Patent Boxes: Innovation in Tax Policy and Tax Policy for Innovation

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A patent box that significantly reduces the corporate tax rate on revenue from qualifying IP, based in part on the extent to which corresponding R&D and production is conducted domestically, would provide firms with a much stronger incentive to innovate and produce in the United States.

An effective corporate tax system reflects current economic realities. As such, the U.S. corporate tax system is in need of reform, for it reflects economic realities of a generation ago. Today, the U.S. economy faces intense global competition for economic advantage, particularly in innovation-based, higher wage industries. Moreover, the economy is based more on innovation and intellectual property (IP).[1] IP is also more mobile, as companies can perform R&D and patent in countries around the world. Therefore, nations that hope to grow and attract innovation-based business establishments need tax policies that promote both the conduct of research and its commercialization.

Toward that end, a number of countries recently have adopted or expanded R&D tax incentives as well as developed new tax incentives to spur the commercialization of that R&D. These incentives or "patent boxes" (so-called because there is a box to tick on the tax form) allow corporate income from the sale of patented products to be taxed at a lower rate than other income. Eight nations (seven in Europe) have enacted patent box regimes that incentivize firms to patent or produce other related innovations. And a ninth, the UK, is set to put in place the incentive in 2013.

Proponents of patent boxes argue that they increase country competitiveness not only by spurring firms to invest more in innovation but also by providing a more competitive corporate tax climate for increasingly innovation-based firms. Skeptics claim that patent boxes do not actually address market failure because firms already have all the incentives they need to commercialize innovation in the marketplace.

This report seeks to inform the debate on whether patent boxes can help promote R&D and commercialization and if a patent box is appropriate for the United States. It articulates two economic rationales for why the United States should follow our European

and Asian competitors and institute a patent box system. First, a patent box reduces the financial risk involved in innovation, better matching firm rewards with societal benefits, including the creation of high-wage jobs. If a patent box is designed in a way that links the incentive to the conduct of R&D and production of the patented product in the United States, it would go even further in spurring the creation and location of more innovation-based jobs in the United States. Second, a patent box would lower the effective corporate tax rate for knowledge-based establishments located in the United States, making it easier for them to compete against establishments in nations providing robust innovation incentives.

As such, Congress should establish a patent box regime modeled after those of other nations, allowing companies in the United States to pay a significantly lower rate on corporate income from patented products where the share of profits that are taxed at the lower rate depends on the extent to which related R&D and production is conducted within the United States.

THE RECENT EMERGENCE OF PATENT BOXES

In the innovation-based global economy, R&D and innovation are increasingly important components of national economic success, particularly for developed nations that must compete on factors other than just low factor costs. Innovation also leads to higher productivity and higher wages, and is a key driver of stronger trade performance.

But innovation is increasingly mobile as the talent and infrastructure to conduct innovation-based activities are available in many nations around the world.[2] Because of this, in the last decade many nations have implemented robust policies to enable their economies to win in innovation-based activities.

While nations have turned to an array of tools, including direct R&D funding, support for science, technology, engineering and math (STEM) education, and technology transfer programs, one key policy tool is tax incentives for R&D and innovation. The earliest of these was the R&D credit. First established by the United States in 1981, at least thirty-eight nations now provide some kind of R&D tax incentives. As late as 1999, the United States ranked eighth among the thirty Organisation of Economic Co-operation and Development (OECD) nations in the generosity of its R&D credit.[3] But because other nations have expanded their credits, the United States now ranks only seventeenth.[4] A growing number of countries have also recently adopted more generous credits to support collaborative R&D (research funded at universities or national laboratories and sometimes in research consortia).[5] For example, France recently instituted a 60 percent flat credit on all R&D expenditures made in partnership with a federal laboratory or university.

