect is located in countries without a highly educated workforce, suggesting that firms reassign their workers rather than hire new workers when their access to qualified labor is low.

4.3. Cross-sectional Analyses

4.3.1 Limits on IP Box Benefits

Although IP box regimes all offer tax advantages for intangible-produced income, the extent of their benefits can differ in a variety of ways across countries (Alstadsæter et al. 2018; Chen et al. 2023). To explore the heterogeneous effects of IP box regimes, we examine the impact of different features of IP box regimes on the trade-off between patents and publications.

In our first analysis, we examine the effects in regimes that vary in the extent of their IP box benefits. Some regimes place a cap on the amount of IP-related income that qualifies for preferential treatment or limit the amount of the tax savings (e.g., Belgium, Italy). Thus, we investigate the effect of IP box adoption on patents and publications for regimes that place a cap on IP box benefits (*Limit*) versus those that do not (*NoLimit*). We expect a less pronounced substitution effect for regimes that place greater restrictions on the benefits of IP boxes. We then re-estimate Eq. (2), replacing *HighLev* with *Limit* and *LowLev* with *NoLimit*, and using the same control variables as in Eq. (1). Since *Limit* only applies to treatment observations, the main effect of *Limit* is subsumed, as are the main effects of *IPBox* and *Post*. If IP box adoption is associated with a stronger substitution between patents and publications for regimes with fewer restrictions, we expect β_2 to be more positive than β_1 when the dependent variable is *NumPatents3/4/5* and more negative than β_1 when the dependent variable is *NumPubs3/4/5*.

Table 7 presents the results of estimating Eq. (2) for regimes that do and do not place a cap on IP box benefits. In columns (i) through (iii), we observe that the significant increase in patenting activity following IP box adoption is concentrated in IP box regimes that do not place a cap on IP box benefits. Similarly, in columns (iv) through (vi), we find that the significant decrease in publications previously documented is concentrated in IP box regimes that have no cap on benefits. F-tests of the difference between β_1 and β_2 in each model show that the effect of IP box adoption on patenting is significantly different for firms in regimes with and without a cap on benefits. The results are consistent with the substitution effect between patents and publications being strongest when IP box benefits are not limited and most valuable.

4.3.2 Expansion of IP Box Benefits

To provide additional corroboratory evidence that firms substitute patenting for publishing when IP box benefits are strong, we perform a second analysis examining IP box regimes that have expanded and broadened their IP box benefits (e.g., France, Netherlands, Spain) after initial adoption versus those that have not (Chen et al. 2023). To do so, we re-estimate Eq. (2), replacing *HighLev* with *Expanded*, an indicator variable equal to one for observations in years in which an IP box regime has expanded its benefits, for instance, by reducing the IP tax rate; and zero otherwise. We replace *LowLev* with *NotExpanded*, an indicator equal to one for years without expanded IP box benefits. Due to the cohort-country and cohort-year fixed effects, the main effects of *IPBox*, *Post,* and *Expanded* are absorbed. We expect a larger coefficient on the interaction of *IPBox* × *Post* × *Expanded* relative to *IPBox* × *Post* × *NotExpanded*, indicating that our documented effects are stronger when IP box benefits are larger.

Table 8 shows the results. We observe that patents increase for treatment firms following IP box adoption both in years without expanded benefits and in years with expanded benefits, but the coefficient estimates are much larger in years with expanded benefits (F-test p-value = 0.012 in column (i); F-test p-value = 0.000 in column (iv)). In economic terms, firms increase patents by 122% over a three-year period in years when IP box benefits are expanded compared with 55% in years when IP box benefits are not expanded. A similar pattern exists for publications—treatment firms reduce publication production to a greater extent in years when IP box benefits are expanded relative to when they are not expanded. These results corroborate the findings in Table 7 that firms face a greater tradeoff between publishing and patenting when IP box regimes are more beneficial.

4.4 Additional Analyses

4.4.1 Relevance of Publications for Patents

In our main analyses, we present evidence that firms forego publishing applied research to pursue more lucrative innovative activities, namely, patents. In this section, we investigate the quality and relevance of publications produced before and after IP box adoption to gauge how the value of publications has changed. As is the case with patents, forward citations of publications are commonly used as an indicator of quality (e.g., Arora et al. 2021). To gauge the quality of publications for patenting activities, we examine the number of times a firm's publications are cited by patents. That is, we examine the effect of IP box adoption on the number of forward citations of a firm's publications by patents. Distinguishing between citations by the firm's own patents and those by other firms allows us to separate internal use from external knowledge spillovers. Furthermore, firms could produce publications primarily for their own benefit, leading to citations by their own firm-produced patents. On the other hand, a firm's publications could also be useful to external parties. A key positive externality of publications is that they voluntarily reveal proprietary firm information to the public domain, enabling knowledge spillover to peers and other information consumers, i.e., the "spill-out" effect (Arora et al. 2021). We expect that a firm's publications will be most useful for its own patents in the short run as publications can support the patenting process, but can lead to knowledge spill-out over a longer term as the research is disseminated. Thus, we examine how IP box adoption affects the number of forward citations a firm's publications receive by both their own patents and by other firms' patents both in the short run and long run.

Table 9 shows the results of testing the effect of IP box adoption on the quality and relevance of publications. In columns (i) and (ii), we estimate the effect of IP box adoption on the number of citations a firm's publication receives from all patents. In columns (iii) and (iv) (columns (v) and (vi)), we examine the effect of IP box regimes on the number of citations a firm's publication receives from its own patents (other firms' patents). Overall, we observe that, controlling for the number of publications and patents, publications produced after IP box adoption receive significantly more patent citations over a five-year period, consistent with publication being more patent-relevant in the post-adoption period. Consistent with expectations, firms' publications post-IB box adoption are more heavily cited by their own patents in the short run (from *t* to *t+2*), while being more heavily cited by other firms' patents in the longer term (from *t* to *t+4*). The results suggest that publications produced after IP box adoption are especially valuable for patenting and eventually generate a spill-out effect that benefits parties other than the firm.

4.4.2 IP Box Adoption and R&D Spending

Our prediction that firms substitute patenting for publishing assumes that firms have limited resources to invest in innovative activities. However, the tax benefits provided by IP box regimes could incentivize firms to increase their overall investment in R&D. Therefore, we check whether firms' R&D spending changes following IP box adoption. Specifically, we examine the effect of IP box adoption on firms' R&D expense accumulated over a three- (i.e., from *t* to *t+2*) to five-year period (i.e., from *t* to *t+4*). Table 10 presents the results. Controlling for current R&D spending, we do not find evidence that firms altered their cumulative R&D expense in the three- to five-year period following IP box adoption. This finding supports the idea that the observed increase in patenting comes at the expense of publishing rather than from additional resources. The results (untabulated) are unchanged if we replace cumulative R&D expense with one- to five-year ahead R&D expense. Collectively, the evidence suggests that firms did not increase their investment in R&D, but reallocated their innovative efforts from publishing to patenting.

