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Make America Innovate Again: Construing Patent Box Proposals in view of a Policy Mix Approach

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MAKE AMERICA INNOVATE AGAIN: CONSTRUING PATENT BOX PROPOSALS IN VIEW OF A POLICY MIX APPROACH

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I. INTRODUCTION

Recent Congressional proposals suggest budding bipartisan support for enacting a patent box.[2] A patent box[3] is a regulatory regime granting tax relief for commercial activity related to qualifying research and development (R&D), patents, or other intellectual property (IP).[4] Tax relief is often provided to firms[5] through a deduction, a reduced rate, or an exemption of IP income.[6] Congressmen Boustany's (R-LA) and Neal's (D-MA) patent box proposal allows corporations to deduct 71% of qualified profits, producing an effective 10% tax rate.[7] Meanwhile, Senator Feinstein's (D-CA) proposal seeks a 15% tax rate on income from patents developed and used for manufacture in the

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[2] JANE G. GRAVELLE, CONG. RESEARCH SERV., IN10289, A U.S. PATENT BOX: ISSUES (2015), https://www.fas.org/sgp/crs/misc/IN10289.pdf ("Congressional proposals for the subsidy (known as a patent or innovation box) include a draft proposal by Representatives Boustany and Neal, the Innovation Promotion Act of 2015, proposed legislation by Senator Feinstein, and a bill introduced by Representative Schwartz in the 113th Congress (H.R. 2605)."); Evan Migdail & Bruce Thompson, *Patent box concept emerges on the tax reform agenda for U.S. Congress*, JDSUPRA BUS. ADVISOR (May 5, 2015), http://www.jdsupra.com/legalnews/patent-box-concept-emerges-on-the-tax-27232/ ("In recent weeks, a major concept has emerged in tax reform discussions: the establishment of a patent or innovation box.").

[3] Depending on the types of intellectual property covered, it is also known as an innovation box. S*ee* Bernard Knight & Goud Maragani, *It Is Time for the United States to Implement a Patent Box Tax Regime to Encourage Domestic Manufacturing*, 19 STAN. J.L. BUS. & FIN. 39, 52 (2013). Ireland implemented the first patent box in 1973, and the UK, France, and China, among others, have done so in recent years. GRAVELLE, *supra* note 2; ROBERT D. ATKINSON & SCOTT ANDES, THE INFO. TECH. & INNOVATION FOUND., PATENT BOXES: INNOVATION IN TAX POLICY AND TAX POLICY FOR INNOVATION 15 (2011), http://www.itif.org/files/2011-patent-box-final.pdf.

[4] Jim Shanahan, *Is it time for your Country to consider the "patent box"?*, PWC'S GLOBAL R&D TAX SYMPOSIUM ON DESIGNING A BLUEPRINT FOR REDUCING THE AFTER-TAX COST OF GLOBAL R&D 4 (2011), http://download.pwc.com/ie/pubs/2011_is_it_time_for_your_country_to_consider_the_patent_box.pdf; ATKINSON & ANDES, *supra* note 3.

[5] Per Bylund, *The Economic Theory of the Firm,* MISES DAILY (Sep. 20, 2011), https://mises.org/library/economic-theory-firm.

[6] Michael J. Graetz & Rachael Doud, *Technological Innovation, International Competition, and the Challenges of International Income Taxation*, 113 COLUM. L. REV. 347, 363 (2013).

[7] JASON J. FICHTNER & ADAM N. MICHEL, MERCATUS CENTER AT GEORGE MASON UNIV., DON'T PUT AMERICAN INNOVATION IN A PATENT BOX: TAX POLICY, INTELLECTUAL PROPERTY, AND THE FUTURE OF R&D, MERCATUS ON POLICY 2–3 (2015), http://mercatus.org/sites/default/files/Fichtner-Patent-Boxes-MOP.pdf; GRAVELLE, *supra* note 2.

US.[8] Although regimes vary,[9] nations typically deploy patent boxes to address certain market failures hindering innovation.[10] In particular, patent boxes have been adopted abroad as a back-end incentive to foster R&D commercialization and spending by domestic firms.[11]

Despite widespread adoption, patent boxes remain controversial.[12] Proponents cite potential domestic manufacturing gains and incentive effects.[13] Skeptics and opponents, on the other hand, raise redundancy and efficacy concerns.[14] Before expending political capital to adopt a patent box, its impact as a potential U.S. policy instrument should be considered.

Assessing the efficacy of a patent box elsewhere may inform the U.S. impact analysis. The U.K. recently enacted a patent box in 2013 and shares enough economic similarities to provide a useful comparison to the U.S.[15] A mere country-to-country comparison, however, fails to consider the broader, interactive factors that contribute to a country's innovation performance.[16] A policy mix approach offers a conceptual framework for understanding the

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[8] GRAVELLE, *supra* note 2.
[9] *See* Shanahan, *supra* note 4, at 4. *See also* Knight & Maragani, *supra* note 3, at 48.
[10] Innovation refers to the "transformation of ideas into new products, services, or improvements in organization or process." RISING TO THE CHALLENGE: U.S. INNOVATION POLICY FOR THE GLOBAL ECONOMY 24 (Charles W. Wessner & Alan Wm. Wolff, eds., Nat'l Academies Press 2012), http://politiques-innovation.org/wp-content/uploads/2013/07/2012-Wessner-STEP-Rising-to-the-Challenge-U.S.-Innovation-Policy-for-Global-Economy.pdf. Accordingly, "[s]ome innovations are incremental; others are disruptive, displacing exiting technologies while creating new markets and value networks." *Id.* ATKINSON & ANDES, *supra* note 3, at 15–16; *see infra* Section III.
[11] ROBERT D. ATKINSON & STEPHEN J. EZELL, INNOVATION ECONOMICS: THE RACE FOR A GLOBAL ADVANTAGE 172 (2012); *see* GLOBAL TAX ACCOUNTING SERVICES, PRICEWATERHOUSECOOPERS, PATENT BOX AND TECHNOLOGY INCENTIVES: TAX AND FINANCIAL REPORTING CONSIDERATIONS 1–2 (2014), https://www.pwc.com/gx/en/tax/publications/assets/pwc-patent-box-and-technology-incentives-tax-and-financial-reporting-considerations.pdf; *see also* Graetz & Doud, *supra* note 6, at 362 ("A substantial number of European countries have recently implemented innovation tax incentives that focus on the income, rather than the development, side of IP by adopting 'patent boxes,' or 'innovation boxes.'").
[12] Simon Goodley, *George Osborne waters down flagship controversial tax break*, THE GUARDIAN (Nov. 11, 2014, 1:07 PM), http://www.theguardian.com/politics/2014/nov/11/george-osborne-patent-boxes-tax-break.
[13] *See, e.g.*, Knight & Margani, *supra* note 3, at 42–46.
[14] ATKINSON & ANDES, *supra* note 3, at 1, 9–14.
[15] ATKINSON & ANDES, *supra* note 3, at 15.
[16] *See infra* Section III.

interdependence of actors, ideas, structures, institutions, and policies integral to a country's innovation performance. Evaluating the impact of the U.K. patent box in this framework will overcome the pitfalls of a direct comparison.[17]