R&D tax incentives are on the "input" side. That is, they provide an incentive for firms to invest more in a key building block of innovation, in this case research. But in recent years a number of nations have gone a step farther, creating tax incentives to spur commercialization of the research outcomes. Eight nations—Belgium, China, France, Ireland, Luxembourg, the Netherlands, Spain, and Switzerland—have established patent boxes, and the UK is set to implement its patent box policy in 2013 with a tax rate of 10

percent on income generated from patented products, compared to the standard rate of 26 percent. Ireland developed the first patent box in 1973, but other nations have adopted patent boxes quite recently, since 2005.

Patent boxes tax qualifying profits (those derived from patents or in some nations additional kinds of IP) at a lower rate in order to incentivize innovation. Patent boxes differ from R&D tax credits in that they provide firms with an incentive for commercialization of innovation, rather than for just the conduct of research. Commercialization of innovation, rather than the simple conduct of R&D, is a key driver of economic growth. Thus, proponents of patent boxes argue that creating tax incentives linked to success at commercializing innovation is an important strategy for growth, competitiveness, and job creation.

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Patent box regimes differ among various nations along several dimensions. One is the definition of the types of profits that qualify for the lower rate. As one would expect, in all nations with patent box regimes, patents are considered qualifying IP. However, Ireland, Luxembourg, Spain, and Switzerland go farther and also allow income from designs, copyrights, models and trademarks to be taxed at the lower patent box rate. And with the broadest definition of IP-sourced income, China extends its patent box to allow income from certain types of commercial "know-how," such as process innovation, to qualify for the lower rate.

In 2009, the Netherlands expanded its patent box into an "innovation box" that allows profits from R&D-based products or services that have not resulted in a patent or trademark to be eligible for the patent box tax rate. Also, because there are often a substantial time lags between when R&D investments are made, when a patent application is submitted, and when a patent is actually granted, the Netherlands allows firms that have applied for a patent but have yet to receive it to take a portion of the patent box credit. China's patent box also goes beyond patents by providing the lower patent box rate to firms that spend at least 3 to 6 percent of gross revenue on R&D (depending on firm size), have 60 percent of firm revenue from core IP (defined as inventions, utility model patents, software, copyrights, proprietary layout designs, and new plant varieties), have 30 percent of their workforce with a college degree, or 10 percent employed in R&D or high-tech occupations.[6]

A second point of divergence among patent box regimes is in how acquired IP is treated. Most patent box countries allow acquired IP to qualify. In other words, if a firm licenses intellectual property from another organization and then generates income from that IP, it is taxed at the lower patent box rate. However, the Netherlands and Spain limit their patent box incentive to IP developed by the business taking the lower patent box rate.

The patent box tax rate also varies considerably among nations. Ireland applies a zero rate of tax with a graduated income cap that eventually reaches the statutory corporate tax rate of 10 percent. Switzerland applies a rate between zero and 12 percent depending on what is negotiated during the tax ruling process. France and Spain have the highest rate of 15 percent, but that is still considerably lower than their statutory corporate rates. Instead of offering a lower tax rate, Belgium and Luxembourg allow 80 percent of qualifying gross

patent income to be deducted from the return, resulting in a maximum effective rate of 6.8 percent and 5.9 percent, respectively. Similarly, Spain allows a 50 percent deduction.

Finally, some countries put caps on the total tax relief companies can receive from patent boxes. For example, Ireland has a cap of five million Euros, Spain caps tax relief at six times development costs and in China, once a company has cut their taxes by five million RMB then further taxes that qualify for the patent box are taxed at half the corporate tax rate. The Netherlands had a cap on qualifying income, but eliminated it in 2009. Table 1 provides a brief summary of each country's patent box regime (see following page).

THE ECONOMIC THEORY UNDERLYING PATENT BOXES

Many nations have realized that they need a more competitive tax code when it comes to innovation-based companies in traded sectors.