4.4.3 Individual-Level Analyses

Our main analyses focus on firm level outcomes. To complement these results, we also examine publication and patenting activity at the individual level of inventors and authors associated with the firms in our main sample. This analysis is based on a dual-activity sample, which includes only individuals who both patent and publish at some point during the sample period. Restricting analysis to this group ensures that we compare the innovative output of the same employees over time, rather than capturing changes driven by turnover or shifts in workforce composition.[19]

For each individual, we calculate the number of patents and publications produced in a given year, and estimate the effect of IP box adoption using a difference-in-differences design with year and employee-firm fixed effects, clustering standard errors at the firm (assignee) level. This approach allows us to identify how IP box regimes alter the allocation of effort among employees who engage in both patenting and publishing. In addition, examining individuals can provide insight into potential mechanisms, such as whether policy changes influence the allocation of productive effort among inventors and authors within firms.

Table 11 presents the results. Panel A shows the impact of IP box adoption on individual-level patenting and publication outcomes. Columns (i) – (iii) show that IP box adoption significant

[19] To further support the idea that the substitution effect occurs within the same employees rather than through changes in workforce composition, we examine the number of inventors and authors in the dual-activity sample as well as in the broader inventor and author samples (untabulated). We find no meaningful changes in the number of dual-activity individuals post-IP box adoption, indicating that the same employees are reallocating effort rather than the firm hiring new dual-activity staff. In addition, when we subset to individuals who are authors, we do not observe a significant shift of authors entirely into patenting, suggesting that authors are not reassigned to exclusively produce patents. In the full inventor sample, we observe a modest increase in inventor counts, which likely reflects external collaborators listed on patents rather than a true increase in firm employment. These patterns suggest that the substitution from publishing to patenting occurs primarily within existing employees.

increase the number of patents produce by these individuals over three- to five-year horizons. For example, total patents rise by roughly 2.3-3.0 per individual over this period. In contrast, columns (iv) – (vi) show reductions in publication activity. For example, publications decline by up to 1.35 publications over five years. The combination of rising patenting and declining publishing demonstrates a substitution effect: individuals appear to reallocate effort from open scientific research toward patentable inventions under IP box regimes.

Panel B of Table 11 examines the effect of IP box adoption on the share of patents in total innovative activity at the individual level. The dependent variable, *Patent Share*, is the ratio of patents to total innovation output (total patents plus total publications) over three- to five-year horizons. As shown in columns (i) – (iii), IP box adoption increases the patent share. These results reinforce the substitution effect documented in Panel A: not only do individuals produce more patents and fewer publications after IP box adoption, but patents also constitute a larger portion of their total innovative activity. This shift being among scientists who engage in both patenting and publishing provides further evidence that IP box regimes reallocate effort toward patentable inventions rather than expanding total innovation output.

V. CONCLUSION

Using a cross-country sample of firms in 17 European countries with 8 IP box adoptions from 2000-2018, our study examines the effect of IP box adoption on the nature of firms' innovative activities. Consistent with our hypothesis, we find that IP box adoption is associated with an increase in patents and decline in publications over the next two- to four- year horizon. Using a stacked cohort difference-in-differences design, we find that firms in countries that adopted an IP box regime increased their production of patents by nearly 57% and reduced their production of publications by 50% over a three-year period relative to firms in countries without an IP box regime. We also observe that the increase in patents and decline in publications is concentrated among firms with greater financial constraints, and among firms located in jurisdictions with a low supply of qualified labor. These findings suggest that the substitution of patenting for publishing only occurs when firms face financial and labor market constraints. Moreover, the results are strongest in IP box regimes that do not limit IP box benefits and in IP box regimes with expanded benefits. Our findings are consistent with firms trading off publishing for patenting when the benefits of patenting are high. Finally, using a sample of individuals who conduct both patenting and publishing for the same firms, we find that individual author/inventors increase their patent production and decrease their publication production following IP box adoption. This test corroborates our main findings by providing direct evidence that firms reallocate the efforts of their workforce from publishing to patenting when the incentives to patent are strong.

Our study highlights a potential unintended consequence of innovation tax incentives that subsidize only profitable, output-based research. Our study suggests that, for resource-constrained firms, incentives to produce commercially profitable research, such as patents, may come at the cost of producing publicly accessible research that generates knowledge spillover benefits to society as a whole. These considerations are especially important as more regimes continue to adopt IP boxes (e.g., Hong Kong in 2024) or consider their adoption. As such, our study should be of interest to firms, scientists, and policymakers alike as they consider the costs and benefits of using IP boxes as a policy tool to stimulate innovation.

Our study is not without limitations. First, to increase comparability within the sample and due to data availability, our study only examines European IP box regimes. IP box adoptions in non-European nations, such as by Israel or Singapore, are omitted from our sample and may not be represented by our findings. Second, to enhance identification, we only include observations in the three years surrounding IP box adoption. Thus, we may not be able to speak to the long-term effects of IP box adoption. Finally, we require firms in our sample to engage in both patenting and publishing activity in order to examine the trade-off between the two activities.

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APPENDIX A: IP Box Regimes

Panel A. Sample Countries with IP Box Regimes

IB Countries	Cap on Benefits	Restrictive	Expanded Benefits	R&D Tax Credit	Existing IP Qualify?	Tax Rate on Qual. Income (%)	Qualified IP
France	N	N	Y	Y	Y	15.5–17.1	Patents, Industrial Fabrication Processes
Belgium	Y	Y	N	Y	N	6.8	Patents
Italy	Y	N	N	Y	Y	21.98	Patents, Know-How, Trademarks, Business Names/Secrets/Designs, Copyrights
Netherlands	N	Y	Y	Y	N	5–10	Patents, Know-How, Business Names/Secrets/Designs, Copyrights, income from IP generated from approved R&D projects
Luxembourg	N	N	N	N	N	5.76	Patents, Trademarks, Business Names/Secrets/Designs, Copyrights
Spain	N	Y	Y	Y	Y	12–15.6	Patents, Know-How, Business Names/Secrets/Designs
Switzerland	N	N	N	N	Y	8.8	Patents, Trademarks
United Kingdom	N	N	N	Y	Y	10	Patents, Regulatory Data Protection and Plant Variety Rights

This table lists countries in our sample that have implemented IP box regimes. Columns indicate whether the regime imposes a cap on IP box benefits or qualifying income (*Cap on Benefits*), whether it has a restrictive nexus requirement (*Restrictive*), whether it expanded IP box benefits during the sample period (*Expanded Benefits*), whether it offers an R&D tax credit exists at any point during the sample period (*R&D Tax Credit*), and whether existing IP qualifies for the regime (*Existing IP Qualify?*). *Tax Rate on Qual. Income (%)* reports the tax rate applicable to qualifying IP income, and *Qualified IP* specifies the types of intellectual property eligible under the regime.