Therefore, to gauge the value of adopting a patent box, this paper first establishes the importance of innovation policy within the increasingly competitive nature of the global economy.[18] It then assesses the U.K. and U.S. policy instruments deployed to foster innovation: the patent box and the R&D tax credit, respectively.[19] With an understanding of these two exemplary policy instruments, a broader policy mix framework is then developed to provide a conceptual underpinning for evaluating the efficacy of the patent box and the innovation ecology of both countries.[20] This paper then, based on the comparison and policy mix framework, argues that the patent box provides little benefit beyond that of already implemented policy tools.[21] Finally, a more comprehensive and directed approach to innovation, rather than the incremental one used thus far, is recommended to ensure that the U.S. remains competitive in the global economy.[22]

II. U.K. AND U.S. INNOVATION POLICY IN A COMPETITIVE GLOBAL ECONOMY

A. Global Competition to Foster Innovation

It is widely accepted by economists and nations alike that innovation drives economic prosperity.[23] It is also well established that private sector R&D is "crucial to ongoing technological advances," is

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[17] *See infra* Section IV.
[18] *See infra* Section II.A.
[19] *See infra* Section II.B.
[20] *See infra* Section III.
[21] *See infra* Section IV.
[22] *See infra* Section IV.
[23] Graetz & Doud, *supra* note 6, at 348 ("Two things are clear and essentially uncontested among economists. First is the importance of technological innovations to economic growth."); ATKINSON & EZELL *supra* note 11, at 6 ("[M]ost nations recognize that they have to be intense competitors if they are to be successful . . . . And most nations also realize that high wage innovation and knowledge-based industries play a key role in driving prosperity."); RISING TO THE CHALLENGE, *supra* note 10, at 201 ("Virtually every important trading partner has declared innovation to be central to increasing productivity, economic growth, and living standards.").

capable of producing positive externalities, and "is underproduced in the absence of government support."[24] This, combined with the growing mobility of firms, has created an environment where countries look to reel in firms with beneficial policies.[25] Fierce competition has thus arisen between nations to develop innovation policies that attract firms willing to invest in R&D and increase commercialization by domestic firms:[26] "Nations around the world are establishing national innovation strategies, restructuring their tax and regulatory systems to become more competitive, expanding support for science and technology, improving their education systems, spurring investment in broadband and other IT areas, and taking a myriad of other pro-innovation steps."[27]

A nation hoping to compete in this environment must make innovation a focal point of its economic development.[28] Failure to acknowledge and adapt to the increasingly competitive international innovation arena could spell future economic trouble.[29]

The U.S. once stood at the forefront of innovation policy in the 1970s but has since fallen.[30] Although it now spends more on R&D than any other nation, "its relative position (measured by the share of such investment in national income) has been falling even as other countries increase their investments in research."[31] This decline will become increasingly problematic as the U.S. economy relies more and

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[24] Graetz & Doud, *supra* note 6, at 349; *see* Laura Tyson & Greg Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness: Gauging the Economic and Fiscal Effectiveness of the Credit*, CTR. FOR AM. PROGRESS 1 (2012), http://www.americanprogress.org/wp-content/uploads/issues/2012/01/pdf/corporate_r_and_d.pdf

[25] *See* ATKINSON & ANDES, *supra* note 3, at 15.

[26] RISING TO THE CHALLENGE, *supra* note 10, at 201 ("The twenty-first century is witnessing a rapidly evolving, intensely competitive global landscape. Political and business leaders in both advanced and emerging economies see innovation-led development as central to growth. China, India, Russia, Germany, and Singapore are among the many nations that are formulating comprehensive national strategies for improving their innovation capacity."); *see* ATKINSON & ANDES, *supra* note 3, at 20 n.1 (quoting Rachel Griffith, Helen Miller & Martin O'Connell, "Corporate Taxes and the Location of Intellectual Property" (June 2011) (working paper) (Center for Economic Policy Research).

[27] 3ATKINSON & EZELL, *supra* note 11, at 6.

[28] *Id.* at 8.

[29] *Cf. id.*, at 9–10 (arguing that rapid industrial decline is related to a lack of challenging the status quo thinking regarding innovation–supporting policies).

[30] *See id.*, at 6.

[31] TYSON & LINDEN, *supra* note 24, at 1.

more on innovation and IP.[32] To stem this decline, the U.S. must reassess its innovation policy.[33]

B. Comparing U.K. and U.S. Innovation Policy

U.K. innovation policy and its effects serve as a useful counterpoint to those of the U.S., providing the comparative utility of a patent box and illustrative economic factors. Both, for example, are world-leaders in research[34] and have top-notch universities, each an important element in sustaining innovation. A key distinction, however, lies in the U.K.'s comparatively low rate of business innovation.[35] From 2000 to 2013, the U.K.'s business R&D intensity[36] ranked well below the average of Organisation for Economic Co-operation and Development (OECD) countries.[37] The U.S., on the other hand, ranked above the OECD average during the period from 2000 to 2012.[38] These distinctions will prove useful in assessing the potential efficacy of the patent box in the U.S.[39]

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[32] *See* ATKINSON & ANDES, *supra* note 3, at 17.
[33] *See id.*
[34] *See* OECD Science, *Technology and Industry Scoreboard* (2011), http://www.oecd-ilibrary.org/sites/sti_scoreboard-2011-en/02/05/index.html?itemId=/content/chapter/sti_scoreboard-2011-16-en (last visited May 14, 2016); Peter Coy, *The Bloomberg Innovation Index*, BLOOMBERG (2015), http://www.bloomberg.com/graphics/2015-innovative-countries/.
[35] *See* THE ORG. FOR ECON. CO-OPERATION AND DEV., DIRECTORATE FOR SCI., TECH. AND INNOVATION, R&D TAX INCENTIVE SUPPORT: UNITED KINGDOM (2016), http://www.oecd.org/sti/OECD-STI-RDTaxIncentives-CountryProfile_GBR.pdf; THE ORG. FOR ECON. CO-OPERATION AND DEV., DIRECTORATE FOR SCI., TECH. AND INNOVATION, R&D TAX INCENTIVE SUPPORT: UNITED STATES (2016), http://www.oecd.org/sti/OECD-STI-RDTaxIncentives-CountryProfile_USA.pdf.
[36] R&D intensity is a measure of an "economy's relative degree of investment in generating new knowledge" and is calculated as the gross domestic expenditure on R&D as a percentage of GDP. OECD, *OECD Science, Technology and Industry Scoreboard* (2011), http://www.oecd-ilibrary.org/sites/sti_scoreboard-2011-en/02/05/index.html?itemId=/content/chapter/sti_scoreboard-2011-16-en (last visited May 14, 2016).
[37] *Id.*
[38] OECD, R&D TAX INCENTIVE SUPPORT: UNITED STATES, http://www.oecd.org/sti/OECD-STI-RDTaxIncentives-CountryProfile_USA.pdf (last visited May 14, 2016).
[39] *See infra* Section IV.

1. Innovation Policy in the UK

"The U.K. has made a conscientious decision to place innovation at the center of our nation's economic growth strategy"[40] by deploying, among other things, R&D tax incentives and tax advantaged venture capital schemes as innovation policy instruments.[41] Most relevant here, however, is its recent adoption of the patent box.

a. History of the U.K. Patent Box

Responding to a growing number of companies moving patent holdings offshore, the government in 2010 announced its intent to introduce a patent box as part of a larger plan to develop a more competitive tax system for businesses.[42] In particular, the goal was to provide incentives for companies to retain and commercialize existing patents and to develop new patented products:[43] "The Patent Box will encourage companies to locate the high-value jobs and activity associated with the development, manufacture and exploitation of patents in the UK. It will also enhance the competitiveness of the UK tax system for high-tech companies that obtain profits from patents."[44]

The patent box was developed, in part, over the course of three consultations.[45] With each consultation, Her Majesty's Treasury (HM Treasury), the economic and finance ministry of the U.K.