Nations have adopted patent box regimes for two key reasons. First, they recognize that the process of innovation is subject to multiple market failures—including spillovers of the benefits to firms not making the investments in innovation—and that tax incentives can help correct these failures. Second, they recognize that the process of innovation is now much more global and footloose. As such, many nations have realized that they need a more competitive tax code when it comes to innovation-based companies in traded sectors (e.g., life sciences, electronics, chemicals, energy, aviation, etc.).

Market Failures

Many conventional neoclassical economists look with suspicion on proposals to use the tax code to favor particular kinds of activities, because they believe (though with almost no actual empirical evidence to support the belief) that markets acting alone maximize a nation's economic welfare. Notwithstanding this predilection for a "neutral" tax code, a not insignificant number of economists are willing to support tax incentives for corporate R&D. This is in large part because there is a well-developed body of economic theory and empirical research demonstrating that companies do not capture anywhere near all the benefits from the research they conduct.[7] Innovation, or the creation of new products, processes, services and business models, is an intangible asset. Companies often have difficulty reaping the full commercial benefits of innovation (even given the presence of patent protection) because some of the value flows to other firms and to society as a whole through spillovers (what economists call positive externalities). While spillovers are good for society (they raise the societal, as opposed to private, rate of return from innovation) they mean that there is less incentive for firms to invest in innovation than is socially optimal. For example, Tewksbury et al. examined the rate of return from twenty prominent innovations and found a median private rate of return of 27 percent but a median social rate of return of 99 percent, almost four times higher.[8] Yale economist William Nordhaus estimates that inventors capture just 4 percent of the total social gains from their innovations; the rest spill over to other companies and to society as a whole.[9]

Country	Exemption Rate	Regular Corporate Tax Rate	Effective Corp. Tax Rate on Qualifying IP	Types of IP that Qualify	Acquired IP Qualifies?	Can R&D be performed abroad?	Expenses that Reduce Qualified Income	Year Enacted
Belgium	80% of patent income is exempt	20%	6.8%	Patents and supplementary protection certificates	Yes, under conditions	Yes	Expenses except license fees and amortization of acquired patents	2008
China	Exemption for revenue below RMB 5M ($783K) and 50% above RMB 5M	16%	16.5-25%	Registered patents and know-how	Yes	No	Most expenses	2008
France	Flat rate	34%	15%	Patents and supplementary protection certificates	Yes, under conditions	Yes	Includes management expenses related to licensing IP	2005
Ireland	Specific rules	10%	<10%	Most IP	Yes	Yes	For capital expenditures after May 7, 2009	1973
Luxembourg	80% of patent income is exempt	17%	5.9%	Software, copyrights, patents, trademarks, designs, or models	Yes	Yes	Most expenses	2008
The Netherlands	Flat rate	17%	17-25%	Patents or IP from qualifying and approved R&D	No	Yes, but not for R&D certificate	Most expenses	2007
Spain	50% of patent income is exempt	25%	15%	Most IP	No	Yes	None	2008
Switzerland	Specific rules	21%	0-12%	Most IP	Yes	Yes	Most expenses	N/A

Table 1: Summary of Global Patent Box Regimes (Source: PricewaterhouseCoopers[10])

Many economists recognize a second market failure associated with innovation. Unlike many other elements of a firm's value chain, innovation requires substantial risk, in part because the time lag between R&D investments and a successful commercial product introduction is often considerable. For example, the average time between initial R&D and when a new drug reaches the market is twenty-five years. Indeed, there is some evidence that there is an inverse relationship between the risk the private sector must assume and the benefits from spillovers to society from an innovation. The reason is that many "game-changer" innovations that hold the most potential for spillovers require significant basic research. Moreover, as pressures from U.S. equity markets for short-term returns increase and venture capitalists look to invest in larger and later stage deals, justifying investment in high-risk research activities has become more difficult.[11] This is one reason why the number of venture capital firms investing in early-stage deals has declined from 35 percent to 24 percent over the last decade and why private-sector basic research as a share of all private sector R&D declined by 3.8 percentage points even as product development expenditures increased by over 7 percentage points between 1991 and 2007.[12]

From a market failure perspective, the types of innovation that ought to be supported by government are those whose benefits are larger for society than for the source firms.