Panel B. Timing of IP Box Regime Implementation

IP Box Countries	**'00**	**'01**	**'02**	**'03**	**'04**	**'05**	**'06**	**'07**	**'08**	**'09**	**'10**	**'11**	**'12**	**'13**	**'14**	**'15**	**'16**	**'17**	**'18**
France		x																	
Belgium								x											
Netherlands								x											
Luxembourg									x										
Spain									x										
Switzerland												x							
United Kingdom														x					
Italy																x			

3 years surrounding IP box implementation

This table reports the year of IP box regime adoption and sample years for each adopting country in our final sample. The columns represent calendar years from 2000 to 2018. An "x" marks the year in which the IP box regime was introduced. The adoption year is dropped from the sample to account for transition costs. Where available, the three years before and after IP box adoption are included in the sample to create a balanced pre- and post- event period.

APPENDIX B: Publications and Patents Retrieval Process

Publications Retrieval Process

To identify the publication activity of European publicly traded firms, we construct a dataset by querying the Web of Science (WoS) Core Collection (http://www.webofscience.com/) with firm names. The procedure involved the following steps:

1. We began with a list of European firms obtained from Compustat Global for the period 2000–2023. To focus on firms engaged in innovative activity, we restricted the sample to companies reporting positive total research and development (R&D) expenses during this period. Each firm record included the company's name (CONM) and a unique firm identifier (GVKEY).
2. To improve search accuracy, firm names were standardized by removing punctuation (with the exception of the ampersand "&"). Both the raw and cleaned firm names were retained for matching.
3. Each firm name was searched in both the affiliation and address fields in the Web of Science Core Collection. Using both fields increases coverage because the company name may appear in the address field even if it does not appear as the affiliation. If no results were returned in the query, the firm was coded as not appearing in WoS. If results were found, we collected detailed bibliometric information for each publication record available, including but not limited to:
   - Author(s) and Author Identifiers
   - Publication IDs
   - Title and Source (journal, conference, or other venue)
   - Conference Information and Sponsors
   - Times Cited Count and Cited References
   - Abstract, Keywords, Addresses, and Affiliations
   - Document Type, WoS Categories, Research Areas, and WoS Editions
   - Usage Count, Hot Paper/ Highly Cited Status
   - Funding and Publisher Information

After retrieval, we clean the publication sample by manually examining cases in which a company's number of publications matched on the affiliation field is significantly different from its number of publications matched on the authors' address field.[20] Using this procedure, we drop companies from the sample if a substantial difference exists between the two matched fields to mitigate the incidence of false positives. We then limit the cleaned publications to scientific, applied publications (e.g., Arora et al. 2021), our sample of interest. Following Arora et al. (2021), scientific publications are defined as publications with the WoS Index field labeled "Conference Proceedings Citation Index – Science (CPCI-S)" or "Science Citation Index Expanded (SCI-EXPANDED)." Publications are classified as "applied" if the publication's journal name, journal category, or WoS category contains the word "applied" or if the publisher is IEEE (Institute of

[20] This can occur if a company's name is a common term, such as "Orange" or "Case," which can appear in the address field associated with an author on the publication but refer to the name of a street rather than to the company.

Electrical and Electronics Engineers), a prolific publisher of engineering research (Breitzman 2009). This process results in a sample of 56,018 publications before sample restrictions. We then match each publication to each firm year based on the publication year.

Patents Retrieval Process

To identify the patenting activity of firms in our sample, we use the Derwent Innovation Index (DII), part of the Web of Science platform and the world's most comprehensive database of international patent information (see: https://clarivate.com/academia-government/scientific-and-academic-research/research-discovery-and-referencing/web-of-science/derwent-innovations-index/).

We employed the same set of firms and firm names as described in Publications Retrieval Process. Each firm name was queried in the assignee field of the DII database to ensure that the retrieved patents were formally attributed to the company.

For firms with patents, we downloaded the text files describing each patent, including but not limited to:

- Patent numbers (application and grant numbers)
- Inventor names
- Assignee names
- Patent abstracts
- Citation data (backward and forward citations)
- Publication dates
- Patent family data
- Classification codes

We then match each patent to each firm year based on the first publication date of the patent.

APPENDIX C: Variable Definitions

Variables	**Description**	**Source**
Dependent Variables		
NumPubs3/4/5	Number of publications published by firm *i* aggregated year *t* to *t + 2* (*NumPubs3*), *t+3* (*NumPubs4*), or *t+4* (*NumPubs5*). Publications consist of scientific, applied publications, and are matched to the firm based on the "affiliation" field of WoS, supplemented with fuzzy matching techniques, and manually cleaned (e.g., Arora et al. 2021). See Appendix B for details of the publication definition and matching process.	Web of Science
NumPatents3/4/5	Number of patents published for which firm *i* is the assignee, aggregated from year *t* to *t* to *t + 2* (*NumPatents3*), *t+3* (*NumPatents4*), or *t+4* (*NumPatents5*). See Appendix B for details of the patent definition and matching process.	Derwent Innovation Index
NumIncremental3/4/5	Number of patents classified as "incremental" for which firm *i* is the assignee, aggregated from year *t* to *t + 2* (*NumIncremental3*),*t+3* (*NumIncremental4*), or *t+4* (*NumIncremental5*). Patents are classified as "incremental" if the patent contains backward citations (e.g., Goldman et al. 2024).	Derwent Innovation Index
NumRadical3/4/5	Number of patents classified as "radical" for which firm *i* is the assignee, aggregated from year *t* to *t + 2* (*NumRadical3*), *t+3* (*NumRadical4*), or *t+4* (*NumRadical5*). Patents are classified as "radical" if the patent does not contain backward citations (e.g., Goldman et al. 2024).	Derwent Innovation Index
NumEngineering3/4/5	Number of publications published by the Institute of Electrical and Electronics Engineers (IEEE) for firm *i* aggregated from year *t* to to *t + 2* (*NumEngineering3*), *t+3* (*NumEngineering4*), or *t+4* (*NumEngineering5*).	Web of Science
NumOther3/4/5	Number of publications not published by IEEE for firm *i* aggregated from year *t* to to *t + 2* (*NumOther3*), *t+3* (*NumOther4*), or *t+4* (*NumOther5*).	Web of Science
TotPatentPubCites3/5	Number of citations of a firm's publications by patents for firm *i* aggregated from year *t* to *t+2* (*TotPatentPubCites3*) or *t+4* (*TotPatentPubCites5*).	Web of Science, Derwent Innovation Index