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[40] ATKINSON & EZELL, *supra* note 11, at 135.

[41] DEPARTMENT FOR BUSINESS INNOVATION & SKILLS, OUR PLAN FOR GROWTH: SCIENCE AND INNOVATION (2014), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387780/PU1719_HMT_Science_.pdf.

[42] HM TREASURY, CONSULTATION ON THE PATENT BOX 3 (2011), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/81512/consult_patent_box.pdf.

[43] CIRD200110 Patent Box: overview of the patent box regime: aim of the patent box, http://www.hmrc.gov.uk/Manuals/cirdmanual/CIRD200110.htm (last visited May 14, 2016).

[44] HM TREASURY, CORPORATE TAX REFORM: DELIVERING A MORE COMPETITIVE SYSTEM 47 (2010), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/81303/corporate_tax_reform_complete_document.pdf.

[45] HM TREASURY, PATENT BOX: SUBSTANTIAL ACTIVITIES 3 (2015), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/469969/Patent_Box_substantial_activities.pdf.

government,[46] hoped to engage "businesses, representative bodies and others interested in the [sic] promoting the growth of innovative companies in the U.K. will play a full part in the consultation process."[47] Shortly after these consultations, the Finance Act of 2012 enacted the current patent box into law.[48]

Recent developments, however, promise forthcoming changes to the patent box.[49] On October 22, 2015, HM Treasury released a consultation discussing options for modifying the patent box in view of OECD recommendations predicated on curbing base erosion and profit shifting by multinational enterprises.[50] The U.K.'s new approach to the patent box will be that of a modified nexus approach.[51] Future legislation will likely "introduce a requirement that, in order to benefit from the regime, a business must conduct the substantial activities which generate the income benefiting from the regime."[52] The changes aligned with the OECD recommendations will apply to new entrants on July 1, 2016.[53]

b. Design of the U.K. Patent Box

The current U.K. patent box, as yet unchanged by the OECD recommendations, applies a 10% lower rate of corporate tax to profits attributable to patents and equivalent forms of IP, whether received as a

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[46] HM Treasury, *About us*, https://www.gov.uk/government/organisations/hm-treasury/about (last visited May 14, 2016) ("HM Treasury is the government's economic and finance ministry, maintaining control over public spending, setting the direction of the U.K.'s economic policy and working to achieve strong and sustainable economic growth.").
[47] CONSULTATION ON THE PATENT BOX, *supra* note 42.
[48] CIRD200120 Patent Box: overview of the patent box regime: history of the patent box, http://www.hmrc.gov.uk/Manuals/cirdmanual/CIRD200120.htm (last visited May 14, 2016); *see* Finance Act 2012, sch. 2, *available at* http://www.legislation.gov.uk/ukpga/2012/14/pdfs/ukpga_20120014_en.pdf (last visited May 14, 2016); *see also* PATENT BOX: SUBSTANTIAL ACTIVITIES, *supra* note 45, at 7.
[49] *See* PATENT BOX: SUBSTANTIAL ACTIVITIES, *supra* note 45, at 10.
[50] *See id.* at 1; Simmons & Simmons, *U.K. consultation on patent box changes*, ELIXICA (Oct. 30, 2015), http://www.elexica.com/en/legal-topics/tax/30-uk-consultation-on-patent-box-changes.
[51] Simmons & Simmons, *supra* note 50.
[52] *Id.*
[53] *Id*.

royalty or embedded in the sales price of a product.[54] The lower rate is achieved through an equivalent deduction based on relevant profits.[55] The deduction can be calculated according to the following formula:

$$RP \times FY\% \times ((MR - IPR) \div MR)$$

where RP is the profits of a company's trade relevant to patent box; FY% is the appropriate percentage for each financial year; MR is the main rate of Corporation Tax; and IPR is the reduced rate of 10%.[56] Qualifying companies can elect to receive this benefit.[57]

In order to qualify, a company must satisfy one of three conditions: condition A, B, or C.[58] A company fulfills condition A if it holds qualifying IP rights or an exclusive license in qualifying IP rights.[59] Condition B is met if a company has held a 'qualifying IP right' or an exclusive license in respect of any qualifying IP rights, has received income in respect of an event or events occurring at times when it was a qualifying company and a patent box election had effect, and that income falls to be taxed in a later accounting period.[60] Lastly, condition C can be met only by members of a group and requires a company to have either developed or be actively managing its IP portfolio.[61] Qualifying IP includes patents granted under the U.K. Patents Act of 1977 and under the European Patent Convention.[62]

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[54] HM REVENUE & CUSTOMS, CORPORATION TAX: THE PATENT BOX (Jan. 1, 2007) https://www.gov.uk/guidance/corporation-tax-the-patent-box; *see also* PATENT BOX: SUBSTANTIAL ACTIVITIES, *supra* note 45, at 7.; CIRD200120, *supra* note 48.
[55] PATENT BOX: SUBSTANTIAL ACTIVITIES, *supra* note 45, at 7.
[56] CORPORATION TAX: THE PATENT BOX, *supra* note 54.
[57] DLA Piper, *The UK Patent Box: Plan Now For 2013 and Beyond* 1 (2012), https://www.dlapiper.com/~/media/Files/Insights/Publications/2012/07/The%20UK%20patent%20box/Files/UK_Patent_Box/FileAttachment/UK_Patent_Box.pdf (last visited May 14, 2016).
[58] CIRD210100 Patent Box: qualifying companies: meaning of 'qualifying company,' http://www.hmrc.gov.uk/manuals/cirdmanual/CIRD210100.htm (last visited May 14, 2016).
[59] *Id.*
[60] *Id.*
[61] *Id*.
[62] DLA Piper, *supra* note 57, at 2.

c. Efficacy of the U.K. Patent Box

It may be too early to assess the true impact of the U.K. patent box.[63] One way to determine the effectiveness of the patent box would require data showing the extent to which it accomplished its aims.[64] A proper evaluation would thus require evidence showing the extent to which the tax regime incentivized companies to retain and commercialize existing patents or develop newly patented products at the margins.[65] It would also consider evidence tending to show the movement of high-value jobs into the U.K. to exploit the tax regime.[66] This, weighed against the loss of tax revenue resulting from these tax breaks would provide an idea of the measure's efficacy.[67]

Some emerging evidence may bear on this balance, but the overall outlook remains unclear. According to HM Treasury, "[t]he introduction of the Patent Box has encouraged investment and economic growth in the U.K. as well as limiting the movement of intellectual property offshore by innovative businesses that might otherwise have invested elsewhere."[68] As of October 22, 2015, 639 companies using the patent box had received a benefit having an aggregate total of £335 million.[69] Further dissection of this statistic, however, would be necessary to understand how it captures the commercialization of patents for companies that would not have otherwise done so. Additionally, GlaxoSmithKline, a pharmaceutical

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[63] *See* CAMBRIDGE DESIGN PARTNERSHIP AND MARKS & CLERK, *An Industry Report on the Patent Box Initiative and its Impact on UK Innovation, Patent Box: Incentivizing UK Innovation* 6 (2013), http://www.marks-clerk.com/MarksClerk/media/MCMediaLib/PDF's/Reports/Marks-Clerk-Patent-Box-Report-2013.pdf?ext=.pdf (last visited May 14, 2016).