The R&D tax credit is one tool to lower the costs of conducting research, including high-risk research, so that private returns better approximate social returns, encouraging firms to invest to maximize both. Thus, a key question is whether patent boxes provide a similar function as the R&D credit and respond to market failures similarly.

From a market failure perspective, the types of innovation that ought to be supported by government are those whose benefits are larger for society than for the source firms. R&D tax credits, for example, address the fact that benefits to society from firm R&D significantly outweigh the firm benefit. Firms must make the decision to perform R&D prior to commercialization and therefore do not know whether or not such R&D will be profitable. However, even research that does not make its way into revenue streams is still important because others within the ecosystem can learn from research discoveries.

But some argue that once a patented innovation is proven profitable firms have ample incentive to take advantage of such innovations in the marketplace and that profits made from patented technologies have little spillover associated with them.[13] Indeed, the point of a patent is to monopolize the value of an innovation. Isn't cutting taxes on patent revenue simply taking money from public coffers to convince firms to do something the market already rewards them for doing?

Not exactly. First, even after patenting and successfully commercializing an innovation, firms are still unlikely to capture all the benefits of their patent in the form of profits. Apple's recent iPad offers a good example. The iPad is protected by patents both in the United States and Europe, and Apple undertook an aggressive marketing and product design strategy to distinguish the iPad as a unique product. All of which are elements of commercialization that allow Apple to gain the maximum returns from the company's innovation. However, there are now dozens of other companies selling similar tablet computers in competition with the iPad (in fact, the 2011 Consumer Electronics Show in Las Vegas saw eighty new tablet computers introduced by a variety of vendors), suggesting that Apple was not able to capture anywhere near all the returns from its innovation.[14]

Second, before investing in R&D, firms estimate the likely returns and an acceptable risk tolerance for failure. R&D tax credits work because they reduce the cost of R&D so that in the event of failure firms do not lose as much. Patent boxes can work in a similar manner; instead of reducing the cost of R&D, they increase the benefits of success. In doing so, patent boxes can make investments in innovation, including early-stage R&D, more attractive compared to other investments. For example, if a firm believes it could make one million dollars investing in either a new innovation or in an existing product, the firm should be indifferent as to which it pursues. However, if the profit from a new innovation is taxed at half the rate as the profits from the conventional product the firm would choose to invest more in innovation. In this sense, patent boxes could help overcome the market failure of too little private-sector innovation relative to the societally optimal rate. Just as economies can get caught in "poverty traps" where too little technology and too few skilled workers lead to the creation of low-skilled firms, (which in turn decreases demand for skills and technology), firms can get caught in low-innovation equilibriums.[15] Patent boxes can incentivize firms to shift production from low- to high-value products and services.

Finally, R&D is necessary but insufficient in order for nations to be globally competitive. Commercialization is the link between R&D and economic growth, but commercial activity does not necessarily follow from successful R&D. Firms often face barriers to bringing ideas to market in the form of coordination failures, lack of proof of concept funding, and other "valley of death" challenges. Obviously the market creates incentives for firms to commercialize; however, market failures, particularly coordination and collective action problems, reduce the rate of commercial R&D. A patent box regime can help correct this.

Globally Competitive Corporate Tax Codes

In a relatively closed economy with little mobile capital, high effective corporate tax rates may have the effect of reducing overall investment but they do little to affect the location of investment between nations. This situation essentially described the United States economy until the late 1970s. But since then, competition for internationally mobile investment has significantly increased, spurred by reduced trade and capital barriers and technological innovation enabling global supply chains.