SelfPatentPubCites3/5	Number of citations of a firm's publications by a firm's own patents for firm *i* aggregated from year *t* to *t + 2* (*SelfPatentPubCites3*) or *t+4* (*SelfPatentPubCites5*).	Web of Science, Derwent Innovation Index
PeerPatentPubCites3/5	Number of citations of a firm's publications by other firms' patents for firm *i* aggregated from year *t* to *t + 2* (*PeerPatentPubCites3*) or *t+4* (*PeerPatentPubCites5*).	Web of Science, Derwent Innovation Index
FutureR&D3/4/5	R&D expense, scaled by total assets, for firm *i* aggregated from year *t* to *t + 2* (*FutureR&D3*)*, t+3* (*FutureR&D4*)*,* or *t+4* (*FutureR&D5*).	Compustat Global
NumPatentsIndivid3/4/5	Number of patents for which individual *k* is the inventor, aggregated from year *t* to *t* to *t + 2* (*NumPatentsIndivid3*)*, t+3* (*NumPatentsIndivid4*)*,* or *t+4* (*NumPatentsIndivid5*).	Derwent Innovation Index (main patents sample)
NumPubsIndivid3/4/5	Number of publications for individual *k* aggregated year *t* to *t + 2* (*NumPubsIndivid3*)*, t+3* (*NumPubsIndivid4*)*,* or *t+4* (*NumPubsIndivid5*).	Web of Science (main publications sample)
PatentShareIndivid3/4/5	The share of patents in individual *k*'s total innovation output, measured as the ratio of the number of patents to the combined total of patents and applied publications, aggregated over the periods *t* to *t+2* (*PatentShareIndivid3*), *t* to *t+3* (*PatentShareIndivid4*), and *t* to *t+4* (*PatentShareIndivid5*).	Web of Science, Derwent Innovation Index (main publications and patents samples)
Independent Variables		
IPBox	Equals 1 for observations in countries that have implemented an IP box regime during the sample period (treatment observations). See Appendix A for IP box regime countries.	Chen et al. (2023) Alstadsaeter et al. (2021)
Post	Equals 1 for firm-years following IP box adoption within each IP box adoption cohort. See Appendix A for IP box regime countries.	Chen et al. (2023) Alstadsaeter et al. (2021)
Corptaxrate	The top corporate statutory tax rate in the country in which firm *i* is domiciled.	Tax Foundation
Expanded (NonExpanded)	Equals 1 for firm-years in which IP box benefits have been expanded (not expanded); zero otherwise.	Chen et al. (2023) Alstadsaeter et al. (2021)
GDPgrowth	Annual percent real GDP growth in country where firm *i* is domiciled.	World Bank

HighLev (LowLev)	Equals 1 for firm-years that have (do not have) an above-median *Leverage* in the year before IP box adoption; zero otherwise.	Compustat Global
HighlyEducated (NotHighlyEducated)	Equals 1 for firm-years that have (do not have) an above-median populated of educated workers in the year before IP box adoption; zero otherwise. Educated workers are computed as the log of the number of workers with a secondary school education in the country in which firm *i* is domiciled.	World Bank
HighUnemployment (LowUnemployment)	Equals 1 for firm-years that have (do not have) an above-median unemployment rate in the year before IP box adoption; zero otherwise.	Eurostat (European Commission)
Leverage	The sum of long-term debt [DLTT] and current maturities of long-term debt [DLC], scaled by total assets [AT]	Compustat Global
Limit (NoLimit)	Equals 1 for firm-years in which a cap (no cap) is placed on IP box benefits; zero otherwise.	Chen et al. (2023) Alstadsaeter et al. (2021)
Log(R&Dstock)	Log of R&D expense [XRD], scaled by total assets [AT], plus 85% of scaled R&D expense from year *t-1* (Arora et al. 2021)	Compustat Global
NumPatents	Number of patents published for which firm *i* is the assignee in year *t*. See Appendix B for details of the patent definition and matching process.	Derwent Innovation Index
NumPubs	Number of publications published by firm *i* in year *t*. Publications consist of scientific, applied publications, and are matched to the firm based on the "affiliation" field of WoS, supplemented with fuzzy matching techniques, and manually cleaned (e.g., Arora et al. 2021). See Appendix B for details of the publication definition and matching process.	Web of Science
Ptroa	Pre-tax book income [PI], scaled by total assets [AT]	Compustat Global
R&D	R&D expense [XRD], scaled by total assets [AT], for firm *i* in year *t*.	Compustat Global
R&Dcredit	Equals 1 for firm-years in a country that has an R&D credit regime in place.	Chen et al. (2023) Alstadsaeter et al. (2021)
Size	Log of total assets [AT] at the beginning of the fiscal year	Compustat Global

Table 1. Sample Selection

	N
Firm-year observations of European firms with R&D expense from 2000-2023	66,258
Less: Firms with no WoS data during sample period	(47,270)
Less: Firms in countries with < 10 total WoS matches	(129)
Less: Firm-years in Ireland (ended IP box in 2010, reinstated new IP box in 2016)	(72)
Sample of unique firm-years from 2000-2023	18,787
Stacked cohort observations from *t-3* and *t+3* around each IP box adoption date (omitting adoption year)	30,628
Less: Firm-years without patents from *t* to *t+2*	(18,700)
Less: Firm-years without publications each year from *t* to *t+2*	(9,137)
Less: Firm-years without all control variables	(541)
Sample used for main analysis from 2000-2018	2,520

NOTE: The sample used for each regression model may vary due to the presence of singletons and/or sample period constraints.

Table 2. Descriptive Statistics

Panel A. Summary Statistics

Variable	N	Mean	Std Dev	P25	P50	P75
NumPubs3	2,520	39.617	200.988	0.000	3.000	14.000
NumPatents3	2,520	399.875	1327.572	4.000	13.000	182.000
IPBox	2,520	0.072	0.258	0.000	0.000	0.000
Size	2,520	7.605	2.899	5.292	7.939	10.167
Ptroa	2,520	-0.054	0.310	-0.077	0.044	0.106
Leverage	2,520	0.161	0.161	0.020	0.138	0.239
Log(R&DStock)	2,520	0.185	0.215	0.044	0.099	0.248
GDPgrowth	2,520	0.013	0.028	0.004	0.019	0.030
Corptaxrate	2,520	0.285	0.050	0.250	0.280	0.302
R&Dcredit	2,520	0.149	0.356	0.000	0.000	0.000
FutureR&D3	2,439	0.387	0.594	0.072	0.172	0.456

Panel B. By Treatment and Control

Variable	Pre-IP Box			Post-IP Box			
Treatment (*IPBox* = 1)	N	Mean	Med	N	Mean	Med	Diff. in means
NumPubs3	58	13.276	8.000	123	49.862	3.000	36.586
NumPatents3	58	163.586	17.000	123	174.415	24.000	10.828
Size	58	7.706	8.089	123	7.482	7.549	-0.225
Ptroa	58	-0.044	0.054	123	-0.012	0.034	0.032
Leverage	58	0.175	0.176	123	0.196	0.189	0.021
Log(R&DStock)	58	0.129	0.063	123	0.128	0.069	-0.002
GDPgrowth	58	0.013	0.014	123	0.014	0.017	0.001
Corptaxrate	58	0.288	0.280	123	0.289	0.300	0.001
R&Dcredit	58	0.293	0.000	123	0.935	1.000	0.642*
FutureR&D3	56	0.246	0.110	117	0.268	0.110	0.022
Control (*IPBox* = 0)	N	Mean	Med	N	Mean	Med	Diff. in means
NumPubs3	1,044	42.118	2.000	1,295	37.808	3.000	-4.310
NumPatents3	1,044	408.717	11.500	1,295	424.744	13.000	16.027
Size	1,044	7.402	7.427	1,295	7.775	8.101	0.373***
Ptroa	1,044	-0.058	0.044	1,295	-0.054	0.044	0.004
Leverage	1,044	0.158	0.117	1,295	0.160	0.146	0.002
Log(R&DStock)	1,044	0.199	0.112	1,295	0.181	0.097	-0.018*
GDPgrowth	1,044	0.020	0.023	1,295	0.008	0.015	-0.012***
Corptaxrate	1,044	0.296	0.280	1,295	0.275	0.280	-0.021***
R&Dcredit	1,044	0.084	0.000	1,295	0.120	0.000	0.035***
FutureR&D3	1,017	0.404	0.198	1,249	0.391	0.168	-0.013

Panel A shows the descriptive statistics of variables used in our primary analyses for the stacked sample. Panel B shows the descriptive statistics for treatment and control observations pre- and post-IP box adoption. Continuous variables are winsorized at the 1st and 99th percentiles. See Appendix C for detailed variable definitions.