[64] ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, *Reducing the Risk of Policy Failure: Challenges for Regulatory Compliance* 7 (2000), https://www.oecd.org/gov/regulatory-policy/1910833.pdf ("A key determinant of government effectiveness is how well regulatory systems achieve their policy objectives."). *See also supra* Section II.B.a.

[65] *See* CHARLES LEVY & LAURA O'BRIEN, *Will the Patent Box Boost the U.K. Innovation Ecosystem?*, BIG INNOVATION CENTRE 7 (2013) https://fvstatic.s3.amazonaws.com/1425647105_0329808001425647105.pdf.

[66] *See supra* Section II.B.2.a.

[67] A similar balancing analysis would be needed to test the impact of the R&D tax credit. *See, e.g,.* GARY GUENTHER, CONG. RESEARCH SERV., RL31191, RESEARCH TAX CREDIT: CURRENT LAW AND POLICY ISSUES FOR THE 114TH CONGRESS 8 (2015), https://www.fas.org/sgp/crs/misc/RL31181.pdf; *see also supra* Section II.B.2.c.

[68] PATENT BOX: SUBSTANTIAL ACTIVITIES, *supra* note 45, at 24.

[69] *Id.* at 5.

company ranked the 135th largest in the world as of 2015,[70] stated an intention to relocate R&D operations into the U.K. to take advantage of the patent box.[71] Though promising, it is unclear the extent to which this may be indicative of other companies following suit. Lastly, another potential efficacy metric, arguably in alignment with stated objectives,[72] might be the extent to which patent filings have increased after or in anticipation of the tax regime's implementation.[73] Patent application filings in the U.K. totaled 22,256 in 2011; 23,229 in 2012; 22,936 in 2013; and 23,040 in 2014.[74] Patent publications totaled 10,043 in 2011; 10,653 in 2012; 11,021 in 2013; and 12,227 in 2014.[75] Based on the data thus far, there is no clear indication that the patent box has affected filings. In light of all presented data, further evidence is needed to assess the efficacy of the U.K. patent box.

2. Innovation Policy in the US

In contrast to the U.K. patent box, U.S. federal law provides two tax incentives for firm R&D investment, both of which were enacted to overcome market failures.[76] Section 174 of the Internal Revenue Code (IRC) offers an unlimited expensing allowance for qualified research spending, while Section 41 of the IRC offers a non-

[70] *The World's Biggest Public Companies*, FORBES.COM, http://www.forbes.com/global2000/list/3/#tab:overall (last visited May 14, 2016).
[71] Bob Stembridge, *Patent Box Tax Incentives Show Positive Signs*, THOMPSON REUTERS, http://stateofinnovation.thomsonreuters.com/patent-box-tax-incentives-show-positive-signs (last visited May 14, 2016) ("GlaxoSmithKline is on record as taking advantage of the U.K. Patent Box by relocating some of its R&D operations back to the U.K. from offshore locations. Chief Executive Andrew Witty said recently, 'Since the Patent Box, we've invested in upgrading 15 or 16 of our sites in the UK. It has made Britain the go-to place for our industry.'").
[72] *See supra* Section II.B.1.
[73] *See* CAMBRIDGE DESIGN PARTNERSHIP AND MARKS & CLERK, *supra* note 63, at 3 (comparing patent application numbers between countries that have enacted Patent Box schemes to those that have not).
[74] INTELLECTUAL PROP. OFFICE, *Facts and figures: Patent, trade mark, design & hearing administrative data 2013 and 2014 calendar years* 5 (June 2015), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/456097/Facts_and_Figures_2015.pdf.
[75] *Id.*
[76] *See* Gary Guenther, *Research Tax Credit: Current Law and Policy Issues for the 114th Congress*, CONG. RESEARCH SERV. RL31191 at 2 (March 13, 2015), https://www.fas.org/sgp/crs/misc/RL31181.pdf; W. Wesley Hill & J. Sims Rhyne, *Opening Pandora's Patent Box: Global Intellectual Property Tax Incentives and Their Implication for the United States*, 53 IDEA 371, 377 (2013).

refundable tax credit for qualified research spending above a base amount ("the R&D credit").[77] The former, enacted in 1954,[78] allows a taxpayer "to deduct currently all 'research and experimental expenditures' made in connection with the taxpayer's trade or business or to amortize the expenditures over a period of not less than 60 months."[79] The latter, and the focus of this section, provides an income tax credit for qualified R&D expenditures.[80]

a. History of the U.S. R&D Tax Credit

Responding to the decline in research and development expenditures relative to the real gross national product from 1968 to 1979,[81] Congress established a temporary research tax credit in Section 41 of the Economic Recovery Tax Act of 1981 ("ERTA").[82] Section 41 of the ERTA provided a tax credit to firms "equal to 25% of qualified research spending above a base amount, which was equal to average spending on such research in the three previous tax years, or 50% of current-year spending, whichever was greater."[83] Since its inception, the R&D credit has been modified and extended numerous times.[84] In

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[77] Guenther, *supra* note 76, at 2; *see* 26 U.S.C. § 174 (2012); 26 U.S.C. § 41 (2012).
[78] Guenther, *supra* note 76, at 2.
[79] David L. Cameron, *Research Tax Credit: Statutory Construction, Regulatory Interpretation and Policy Incoherence*, 9 COMP. L. REV. & TECH. J. 63, 72 (2004); Hill & Rhyne, *supra* note 76, at 376.
[80] Graetz & Doud, *supra* note 6, at 353.
[81] Staff of Joint Comm. on Taxation, 97th Cong., *General Explanation of the Economic Recovery Tax Act of 1981*, at 119 (Comm. Print 1981) ("In the case of research and development activities conducted by business, company-financed and Federal expenditures over the 12-year period 1968-1979 remained at a fairly stable level in real terms, fluctuating between $19 and $22.8 billion in constant dollars. Relative to real gross national product, such expenditures for company research declined from 2.01 percent in 1968 to 1.58 percent in 1975, essentially remaining at that level since then.").
[82] *Id.* at 120 ("In order to reverse this decline in research spending by industry, the Congress concluded that a substantial tax credit for incremental research and experimental expenditures was needed to overcome the reluctance of many ongoing companies to bear the significant costs of staffing and supplies, and certain equipment expenses such as computer charges, which must be incurred to initiate or expand research programs in a trade or business."). *See* Hill & Rhyne, *supra* note 76, at 377; Graetz & Doud, *supra* note 6, at 352.
[83] Guenther, *supra* note 76, at 11.
[84] Tyson & Linden, *supra* note 24, at 7 ("Since then [1981], the credit has been restructured several times and renewed 13 times. With a single 12-month exception in 1995–1996 (during which the credit ceased to be in effect), each extension has continued from the previous date of expiration."); Guenther, *supra* note 76, at 11.

the first such alteration, Congress revised the research tax credit in the Tax Reform Act of 1986 and extended the credit until December 31, 1988.[85] Other noteworthy modifications occurred in the Omnibus Budget Reconciliation Act of 1989 and the Energy Policy Act of 2005. The Omnibus Budget Reconciliation Act of 1989 raised the base amount so that it was equal to the greater of 50% of a firm's current-year qualified research expenditures, or the product of the firm's average annual gross receipts in the previous four tax years and a "fixed-base percentage."[86] The Energy Policy Act "added a fourth component to the research tax credit by establishing a credit equal to 20% of payments for energy research performed under contract by qualified research consortia, colleges and universities, federal laboratories, and eligible small firms."[87] Now, with the passage of the Protecting Americans from Tax Hikes Act of 2015, the R&D tax credit been extended indefinitely.[88]

b. Design of the U.S. R&D Tax Credit

In an effort spanning decades, the U.S. has developed a quadripartite R&D credit, comprising: (1) a regular research credit, (2) an alternative simplified credit, (3) a basic research credit, and (4) an energy research credit.[89] The regular research credit equals the sum of 20% of a company's qualified research expenditures for the taxable year over the base amount.[90] With the alternative simplified credit, a firm may elect to receive a credit equal to 14% of the qualified research expenses "for the taxable year as exceeds 50 percent of the average qualified research expenses for the 3 taxable years preceding the taxable year for which the credit is being determined."[91] The basic research credit, under IRC Section 41(e), allows companies that partner with non-profit organizations to receive a credit equal to 20% for qualified research above the qualified organizational base period