In response, most nations have established robust competitiveness policies, including putting in place more competitive corporate tax codes. Deveraux, Lockwood, and Redoano find that corporate tax rates for OECD nations have declined from nearly 50 percent in the early 1980s to less than 35 percent in 2001, and that international tax competition was the principle driver of those reductions.[16] Indeed, many formerly high-tax nations have reduced their taxes dramatically. For example, the statutory corporate tax rate in Sweden in 1982 was 60 percent; by 1999, it had been reduced to 28 percent. In fact, by 2009, the non-U.S. OECD rate had declined even more, to just below 30 percent. Deveraux, Lockwood, and Redoano find that a 1 percentage point decline in the weighted average statutory corporate tax rate in other nations tends to reduce the corporate tax rate in the home country by about 0.7 percentage points.[17]

Countries are increasingly using their corporate tax code to become more attractive locations for internationally mobile investment and to reduce outflow of investment. Deveraux, Lockwood, and Redoano find that increases in corporate tax rates by low-tax European nations would lead to an increase in corporate investment in the United States and other nations. And this effect has grown over time. Altshuler finds that the elasticity of foreign direct investment to corporate tax rates has increased from 1.5 to 3 from 1984 to 1992, indicating that a 1 percentage point reduction in the host country tax rate now raises foreign direct investment by 3 percentage points.[18] A decade later, the effect was even larger at 3.7.[19]

Not only have an increasing number of nations lowered their effective corporate tax rates; many have done so in ways that specifically target globally traded sectors. If taxes on firms in globally traded sectors (e.g., steel, pharmaceuticals, electronics, etc.) are raised, firms will act rationally by moving some production to nations that tax them less. Indeed, most IP-based industries are now highly tradable and have significant locational freedom. IT management systems have allowed firms to decentralize and separate research and the development of IP from manufacturing and other segments of the firm at distant locations.[20] In this sense, the tax benefits of patent boxes accrue largely to internationally traded industries.

Not only have an increasing number of nations lowered their effective corporate tax rates; many have done so in ways that specifically target globally traded sectors.

Because of this, tax policy plays a growing role in influencing the global allocation of economic activity. One study of European multinational corporations between 1995 and 2005 found that the lower the statutory corporate tax rate of a subsidiary relative to all other affiliates of the multinational group, the higher the level of intangible assets at its location. Specifically, a 1 percent increase in the tax differential between a low-tax subsidiary and all other group affiliates increases its stock of intangible assets by 1.4 percent, on average.[21]

For these reasons, patent boxes have been the most rapidly growing new tax incentive around the globe. The regimes seek to encourage firms to do more innovation and to do more of it at home. And in doing so, firms are able to lower their effective corporate tax rate, especially on mobile factors of production.

The Mirrlees review from the London-based Institute for Fiscal Studies noted that, in principle, it would be efficient to tax mobile activities (e.g., an R&D laboratory or semiconductor plant) at a lower rate than relatively immobile ones (e.g., grocery stores and railroads). It states:

> This would allow a higher rate of corporation tax to be supported on less mobile (location-specific) economic profits, while using a lower rate to reduce the deterrence to mobile income. Explicitly setting a different rate for mobile income carries considerable implementation difficulties, has been rare in practice, and is explicitly discouraged by international agreements (including OECD initiatives on harmful tax competition). However, seen in this light, patent boxes may allow governments to maintain a higher tax rate and therefore collect more revenue from other, less mobile, forms of corporate income than would otherwise be the case.[22]

Adopting a patent box that requires R&D and/or production associated with qualifying IP to be done in the United States in order to qualify for the patent box rate would "kill two birds with one stone." It would incentivize backend R&D while at the same time tie R&D to commercial outcomes through patent revenues. And it would make the United States more attractive from a tax basis for the commercialization of innovation, leading to more robust job creation.

EFFECTIVENESS OF PATENT BOXES

How effective have patent boxes been at increasing R&D and creating new high-tech jobs and innovations? Because most patent boxes have only been in effect for a few years, and may not be optimally structured, answering this question precisely is difficult.