Table 2. Descriptive Statistics (cont)

Panel C. Observations by Country

Country	IP Box Regime	N	Number of Publications	Number of Patents
Austria (AUT)		111	390	4,159
Belgium (BEL)	X	35	90	947
Croatia (HRV)		7	13	60
Denmark (DNK)		373	1,300	16,616
Finland (FIN)		144	95	481
France (FRA)	X	39	1,853	3,270
Germany (DEU)		877	27,237	286,224
Italy (ITA)	X	134	272	324
Luxembourg (LUX)	X	3	64	105
Latvia (LVA)		26	2	155
Netherlands (NLD)	X	5	20	298
Norway (NOR)		55	62	124
Poland (POL)	X	48	13	77
Spain (ESP)	X	13	120	117
Sweden (SWE)		373	531	2,003
Switzerland (CHE)	X	75	111	10,280
United Kingdom (GBR)	X	202	329	13,388
Total		**2,520**	**32,502**	**365,183**

Panel C shows the distribution of observations, publications, and patents in our stacked sample. Countries are denoted as having an IP box regime if they have implemented an IP box at any point from 2000-2020. Observations (*N*) include both treatment and control observations in each country.

Table 3. Effect of IP Box Adoption on Patents and Publications (H1)

DV =	# Patents (*NumPatents3/4/5*)			# Pubs (*NumPubs3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox × Post	**0.454****	**0.434****	**0.303**	**-0.689****	**-0.723****	**-0.671****
	(2.152)	**(2.133)**	**(1.539)**	**(-2.352)**	**(-2.506)**	**(-2.174)**
Size	0.760***	0.754***	0.749***	1.072***	1.055***	1.056***
	(4.845)	(4.805)	(4.722)	(3.975)	(4.003)	(4.052)
Ptroa	1.548	1.393	1.174	-2.517**	-2.725**	-2.924**
	(1.122)	(1.016)	(0.886)	(-2.130)	(-2.242)	(-2.369)
Leverage	-2.087	-2.226	-2.385	-5.344***	-5.527***	-5.770***
	(-1.327)	(-1.381)	(-1.451)	(-2.587)	(-2.624)	(-2.780)
Log(R&Dstock)	4.842***	4.550***	4.328***	3.415	2.964	2.459
	(2.931)	(2.785)	(2.698)	(1.271)	(1.113)	(0.881)
GDPgrowth	-2.715	-0.987	0.178	9.522*	7.111	7.749*
	(-1.071)	(-0.435)	(0.077)	(1.908)	(1.455)	(1.657)
Corptaxrate	0.792	1.610	1.802	0.745	-1.070	0.896
	(0.313)	(0.636)	(0.700)	(0.146)	(-0.225)	(0.179)
R&Dcredit	-0.345	-0.325	-0.306	-0.178	-0.047	-0.017
	(-1.582)	(-1.546)	(-1.473)	(-0.401)	(-0.104)	(-0.040)
Constant	-1.323	-1.184	-0.905	-5.015**	-3.780*	-4.038**
	(-1.229)	(-1.096)	(-0.797)	(-2.477)	(-1.850)	(-2.054)
Observations	2,519	2,409	2,293	2,503	2,259	2,066
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.757	0.760	0.760	0.673	0.682	0.696

This table shows the effect of IP box adoption on the number of patents from years *t* to *t+2* (column i), *t+3* (column ii), or *t+4* (column iii), and on the number of publications from years *t* to *t+2* (column iv), *t+3* (column v), or *t+4* (column vi). *# Patents* (*NumPatents3/4/5*) is the number of patents in which the firm is the assignee. *# Pubs* (*NumPubs3/4/5*) is the number of scientific, applied publications produced by the firm. *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 4. Types of Patents and Publications

Panel A. Types of Patents

DV =	# Incremental Patents (*NumIncremental3/4/5*)			# Radical Patents (*NumRadical3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox* × *Post	**0.440****	**0.418****	**0.284**	**0.783*****	**0.749*****	**0.640****
	(2.066)	**(2.046)**	**(1.439)**	**(2.642)**	**(2.621)**	**(2.378)**
Size	0.751***	0.746***	0.744***	0.877***	0.849***	0.815***
	(4.614)	(4.583)	(4.510)	(5.530)	(5.699)	(5.472)
Ptroa	1.673	1.507	1.245	-0.310	-0.340	0.054
	(1.181)	(1.069)	(0.914)	(-0.228)	(-0.256)	(0.042)
Leverage	-2.148	-2.281	-2.448	-2.006	-2.129	-2.054
	(-1.300)	(-1.348)	(-1.423)	(-1.156)	(-1.275)	(-1.226)
Log(R&Dstock)	4.892***	4.627***	4.390***	3.304	2.763	2.891
	(2.932)	(2.803)	(2.700)	(1.234)	(1.008)	(1.063)
GDPgrowth	-2.342	-0.777	0.223	-8.462**	-4.515	0.487
	(-0.899)	(-0.330)	(0.094)	(-2.155)	(-1.619)	(0.182)
Corptaxrate	0.440	1.162	1.333	3.470	5.129	6.057*
	(0.176)	(0.469)	(0.527)	(0.946)	(1.322)	(1.648)
R&Dcredit	-0.323	-0.294	-0.265	-0.436	-0.474*	-0.609**
	(-1.451)	(-1.375)	(-1.265)	(-1.442)	(-1.678)	(-2.316)
Constant	-1.239	-1.091	-0.819	-5.209***	-5.156***	-5.004***
	(-1.091)	(-0.958)	(-0.683)	(-3.164)	(-3.193)	(-3.337)
Observations	2,515	2,405	2,293	2,508	2,406	2,290
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.745	0.747	0.747	0.781	0.792	0.797

This panel shows the effect of IP box adoption on the number of incremental patents from years *t* to *t+2* (column i), *t+3* (column ii), or *t+4* (column iii), and on the number of radical patents from years *t* to *t+2* (column iv), *t+3* (column v), or *t+4* (column vi). *# Incremental Patents* (*NumIncremental3/4/5*) is the number of patents with backward patent citations. *# Radical Patents* (*NumRadical3/4/5*) is the number of patents without backward patent citations. *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 4 (cont)