[85] Guenther, *supra* note 76, at 11.
[86] *Id*.
[87] *Id.* at 13.
[88] *See* Kevin Brady, *Section-by-Section Summary of the Proposed "Protecting Americans from Tax Hikes Act of 2015,"* COMMITTEE ON WAYS AND MEANS 3 (2015), http://waysandmeans.house.gov/wp-content/uploads/2015/12/SECTION-BY-SECTION-SUMMARY-OF-THE-PROPOSED-PATH-ACT.pdf.
[89] Guenther, *supra* note 76, at 3.
[90] 26 U.S.C. § 41(a)(1) (2012); Guenther, *supra* note 76, at 13.
[91] 26 U.S.C. § 41(c)(5).

amount.[92] Lastly, the energy research credit provides firms with a tax credit that equals "20 percent of the amounts paid or incurred by the taxpayer in carrying on any trade or business of the taxpayer during the taxable year (including as contributions) to an energy research consortium for energy research."[93]

The regular research credit and the alternative simplified credit rely on calculations using qualified research expenses and a base amount.[94] Qualified research expenses refer to the sum of in-house research expenses or contract research expenses that are paid or incurred by a firm during the taxable year.[95] In-house expenses include wages and supply costs.[96] Contract research expenses refer to 65% of the amount paid to another for qualified research.[97] The base amount is calculated from the product of the fixed-base percentage and the average gross receipts of the taxpayer for the four taxable years prior to the credit year.[98]

c. Efficacy of the U.S. R&D Tax Credit

Much like the U.K. patent box,[99] the effectiveness of the U.S. R&D credit remains unclear.[100] "In theory, the credit stimulates increased investment in qualified research by lowering the after-tax cost of undertaking another dollar of research."[101] Economic studies have attempted to measure the efficacy of the R&D tax credit using cost-benefit or R&D price elasticity analyses.[102] This cost-benefit method compares the increase in R&D spending to the loss in tax revenue, while the price elasticity method "measures the percent change in R&D in response to a 1% change in the user cost of R&D."[103] A review of such studies found that there was a "dollar-for-dollar increase in reported R&D spending on the margin" as a result of

[92] Guenther, *supra* note 76, at 8.
[93] 26 U.S.C. § 41(a)(3) (2012).
[94] *Id.* at § 41.
[95] *Id.* at § 41(b).
[96] *Id.* at § 41(b)(3).
[97] *Id.*
[98] *Id.* at § 41(c).
[99] *See supra* Part II.B.1.iii.
[100] Graetz & Doud, *supra* note 6, at 355.
[101] Guenther, *supra* note 76, at 8.
[102] Graetz & Doud, *supra* note 6, at 355.
[103] *Id.* at 356.

the R&D tax credit from 1980 to 1991.[104] A study specific to the pharmaceutical industry from 1982 to 1985, however, found the credit to be much less beneficial, calling into question the reliability of such analyses.[105] Even in more recent studies, the efficacy of the R&D tax credit remains debated.[106]

III. AN INNOVATION POLICY MIX

Policy makers and scholars increasingly tout the use of a *policy mix* to address the intricacies affecting a nation's ability to stimulate innovation.[107] Although the scope of the term itself is subject to debate,[108] a policy mix[109] can be understood as the combination of and interaction between the domain areas covered, the rationales proposed, the strategic tasks pursued, and the policy instruments deployed to address a country's innovation goals.[110] The policy mix approach accounts for the interdependence of actors, ideas, structures, institutions, and policies that contribute to a nation's innovation performance and provides a tool for assessing the effectiveness of the entirety of a nation's innovation policies and the interactions thereof.[111] "Using the policy mix concept . . . helps draw attention to inconsistencies and redundancies" that may arise from the incremental deployment of policy instruments.[112] If it does not consider the entire

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[104] *See* BRONWYN H. HALL, EFFECTIVENESS OF RESEARCH AND EXPERIMENTATION TAX CREDITS: CRTITICAL LITERATURE REVIEW AND RESEARCH DESIGN (1995), https://eml.berkeley.edu/~bhhall/papers/BHH95%20OTArtax.pdf.
[105] Graetz & Doud, *supra* note 6, at 356.
[106] *See* Guenther, *supra* note 76, at 8.
[107] Kieron Flanagan, Elvira Uyarra, & Manuel Laranja, *Reconceptualising the 'policy mix' for Innovation*, RESEARCH POLICY, Vol. 40 702–13 (2011); OECD, *OECD Science, Technology and Industry Outlook,* OECD PUBLISHING 254 (2010), http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/oecd-science-technology-and-industry-outlook-2010_sti_outlook-2010-en#page265.
[108] Flanagan, Uyarra, & Laranja, *supra* note 107, at 4–5; OECD, *supra* note 107, at 254.
[109] The policy mix concept originated in the 1960s in the context of monetary and fiscal policy and has since migrated to other policy arenas, including innovation. Flanagan, Uyarra, & Laranja, *supra* note 107, at 3.
[110] OECD, *supra* note 107, at 257. This understanding can be debated; however, in this paper, this use is preferred.
[111] *Id.* at 255–56; *see also Innovation policy mix for business R&D and Innovation*, OECD, http://www.oecd.org/sti/outlook/e-outlook/stipolicyprofiles/competencestoinnovate/innovationpolicymixforbusinessrdandinnovation.htm (last visited May 14, 2016).
[112] *Innovation policy mix for business R&D and Innovation*, *supra* note 111.

innovation ecology assessed by the policy mix, a nation, though interested in stimulating domestic innovation, might implement policy instruments that focus too heavily on too small of an area, minimizing its potential returns.[113] Developing this framework will inform the patent box efficacy analysis.

A. Domain Areas

All of innovation policies can be bifurcated into *domain areas*: framework condition policies and dedicated science, technology, and innovation policies.[114] The complementary nature, or lack thereof, of these domain areas may augment or reduce intended policy effects.[115] Accordingly, a considered approach addressing the interaction of these policies can "promote positive feedback responses in the tightly-coupled parts of the economy, or at least . . . mitigate the force of negative feedbacks that can damp, or effectively counteract, the intended effects of the policy intervention targets."[116]

Framework condition policies affect the broad economic factors relating to innovation and may not relate solely to innovation goals.[117] Exemplary economic factors include, among others, macroeconomic policy, tax policy, labor market policy, competition policy, education and training, infrastructure, and intellectual property rights.[118] Although these policies may not be innovation-specific, they can be foundational.[119] For example, a strong education system will