However, some data are available that allow, at a minimum, a comparison between countries with and without patent boxes. Griffith, Miller, and O'Connell analyzed the likely short-term effect of patent box regimes on the distribution and revenue from patents throughout Europe.[23] They did not attempt to model the impact of the patent box regime on the overall amount of R&D, only the short-term impact on the location of tax payments. They found that patent box policies do induce firms to patent more in the nations with the patent boxes. However, they found that the increased tax revenues from the increased income do not fully offset lost taxes from the lower tax rates, at least in the short term.

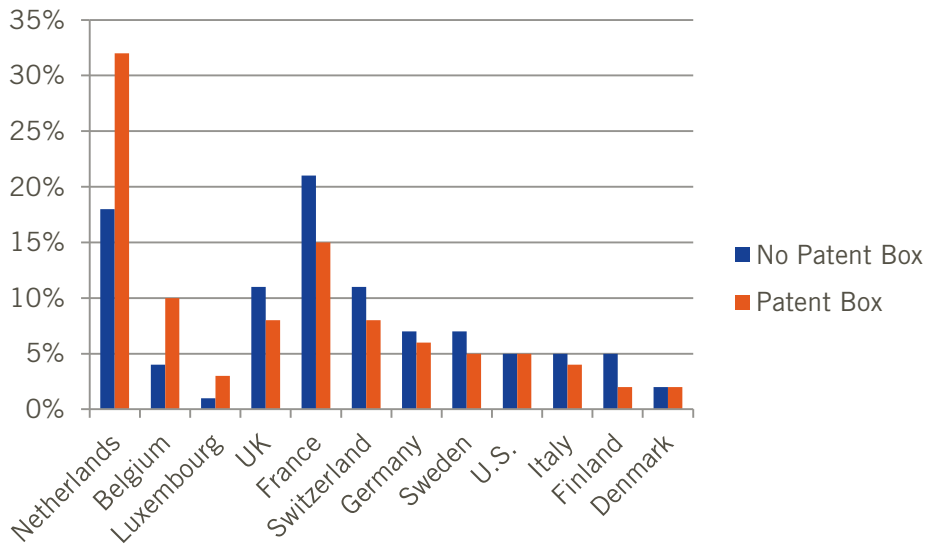

Figure 1: Anticipated distribution of patents after patent boxes are introduced in Luxembourg, Belgium, and the Netherlands
(Source: Rachel Griffith, Helen Miller and Martin O'Connell, 2010)

The authors first modeled the distribution of patents across Europe after the introduction of patent boxes.[24] Figure 1 estimates how the distribution of patents will shift after patent boxes were introduced in the Netherlands, Belgium, and Luxembourg but not in other

nations. The Netherlands and Belgium are expected to see the largest gains in patents with the UK and France losing the largest share.[25] Other nations see losses in their relative share of patents.

Even though the three nations with patent boxes that are studied (the Netherlands, Belgium, and Luxembourg) are expected to generate more patents, the authors estimated that they would get less tax revenue from patent income at least in a static analysis. As Figure 2 shows, so do the other nations that are modeled as not having patent boxes because they now would have less taxable income from patented products, even if the tax rate remained the same because some of the income would be now in nations with patent boxes. In Figure 2, the scenario of no patent boxes equals 100 percent for every country (blue bar) because it represents the status quo (in 2005). The patent box bar represents the percent of current value each country would hypothetically receive in tax revenue from patented profits after Luxembourg, Belgium, and the Netherland put their patent boxes into effect.[26]

The reason for this finding is twofold. Even though companies in nations with patent boxes have more patent income, the lower rate they now pay is not enough to make up for the loss in revenue. There is no "Laffer curve" here in the sense of lower rates leading to fully compensating higher revenues, at least in the short term. Second, other nations lose patent tax revenue because of firms' choice to relocate patent based activities to countries with patent boxes.