Panel B. Types of Publications

DV =	# Engineering Pubs (*NumEngineering3/4/5*)			# Other Pubs (*NumOther3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox × Post	**-0.380**	**-0.468**	**-0.490**	**-0.943*** **	**-0.884*** **	**-0.762*** **
	(-1.180)	**(-1.375)**	**(-1.269)**	**(-3.830)**	**(-3.743)**	**(-2.880)**
Size	1.636***	1.559***	1.533***	0.648***	0.640***	0.632***
	(3.701)	(3.644)	(3.683)	(4.805)	(4.774)	(4.613)
Ptroa	-3.549**	-3.761**	-3.956**	-1.823**	-1.937**	-2.033**
	(-2.084)	(-2.165)	(-2.281)	(-2.275)	(-2.442)	(-2.523)
Leverage	-7.279**	-7.254**	-7.421***	-3.906***	-4.095***	-4.258***
	(-2.550)	(-2.575)	(-2.728)	(-2.822)	(-2.869)	(-2.915)
Log(R&Dstock)	6.201	5.344	4.577	1.091	0.805	0.392
	(1.596)	(1.416)	(1.202)	(0.647)	(0.479)	(0.220)
GDPgrowth	12.833*	9.581	11.491	5.983*	4.339	3.314
	(1.859)	(1.335)	(1.562)	(1.760)	(1.214)	(1.305)
Corptaxrate	-3.766	-7.473	-4.407	-0.171	-1.966	-1.608
	(-0.665)	(-1.345)	(-0.740)	(-0.051)	(-0.695)	(-0.579)
R&Dcredit	-1.378	-1.338	-1.163	0.297	0.367	0.373
	(-1.294)	(-1.202)	(-1.056)	(1.022)	(1.348)	(1.526)
Constant	-9.246**	-6.580	-6.874*	-1.660	-0.644	-0.376
	(-2.267)	(-1.603)	(-1.754)	(-1.140)	(-0.456)	(-0.283)
Observations	2,471	2,224	2,033	2,500	2,257	2,064
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.686	0.689	0.704	0.605	0.621	0.631

This panel shows the effect of IP box adoption on the number of engineering publications from years *t* to *t+2* (column i), *t+3* (column ii), or *t+4* (column iii), and on the number of non-engineering publications from years *t* to *t+2* (column iv), *t+3* (column v), or *t+4* (column vi). *# Engineering Pubs* (*NumEngineering3/4/5*) is the number of a firm's publications published by IEEE. *# Other Pubs* (*NumOther3/4/5*) is the number of firm publications not published by IEEE. *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 5. Effect of IP Box Adoption on Patents and Publications—Financial Constraints (H2a)

DV =	# Patents (*NumPatents3/4/5*)			# Pubs (*NumPubs3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox × Post × HighLev (β_1)	**0.415***	**0.373**	**0.224**	**-0.897****	**-0.928*****	**-0.790****
	(1.686)	**(1.508)**	**(0.892)**	**(-2.357)**	**(-2.644)**	**(-2.434)**
IPBox × Post × LowLev (β_2)	**0.656**	**0.714**	**0.654**	**1.050**	**0.796**	**0.661**
	(1.275)	**(1.428)**	**(1.375)**	**(1.307)**	**(1.037)**	**(0.928)**
HighLev	-0.046	-0.092	-0.140	-0.181	-0.291	-0.451
	(-0.156)	(-0.305)	(-0.454)	(-0.333)	(-0.562)	(-0.887)
Size	0.707***	0.710***	0.711***	0.943***	0.938***	0.932***
	(4.274)	(4.313)	(4.333)	(4.023)	(3.961)	(4.010)
Ptroa	1.280	1.064	0.741	-4.486***	-4.566***	-4.851***
	(0.888)	(0.738)	(0.527)	(-3.621)	(-3.752)	(-4.055)
Leverage	-1.821	-1.927	-2.065	-6.088**	-6.303**	-6.556***
	(-0.967)	(-1.001)	(-1.066)	(-2.395)	(-2.524)	(-2.865)
Log(R&Dstock)	3.919**	3.576*	3.164*	-3.504	-4.038	-5.039*
	(2.070)	(1.889)	(1.666)	(-1.294)	(-1.503)	(-1.743)
GDPgrowth	-3.022	-1.570	-0.373	10.412***	6.342*	6.843**
	(-1.171)	(-0.703)	(-0.169)	(2.852)	(1.705)	(2.318)
Corptaxrate	0.295	0.873	0.781	-0.880	-1.818	1.486
	(0.108)	(0.328)	(0.292)	(-0.194)	(-0.398)	(0.343)
R&Dcredit	-0.358	-0.322	-0.296	0.006	0.156	0.134
	(-1.473)	(-1.353)	(-1.258)	(0.014)	(0.388)	(0.379)
Constant	-0.563	-0.415	-0.052	-2.571	-1.614	-2.058
	(-0.528)	(-0.397)	(-0.046)	(-1.184)	(-0.657)	(-0.948)
F-test p-val: $\beta_1 \neq \beta_2$	0.686	0.562	0.453	0.006	0.013	0.022
Observations	2,154	2,019	1,891	2,149	1,968	1,801
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.751	0.749	0.748	0.737	0.742	0.755

This table shows the effect of IP box adoption on the number of patents and publications from years *t* to *t+2*, *t+3*, or *t+4* for observations for firms with above-median leverage in the year before IP box adoption (*HighLev*) and for firms without above-median leverage in the year before IP box adoption (*LowLev*). *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 6. Effect of IP Box Adoption on Patents and Publications —Labor Constraints (H2b)

Panel A. Labor Supply

DV =	# Patents (*NumPatents3/4/5*)			# Pubs (*NumPubs3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox × Post × HighUnemployment (β₁)	**0.330**	**0.315**	**0.169**	**-0.187**	**-0.179**	**0.080**
	(0.739)	**(0.731)**	**(0.451)**	**(-0.677)**	**(-0.679)**	**(0.270)**
IPBox × Post × LowUnemployment (β₂)	**0.511****	**0.485****	**0.358**	**-1.336****	**-1.454****	**-1.445****
	(2.226)	**(2.176)**	**(1.595)**	**(-2.486)**	**(-2.489)**	**(-2.385)**
Constant	-1.081	-1.073	-0.890	-2.790	-1.684	-1.284
	(-0.958)	(-0.967)	(-0.781)	(-1.218)	(-0.695)	(-0.549)
F-test p-val: $\beta_1 \neq \beta_2$	0.702	0.707	0.636	0.067	0.061	0.045
Observations	1,957	1,885	1,801	1,957	1,838	1,712
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.749	0.749	0.749	0.671	0.681	0.697