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[113] *See id.*
[114] *See* OECD, *supra* note 107, at, 259.
[115] *See id.* at 260–61.
[116] PHILIPPE AGHION, PAUL A. DAVID & DOMINQUE FORAY, SCIENCE, TECHNOLOGY AND INNOVATION FOR ECONOMIC GROWTH: TOWARDS LINKING POLICY RESEARCH AND PRACTICE IN 'STIG SYSTEMS' 22 (Stanford Inst. for Econ. Policy Research Discussion Paper No. 06-39, Oct. 2008), http://siepr.stanford.edu/sites/default/files/publications/06-39_0.pdf.
[117] OECD, *supra* note 107, at 260.
[118] OECD, *supra* note 107, at 260–62; OECD, INTELLIGENT DEMAND: POLICY RATIONALE, DESIGN AND POTENTIAL BENEFITS 54–57 (OECD Sci, Tech and Industry Policy Papers No. 13, 2014), http://www.oecd-ilibrary.org/docserver/download/5jz8p4rk3944.pdf?expires=1462395748&id=id&accname=guest&checksum=A0747E344EF9D325F9BD0AF914380578 [hereinafter INTELLIGENT DEMAND].
[119] *See* OECD, OECD REVIEWS OF INNOVATION POLICY: CHINA 395 (2008), http://climatesolver.org/sites/default/files/pdf/0809.pdf ("It is widely acknowledged that innovative capacity is determined not only by a country's research and development (R&D) system but also by the interplay of factors which enable knowledge to be

provide the highly-skilled workforce necessary to drive innovation.[120] In another example, a stable macroeconomic environment may relieve some of a firm's more immediate concerns and allow it to invest in long-term R&D projects.[121] "There is a strong link between innovation performance and innovation framework conditions."[122] "Supportive framework conditions enable and facilitate innovation throughout the economy" and have recently become more of a focal point for fostering innovation.[123]

Dedicated science, technology, and innovation policies, by contrast, target specific market, system, or even framework condition policy failures relating to innovation.[124] These policies incorporate both supply- and demand-side measures—for example, R&D tax incentives schemes or grants, and procurement policies, respectively—to support direct investment in science, technology, and innovation, to enhance the innovation competencies of firms, or to strengthen linkages within innovation systems.[125] Both the U.K. patent box and U.S. R&D tax credit are examples of dedicated science, technology, and innovation polices, as each focused on correcting specific market failures.[126]

B. Rationales

The fundamental rationales justifying policy intervention address market failure, systems failure, or societal missions and challenges.[127]

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converted into new products, processes and organisational forms which in turn enhance economic development and growth.").

[120] OECD, *supra* note 107, at 261.

[121] *Id.*

[122] INSIDE CONSULTING, BENCHMARKING INNOVATION POLICY AND INNOVATION FRAMEWORK CONDITIONS 2 (Jan. 2004), http://www.oecd.org/site/worldforum/33705586.pdf.

[123] OECD, *supra* note 107, at 260.

[124] *Id.* at 260, 262.

[125] *Id.* at 260, 268.

[126] *See supra* Section II.

[127] JAKOB EDLER, HUGH CAMERON & MOHAMMAD HAJHASHEM, WORLD INTELLECTUAL PROPERTY ORGANIZATION [WIPO], THE INTERSECTION OF INTELLECTUAL PROPERTY RIGHTS AND INNOVATION POLICY MAKING – A LITERATURE REVIEW 7 (Jul. 2015), http://www.wipo.int/edocs/pubdocs/en/wipo_report_ip_inn.pdf.

1. Market Failure

Market failure describes both the inability of price-market institutions to facilitate desirable activities or to halt undesirable ones and the inefficient allocation of resources.[128] These failures stem from indivisibilities, uncertainties, and externalities in the market economy.[129] Innovation market failures, in particular, primarily manifest in three ways:

> *i)* R&D activity often incurs high fixed costs and economies of scale, while learning-by-doing gives rise to dynamic economies of scale; *ii)* investment in R&D is inherently risky and information asymmetries abound in markets for knowledge and technology, where they exist; and *iii)* because knowledge has properties of a public good as performers of R&D can only imperfectly appropriate the results of their effort and the use of knowledge does not preclude its simultaneous use by others.[130]

Underinvestment in R&D in the face of market failure has long been the principle reason for policy intervention.[131] These failures, it is argued, prevent investment in innovation at the socially optimal level.[132] The U.K. patent box and U.S. R&D credit were predicated on addressing market failures.[133]

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[128] Frances M. Bator, *The Anatomy of Market Failure*, 72 Q. J. ECON. 3 (1958), http://opim.wharton.upenn.edu/~sok/papers/b/Bator-market-failure.pdf; CLIFFORD WINSTON, GOVERNMENT FAILURE VERSUS MARKET FAILURE: MICROECONOMICS POLICY RESEARCH AND GOVERNMENT PERFORMANCE 2 (2006), http://www.brookings.edu/~/media/research/files/papers/2006/9/monetarypolicy-winston/20061003.pdf; *see also* ELLEN SEWELL, MARKET FAILURE 26, http://www.ncpublicschools.org/docs/curriculum/socialstudies/rigorous-ap/economics/microeconomics.pdf (Apr. 10, 2016).

[129] Kenneth Arrow, *Economic Welfare and the Allocation of Resources for Invention*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 609, 609 (1962), http://www.nber.org/chapters/c2144.pdf; INTELLIGENT DEMAND, *supra* note 118, at 8.

[130] INTELLIGENT DEMAND, *supra* note 118, at 8 (emphasis in original).

[131] *Id.*; OECD, *supra* note 107, at 262.

[132] INTELLIGENT DEMAND, *supra* note 118, at 8.

[133] *See supra* Section II.

2. System Failure

System failures describe the barriers to innovation that arise from inertia in the economy and hinder the production, distribution, and adoption of knowledge.[134] Innovation often requires cooperation or the exchange of ideas to generate knowledge.[135] System failures are framework conditions—such as network effects, slow technological transitions, slow-changing norms and values, and lack of infrastructure[136]—that inhibit these necessary interactions.[137] "System failures block the functioning of the innovation system, hinder the flow of knowledge and technology and, as a result, reduce the overall efficiency of the system-wide R&D and innovation effort."[138] Overcoming these failures, however, necessitates building up capability, intermediation, training, and cooperative programs.[139]

3. Societal Missions and Costs

Societal missions and challenges direct the focus of technology development in order to satisfy certain societal needs: "[I]t is a primary duty of politics to provide direction for technological development and innovation in order to satisfy state needs (e.g. defence, security) and citizen needs (health, education)."[140] These measures incentivize actors to invest or pool resources to achieve a predetermined goal.[141]

C. Strategic Tasks

Strategic tasks are the objectives addressed by policy instruments.[142] Complementary strategic tasks provide an optimal

[134] OECD, *supra* note 107, at 263; INTELLIGENT DEMAND, *supra* note 118, at 9.
[135] EDLER, CAMERON & HAJHASHEM, *supra* note 127, at 7.
[136] INTELLIGENT DEMAND, *supra* note 118, at 9–10.
[137] EDLER, CAMERON & HAJHASHEM, *supra* note 127, at 7.
[138] OECD, *supra* note 107, at 263.
[139] EDLER, CAMERON & HAJHASHEM, *supra* note 127, at 7.
[140] *Id.*
[141] *Id.*
[142] OECD, *supra* note 107, at 264–65.

arrangement of policy instruments for supporting innovation.[143] These objectives include educating a potential workforce, ensuring proper development and use of knowledge, providing supportive infrastructures, enhancing public research contributions, and unleashing the potential of firms.[144] In the case of the U.K. patent box, one strategic task, among others, was to increase patent related commercialization.[145] The U.S. R&D tax credit, by contrast, sought to incentivize firms to invest in R&D.[146]

D. Instruments

Policy instruments are the regulatory tools used to achieve particular strategic tasks and can be divided into five different binaries.[147]

1. Population vs. Non-Population Specific

This distinction characterizes *who* is the focus of the policy intervention.[148] Population-targeted instruments focus on the type of firm or sector to be supported, whereas non-population targeted instruments will apply broadly.[149] Population-targeted instruments may be directed toward facilitating innovation in small and medium-sized enterprises ("SMEs").[150] The U.K., for instance, has implemented several policy measures focused on SMEs.[151] In non-population-targeted instruments, policy intervention may affect firms of all types.