Panel B. Labor Quality

DV =	# Patents (*NumPatents3/4/5*)			# Pubs (*NumPubs3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox × Post × HighlyEducated (β₁)	**0.441**	**0.421**	**0.282**	**0.298**	**0.209**	**0.238**
	(1.445)	**(1.459)**	**(1.179)**	**(0.793)**	**(0.588)**	**(0.596)**
IPBox × Post × NotHighlyEducated (β₂)	**0.489***	**0.469***	**0.347**	**-1.103*****	**-1.252*****	**-1.522****
	(1.804)	**(1.725)**	**(1.253)**	**(-2.929)**	**(-2.831)**	**(-2.191)**
Constant	-0.882	-0.811	-0.588	-1.545	-0.663	0.028
	(-0.745)	(-0.690)	(-0.502)	(-0.667)	(-0.272)	(0.010)
F-test p-val: $\beta_1 \neq \beta_2$	0.909	0.909	0.870	0.028	0.030	0.072
Observations	1,994	1,922	1,838	1,991	1,872	1,749
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.749	0.749	0.748	0.671	0.681	0.697

Panel A shows the effect of IP box adoption on the number of patents and publications from years *t* to *t+2*, *t+3*, or *t+4* for observations for firms in countries with an above-median unemployment rate in the year before IP box adoption (*HighUnemployment*) and for firms in countries without above-median unemployment rate in the year before IP box adoption (*LowUnemployment*). Panel B shows the same for firms in countries with a highly educated workforce in the year before IP box adoption (*HighlyEducated*) and for firms in countries without a highly educated workforce in the year before IP box adoption (*NotHighlyEducated*). Control variables in all models are the same as in Table 3. *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 7. Cross-sectional Analysis—Limits on IP Box Benefits

DV =	# Patents (*NumPatents3/4/5*)			# Pubs (*NumPubs3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox × Post × Limit (β_1)	**-0.882***	**-0.798**	**-0.690**	**-0.647**	**-0.463**	**-0.298**
	(-1.741)	**(-1.475)**	**(-1.163)**	**(-1.527)**	**(-1.176)**	**(-0.650)**
IPBox × Post × NoLimit (β_2)	**0.583*****	**0.540****	**0.370***	**-0.714***	**-0.838****	**-0.761***
	(2.620)	**(2.519)**	**(1.822)**	**(-1.824)**	**(-2.079)**	**(-1.938)**
Size	0.761***	0.754***	0.750***	1.072***	1.055***	1.056***
	(4.842)	(4.803)	(4.717)	(3.976)	(4.010)	(4.058)
Ptroa	1.586	1.427	1.202	-2.520**	-2.742**	-2.940**
	(1.147)	(1.038)	(0.904)	(-2.124)	(-2.249)	(-2.375)
Leverage	-2.051	-2.191	-2.355	-5.346***	-5.539***	-5.779***
	(-1.295)	(-1.349)	(-1.421)	(-2.587)	(-2.630)	(-2.785)
Log(R&Dstock)	4.912***	4.615***	4.383***	3.413	2.951	2.455
	(2.944)	(2.795)	(2.704)	(1.267)	(1.106)	(0.880)
GDPgrowth	-1.907	-0.505	0.421	9.332**	6.368	6.999*
	(-0.792)	(-0.230)	(0.187)	(2.169)	(1.457)	(1.677)
Corptaxrate	5.327**	5.755**	5.077*	0.598	-1.974	-0.774
	(1.991)	(2.017)	(1.784)	(0.126)	(-0.457)	(-0.175)
R&Dcredit	-0.104	-0.089	-0.100	-0.175	-0.052	-0.070
	(-0.546)	(-0.489)	(-0.527)	(-0.399)	(-0.116)	(-0.160)
Constant	-2.866***	-2.602**	-2.034*	-4.954**	-3.411	-3.396*
	(-2.589)	(-2.264)	(-1.756)	(-2.350)	(-1.608)	(-1.709)
F-test p-val: $\beta_1 \neq \beta_2$	0.008	0.023	0.095	0.906	0.516	0.461
Observations	2,519	2,409	2,293	2,503	2,259	2,066
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.758	0.760	0.761	0.673	0.682	0.696

This table shows the effect of IP box adoption on the number of patents and publications from years *t* to *t+2*, *t+3*, or *t+4* for firms in an IP box regime that places a cap on IP box benefits (*Limit*) and for firms in an IP box regime that does not place a cap on IP box benefits (*NoLimit*) (see Chen et al. 2023). Control variables are the same as in Table 3. *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 8. Cross-sectional Analysis—Expanded IP Box Benefits

DV =	# Patents (*NumPatents3/4/5*)			# Pubs (*NumPubs3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox × Post × Expanded (β_1)	**0.799*****	**0.717*****	**0.515*****	**-2.144*****	**-1.349*****	**-0.636****
	(4.573)	**(4.397)**	**(3.386)**	**(-8.236)**	**(-5.489)**	**(-2.543)**
IPBox × Post × NotExpanded (β_2)	**0.440****	**0.421****	**0.292**	**-0.674****	**-0.713****	**-0.671****
	(2.049)	**(2.030)**	**(1.452)**	**(-2.284)**	**(-2.447)**	**(-2.137)**
Size	0.760***	0.754***	0.749***	1.072***	1.055***	1.056***
	(4.845)	(4.806)	(4.723)	(3.974)	(4.002)	(4.052)
Ptroa	1.546	1.390	1.172	-2.515**	-2.724**	-2.924**
	(1.120)	(1.014)	(0.885)	(-2.129)	(-2.241)	(-2.369)
Leverage	-2.087	-2.226	-2.385	-5.343***	-5.527***	-5.770***
	(-1.327)	(-1.381)	(-1.452)	(-2.586)	(-2.624)	(-2.781)
Log(R&Dstock)	4.841***	4.549***	4.327***	3.417	2.965	2.459
	(2.932)	(2.786)	(2.698)	(1.271)	(1.113)	(0.881)
GDPgrowth	-1.844	-0.223	0.761	9.119*	6.889	7.765
	(-0.667)	(-0.090)	(0.302)	(1.801)	(1.387)	(1.617)
Corptaxrate	0.849	1.666	1.848	0.715	-1.082	0.897
	(0.335)	(0.657)	(0.715)	(0.140)	(-0.227)	(0.179)
R&Dcredit	-0.344	-0.324	-0.305	-0.185	-0.052	-0.017
	(-1.577)	(-1.541)	(-1.467)	(-0.417)	(-0.114)	(-0.040)
Constant	-1.352	-1.211	-0.927	-5.004**	-3.776*	-4.039**
	(-1.257)	(-1.122)	(-0.815)	(-2.475)	(-1.850)	(-2.055)
F-test p-val: $\beta_1 \neq \beta_2$	0.012	0.023	0.081	0.000	0.067	0.921
Observations	2,519	2,409	2,293	2,503	2,259	2,066
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.757	0.760	0.760	0.673	0.682	0.696

This table shows the effect of IP box adoption on the number of patents and publications from years *t* to *t+2*, *t+3*, or *t+4* for observations in years where an IP box regime has expanded benefits (*Expanded*) per Chen et al. (2023) and for observations in years where an IP box regime does not have expanded benefits (*NotExpanded*). *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 9. Additional Analysis—Relevance of Publications for Patents