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[143] *See* Zeting Liu, *The Research Tax Credit in the Policy Mix for Innovation: The French Case*, J. INNOVATION ECON. no. 12, at 199, ¶ 3 (2013), http://www.cairn.info/revue-journal-of-innovation-economics-2013-2-page-199.htm.
[144] OECD, *supra* note 107, at 265.
[145] *See supra* Section II.B.1.
[146] *See supra* Section II.B.2.
[147] *See* OECD, *supra* note 107, at 267–70; *Innovation policy mix for business R&D and Innovation*, *supra* note 111.
[148] *Innovation policy mix for business R&D and Innovation*, *supra* note 111.
[149] *Id.*
[150] *Id.*
[151] *See* OECD, *OECD Science, Technology and Industry Outlook*, OECD PUBLISHING 441 (2014), http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/oecd-science-technology-and-industry-outlook-2014_sti_outlook-2014-en#page1.

Both the U.K. patent box and the U.S. R&D tax credit exemplify non-population-targeted instruments, as each applies broadly.[152]

2. Technology vs. Non-Technology Targeted

Technology-targeted policy instruments focus on developing specific technologies, whereas non-technology-targeted instruments apply broadly.[153] For example, a nation may have an interest in developing its biotechnology sector and intervene accordingly.[154] Policy instruments may instead encourage all technologies. The U.K. patent box and U.S. R&D tax credit typify the latter, as neither focuses on incentivizing one particular technology.[155]

3. Competitive vs. Non-competitive

Competitive policy instruments confer a benefit once certain performance threshold criteria have been met.[156] Non-competitive instruments, on the other hand, apply universally or after a selection process based on eligibility requirements.[157] Recently, countries have moved toward more competitive instruments for public sector research institutions.[158] The U.K. patent box and U.S. R&D tax, however, exemplify non-competitive policy instruments, as applicants can simply elect to apply these measures to eligible income or expenditures.[159]

4. Financial vs. Non-financial

Policy instruments can be financial or non-financial in nature.[160] Financial instruments can be further divided into direct and indirect instruments.[161] Direct financial instruments include loans, grants and innovation vouchers, while tax incentives are an example of

[152] *See supra* Section II.
[153] *Innovation policy mix for business R&D and Innovation*, *supra* note 111.
[154] *See id.*
[155] *See supra* Section II.
[156] *See Innovation policy mix for business R&D and Innovation*, *supra* note 111.
[157] *See id.*
[158] OECD, *supra* note 107, at 267.
[159] *See supra* Section II.B.
[160] OECD, *supra* note 151, at 153.
[161] *Innovation policy mix for business R&D and Innovation*, *supra* note 111.

an indirect financial instrument.[162] Accordingly, the U.K. patent box and the U.S. R&D tax credit are both examples of indirect financial policy instruments.[163] Non-financial instruments include information campaigns or providing services.[164] More often than not, nations deploy financial instruments.[165]

5. Supply-side vs. Demand-side

Lastly, "[p]olicy instruments to accelerate innovation have been described as either technology (supply) push or demand (market) pull."[166] Supply-side instruments foster knowledge production in order to accelerate knowledge spillovers and externalities.[167] Providing tax incentives to encourage R&D spending is one example of a supply-side measure.[168] Both the U.K. patent box and U.S. R&D tax credit exemplify supply-side measures. In contrast, demand-side instruments foster market opportunities for innovation and encourage suppliers to meet consumer innovation needs.[169] Public procurement is one example of demand-side measure.[170] Although innovation policy has traditionally favored supply-side instruments, interest in demand-side instruments has grown in recent years.[171]

IV. CONSTRUING THE PATENT BOX IN VIEW OF THE POLICY MIX

A policy prescription based solely on a comparison of pertinent regulatory measures and the effects thereof would necessarily ignore numerous dissimilarities and empirical uncertainties.[172] The U.K., or any country for that matter, has a unique set of actors, ideas, structures, institutions, and policies that shape its innovation performance.[173] No single policy instrument is implemented in a

[162] *Id.*
[163] *See supra* Section II.B.
[164] *Innovation policy mix for business R&D and Innovation*, *supra* note 111.
[165] *Id.*
[166] INTELLIGENT DEMAND, *supra* note 118, at 3.
[167] *Innovation policy mix for business R&D and Innovation*, *supra* note 111.
[168] *See supra* Section II.B.
[169] *Innovation policy mix for business R&D and Innovation*, *supra* note 111.
[170] OECD, *supra* note 151, at 187–88.
[171] OECD, *supra* note 107, at 267–68; INTELLIGENT DEMAND, *supra* note 118, at 3; *see also* OECD, *supra* note 151, at 188.
[172] *See supra* Section II.B.
[173] OECD, *supra* note 107, at 254.

vacuum. Proclaiming the efficacy of a patent box based on the number of participating companies or the patents filed in the U.K. alone likely neglects other important factors at play. To the extent this can be overcome, a policy mix approach provides a means for normalization and contextualization in performing such a comparison.[174] In other words, there is something to be gained from comparing the U.K.'s adoption of the patent box in the context of the policy mix and from the policy mix approach *per se.*

A. Redundancy

A patent box provides a similar yet less effective incentive scheme compared to the already deployed R&D tax credit. Applying the policy mix reveals that both the patent box and the R&D tax credit are substantially similar policy instruments.[175] Both, as dedicated science, technology, and innovation policies,[176] target specific market failures rather than framework conditions.[177] In particular, the patent box pushes companies to commercialize patent-related products,[178] while the U.S. R&D tax credit incentivizes companies to invest in R&D.[179] In terms of the binaries, each is broadly applicable and without significant thresholds, and thus non-population targeted, non-technology specific, and non-competitive.[180] Each provides firms with a tax credit, characteristic of an indirect financial instrument.[181] Lastly, both measures seek to foster the production of innovation rather than the market demand for it, making them supply-side instruments.[182]

Nevertheless, instruments sharing these attributes do not necessarily share effectiveness. An important distinction can be made regarding where a given policy instrument acts within the innovation development cycle.[183] Here, the R&D tax credit applies when a firm incurs expenses (a front-end incentive),[184] whereas the patent box

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[174] *See id.*
[175] *See supra* Section III.
[176] *See supra* Section III.A.
[177] *See supra* Section III.A.
[178] *See supra* Section II.B.1.i.; CIRD200110, *supra* note 43.
[179] *See supra* Section II.B.2.
[180] *See supra* Section III.D
[181] *See supra* Section III.D.5.
[182] *Id.*
[183] Graetz & Doud, *supra* note 6, at 363.
[184] Hill & Rhyne, *supra* note 76, at 377.

applies upon earning qualified income (a back end incentive).[185] Regarding these particular instruments, it is likely more beneficial to subsidize front-end activity than it is to subsidize back-end activity.[186] "Rather than incentivizing private investment in technologies that are under-explored (those with large and hard-to-capture benefits), a patent box incentivizes firms to invest in new technologies that return the largest private profits with the fewest externalities."[187] Put differently, patent boxes may encourage profit at the expense of innovation. Additional difficulties in defining what income is sufficiently related to a patent in order to qualify may further tip the scales.[188]

Patent box proponents argue that the policies in tandem might provide synergistic returns outweighing the social cost.[189] Based on the understanding of the UK's innovation landscape provided by the policy mix, however, nothing suggests that this would be the case.[190] The U.K. has implemented both policies, and nothing yet suggests such a benefit.[191] This may be made more compelling by the fact that there is a commercialization market failure in the U.K. that is not present, comparatively, in the US.[192] If one was to expect a combined effect from adding a patent box, it seems like it might occur in the instance where the patent box, by its nature, addresses the specific market failure of that country. All told, using these supply-side measures in conjunction would be granting similar tax breaks to firms without a clear social benefit in doing so.