DV =	**Total citations of pubs by patents** (*TotalPatentPubCites3/5*)		**Citations of pubs by own patents** (*SelfPatentPubCites3/5*)		**Citations of pubs by other patents** (*PeerPatentPubCites3/5*)	
	Short-term	*Long-term*	*Short-term*	*Long-term*	*Short-term*	*Long-term*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox* × *Post	**0.198**	**0.501****	**0.973****	**0.003**	**0.104**	**0.516*****
	(0.507)	**(2.395)**	**(2.111)**	**(0.008)**	**(0.241)**	**(2.609)**
NumPubs	0.004***	0.003***	0.004***	0.004***	0.004***	0.003***
	(4.009)	(3.267)	(3.779)	(4.780)	(3.778)	(3.100)
NumPatents	0.000***	0.000***	0.000**	0.000	0.000***	0.000***
	(3.114)	(3.208)	(2.243)	(1.214)	(3.093)	(3.684)
Size	0.033	0.486***	0.030	0.313**	0.030	0.504***
	(0.225)	(3.736)	(0.231)	(2.460)	(0.200)	(3.904)
Ptroa	0.760	-1.612	-1.856	-1.559	0.896	-1.782*
	(0.675)	(-1.489)	(-0.988)	(-0.826)	(0.776)	(-1.738)
Leverage	0.291	-4.951***	0.392	-4.114**	0.258	-5.203***
	(0.188)	(-3.441)	(0.268)	(-2.389)	(0.162)	(-3.761)
Log(R&Dstock)	-2.445	-0.864	-4.247	-10.554***	-2.396	-0.320
	(-1.167)	(-0.687)	(-1.479)	(-3.955)	(-1.114)	(-0.263)
GDPgrowth	10.221**	2.554	18.801***	20.600***	9.653**	1.441
	(2.507)	(0.724)	(3.974)	(2.642)	(2.275)	(0.422)
Corptaxrate	9.731	-2.169	3.831	5.279	10.939	-2.702
	(1.160)	(-0.544)	(0.421)	(0.863)	(1.198)	(-0.700)
R&Dcredit	-0.233	-0.196*	-0.388	-0.875***	-0.309	-0.195*
	(-1.069)	(-1.876)	(-1.562)	(-2.939)	(-1.274)	(-1.723)
Constant	-2.358	-0.901	-2.334	-3.241	-2.807	-0.961
	(-0.774)	(-0.396)	(-0.650)	(-1.173)	(-0.862)	(-0.444)
Observations	319	235	319	235	319	235
Cohort-country FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Pseudo R-squared	0.783	0.890	0.627	0.723	0.774	0.885

This table shows the effect of IP box adoption on the number of citations of a firm's publications by: (1) all patents (*TotalPatentPubCites3/5*) from years *t* to *t+2* or *t+4* (columns i-ii), (2) a firm's own patents (*SelfPatentPubCites3/5*) from years *t* to *t+2* or *t+4* (columns iii-iv), and (3) other firms' patents (*PeerPatentPubCites3/5*) from years *t* to *t+2* or *t+4* (columns v-vi). *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 10. Additional Analysis—IP Box Adoption and R&D Spending

DV =	**Future R&D** (*FutureR&D3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)
IPBox × Post	**0.047**	**0.028**	**-0.006**
	(0.715)	**(0.418)**	**(-0.079)**
R&D	2.367***	2.909***	3.422***
	(10.414)	(10.255)	(11.183)
Size	-0.008	-0.018	-0.035**
	(-0.766)	(-1.441)	(-2.143)
Ptroa	-0.228	-0.312*	-0.287
	(-1.517)	(-1.683)	(-1.490)
Leverage	-0.244***	-0.425***	-0.507***
	(-2.734)	(-3.478)	(-3.412)
GDPgrowth	-0.971	-1.136	-0.558
	(-0.772)	(-0.715)	(-0.350)
Corptaxrate	-1.546	-0.913	-1.645
	(-0.749)	(-0.426)	(-0.812)
R&Dcredit	-0.165	-0.213*	-0.214*
	(-1.479)	(-1.830)	(-1.769)
Constant	0.672	0.678	1.084
	(1.176)	(1.081)	(1.633)
Observations	2,453	2,318	2,175
Cohort-country FE	Yes	Yes	Yes
Cohort-year FE	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm
Adj. R-squared	0.817	0.834	0.837

This tables shows the effect of IP box adoption on R&D spending (*FutureR&D3/4/5*) from years *t* to *t+2* (column i), *t+3* (column ii), or *t+4* (column iii). *Future R&D* is cumulative R&D expense, scaled by assets. *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 11. Additional Analysis—Individual-Level Effects of IP Box Adoption

Panel A. Effect of IP Box Adoption on Patent and Publication Outcomes

DV =	**# Patents** (*NumPatentsIndivid3/4/5*)			**# Pubs** (*NumPubsIndivid3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*	*t to t+2*	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
IPBox x Post	**2.278****	**2.820****	**2.969***	**-0.075**	**-0.926*****	**-1.348****
	(2.544)	**(2.234)**	**(1.928)**	**(-0.495)**	**(-2.826)**	**(-2.549)**
Observations	80,540	80,540	80,540	61,602	61,602	61,602
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Employee-firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm	By firm	By firm	By firm
Adj. R-squared	0.720	0.764	0.800	0.700	0.757	0.793

This table reports individual-level regressions, where individuals are both authors and inventors associated with the firms in the main sample. The analysis is restricted to the dual-activity sample, which includes only individuals who patent or publish at some point during the sample period. The dependent variables are the number of patents or publications produced from years *t* to *t+2* (columns i, iv), *t* to *t+3* (columns ii, v), or *t* to *t+4* (columns iii, vi). *# Patents* is the number of patents in which the individual is listed as an inventor. *# Pubs* is the number of publications authored by the individual. Patent and publication data are from the main firm-level sample. *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.

Table 11 (cont)

Panel B. Effect of IP Box Adoption on the Share of Patents in Total Innovation Activity

DV =	**Patent to Total Innov. Activity** (*PatentShareIndivid3/4/5*)		
	t to t+2	*t to t+3*	*t to t+4*
	(i)	(ii)	(iii)
IPBox x Post	0.056*	0.056*	0.055*
	(1.864)	(1.938)	(1.937)
Observations	120,867	122,988	124,685
Year FE	Yes	Yes	Yes
Employee-firm FE	Yes	Yes	Yes
Clustered errors	By firm	By firm	By firm
Adj. R-squared	0.488	0.496	0.502

This table reports individual-level regressions of the share of patents in total innovative activity. *Patent Share* is the ratio of patents to total innovation output (patents plus publications) over years *t* to *t+2* (column i), *t* to *t+3* (column ii), or *t* to *t+4* (column iii). The data is restricted to the dual-activity sample, which includes only individuals who patent or publish at some point during the sample period. *t*-statistics are presented in parentheses and based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed tests. All variables are defined in Appendix C.