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[185] Graetz & Doud, *supra* note 6, at 363.

[186] GRAVELLE, *supra* note 2 ("Economic theory also suggests that it may be more desirable to subsidize investment in R&E rather than reduce the tax rates on the returns: higher tax rates reduce variance (the variation in return that occurs depending on the success of the research) as well as return and may, in some circumstances, increase risk taking."); FICHTNER & MICHEL, *supra* note 7, at 3 ("Contrary to sound economic policy, a patent box explicitly subsidizes corporate profits that are captured by the private firm.").

[187] FICHTNER & MICHEL, *supra* note 7, at 3

[188] *See id.*

[189] ATKINSON & ANDES, *supra* note 3, at 1.

[190] *See supra* Section II.B.1.iii.

[191] *Id.*

[192] *See supra* Section II.B.

B. Remedying Market and System Failures

It is also uncertain to what extent the patent box resolves the failures it purportedly addresses.[193] One reason the U.K. implemented the patent box was to provide incentives for companies to retain and commercialize existing patents and to develop new patented products.[194] In this regard, "[t]he data paint[s] a somewhat unclear picture as to whether or not patent boxes are serving their intended purpose to 'attract R&D and increase commercialization of innovation from domestic firms.'"[195] Beyond mere anecdotes,[196] the adoption of the U.K. patent box has done little so far to discharge this uncertainty.[197] For at least this reason, it seems prudent to wait until more data provides clarity on how well it overcomes this market failure and whether it is worth implementation in the U.S.

Another reason proffered for deploying the patent box was to prevent tax base shifting, a system failure, and instead incentivize firms to relocate manufacturing operations to the adopting country.[198] A recent study, however, has confirmed that patent boxes generate "significant effect on patent location without a change in real research activity, aiming only at the tax benefits."[199] In other words, firms are moving holdings to patent box countries while maintaining operations elsewhere. The recent OECD recommendations suggest that this may be the case with the current U.K. patent box.[200] It is possible that these recommendations will resolve certain issues, but only time will tell if these changes will result in the relocation of manufacturing. Again, it

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[193] *Id.*
[194] *Id.*
[195] ATKINSON & ANDES, *supra* note 3, at 12.; *see supra* Section II.B.
[196] *See supra* Section II.B.
[197] *Id.*
[198] Alexandra Thornton, *Patent Tax Dodge: Why the Patent Box Does Not Answer America's Need for Tax Reform*, CENTER FOR AMERICAN PROGRESS (June 1, 2015), https://www.americanprogress.org/issues/economy/news/2015/06/01/114088/patent-tax-dodge-why-the-patent-box-does-not-answer-americas-need-for-tax-reform/; *see* Knight & Maragani, *supra* note 3, at 41.
[199] Annette Alstadsæter et al., *European Commission, Patent Boxes Design, Patents Location and Local R&D* 25 (Taxation Papers, Working Paper No. 57, June 2015), *available at* http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_papers/taxation_paper_57.pdf
[200] *See supra* Section II.B.

seems sensible to see how well the UK's new patent box produces the intended results before acting.

C. Recommendations

Expending political capital to enact a patent box as a cure-all for the U.S.'s innovation and tax woes would likely miss the mark. Instead, the U.S., once a leader in innovation policy,[201] might well benefit from the measured and holistic approach provided by the policy mix model. Rather than simply following suit as other countries enact patent boxes, the U.S. could deploy any number of coherent and synergistic policy instruments to better foster innovation. For example, the U.S. could address certain framework conditions or perhaps target instruments to aid the innovation of SMEs.[202] Looking into demand-side policies may also provide a worthy compliment to the R&D tax credit, as studies have shown a clear interaction between such policies.[203] Technology-targeted policy instruments might also help by providing resources to underfunded technology spaces.[204]

Additionally, an ever-present undercurrent to patent box discussions seems to be corporate tax regulation as a whole.[205] Some even see these proposals as a platform to address corporate tax reform.[206] While tax policy is one of the framework conditions affecting innovation,[207] it may be better to address these issues head on rather than attempting to solve with the patent box. "[P]roviding tax benefits for patent box income, especially if broadly defined, will lose revenues and make lowering overall corporate tax rates more difficult to achieve in a revenue-neutral tax reform."[208]

Lastly, measuring the efficacy of policy instruments can be quite difficult.[209] In engineering control theory, feedback loops are used

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[201] *See* ATKINSON & EZELL, *supra* note 11, at 245.
[202] OECD, *supra* note151, at 441–46.
[203] INTELLIGENT DEMAND, *supra* note 118, at 35.
[204] *See* ATKINSON & EZELL, *supra* note 11, at 254–56.
[205] *See supra* Section II.
[206] Brett Nowak, *U.S. Patent Box: Will It Be a Box of Chocolates or Pandora's Box for Taxpayers?*, A & M TAX ADVISOR WEEKLY (Oct. 6, 2015) , http://www.alvarezandmarsal.com/us-patent-box-will-it-be-box-chocolates-or-pandoras-box-taxpayers ("[M]any lawmakers welcome the Boustany-Neal proposal and view it as an initial step towards U.S. tax reform . . . .").
[207] *See supra* Section III.
[208] GRAVELLE, *supra* note 2.
[209] *See supra* Section II.B.

to monitor dynamic systems.[210] These feedback loops provide data for further corrective or adaptive modification.[211] This concept may have value in forming policy instruments. Perhaps part of the policy development process could focus on how an instrument's effectiveness might be evaluated in the future and ways in which pertinent data could be collected. In that way, the true impact could be assessed for more informed policymaking.

V. CONCLUSION

Emerging Congressional support for a patent box has afforded an opportunity to assess its potential use as an innovation policy tool.[212] Evaluating the U.K.'s recent adoption of a patent box in light of existing U.S. policy and within a policy mix framework has revealed certain redundancy and efficacy concerns. Innovation in the U.S. might be better served by adopting a policy mix approach, addressing certain framework conditions critical to innovation, and implementing additional policy tools to complement its R&D tax credit. Doing so may ensure continued prosperity in an increasingly competitive and innovation focused global economy.

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[210] S. Simrock, *Control Theory*, DESY, https://cds.cern.ch/record/1100534/files/p73.pdf (last visited May 14, 2016).
[211] Yuriy Brun et al., *Engineering Self-Adaptive Systems through Feedback Loops*, *in* SOFTWARE ENGINEERING FOR SELF-ADAPTIVE SYSTEMS (Betty H. Cheng et al. eds. 2009), http://people.cs.umass.edu/~brun/pubs/pubs/Brun09SEfSAS.pdf.
[212] *See supra* Section I.