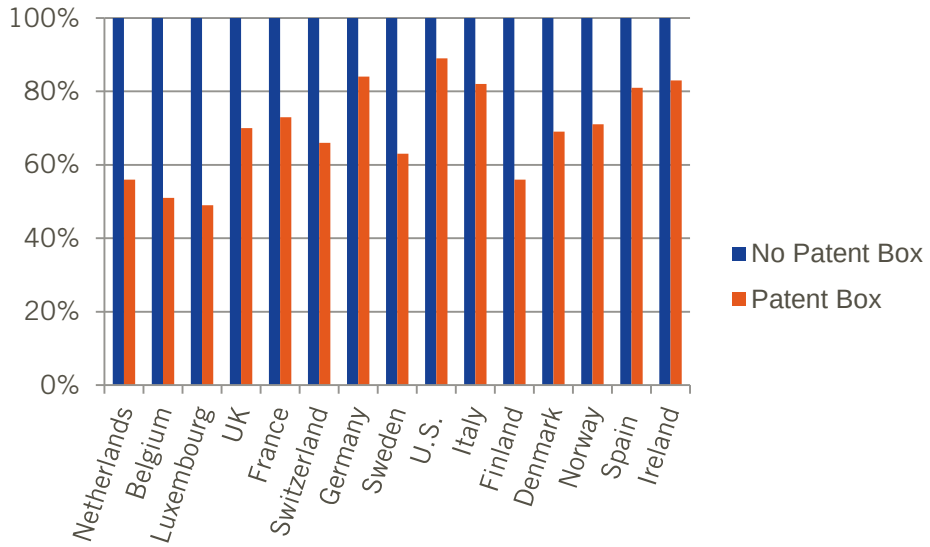

Figure 2: Impact on tax revenue of European patent boxes*
(Source: Rachel Griffith, Helen Miller, and Martin O'Connell, 2010)
***No patent box data (blue) represents the status quo with 100 percent reflecting tax revenue from patented technologies in the absence of patent boxes**

But Griffith, Miller, and O'Connell estimate short-term static impacts, not dynamic effects that reflect changes in employment, high-tech exports, and R&D. In other words, a patent box presumably leads to more research, patents, and sales of patented products, which in turn will lead to more jobs and increased corporate tax payments. Measuring this is more

difficult given how recently the patent box policies were put in place and given that the global recession intervened. We did find this "Laffer curve" effect to be the case with regard to the R&D tax credit, but without further data it is not possible to determine this effect definitively vis-à-vis patent boxes.[27] However, Eurostat does provide some data from 2009 that can be used to evaluate the near-term effects of these new patent box policies.

Table 2 (below) shows the differences between EU patent box countries with regard to levels of venture capital, industry R&D, trademarks, employment in knowledge-intensive activities, medium- and high-tech product exports, and licensing activity from 2008 to 2009. Patent box and non-patent box country averages for these categories are shown at the bottom of the table.

Between 2008 and 2009, industry R&D among European countries with patent boxes increased by 4 percent, versus 3.8 percent in non-patent box nations. Patent box nations also saw greater growth in medium- and high-tech exports than non-patent box nations.

Country	Venture Capital	Industry R&D	Trademarks	Employment in Knowledge-intensive Activities	Medium and High-tech Product Exports	License and Patent Revenues from Abroad
Belgium	17.6%	0.0%	36.8%	-2.2%	3.6%	123.8%
Ireland	-33.3%	24.5%	15.7%	7.0%	2.2%	47.8%
Spain	-29.4%	-2.7%	4.8%	1.9%		41.2%
France	8.0%	3.8%	15.8%	3.0%	1.8%	-4.1%
Luxembourg	9.3%	1.6%	33.0%	7.0%	16.7%	-3.8%
The Netherlands	-3.9%	0.0%	32.2%	-6.2%	2.4%	23.5%
Switzerland	-5.6%	0.5%	N/A	0.7%	N/A	N/A
EU Country Average with Patent Box	**-5.3%**	**4.0%**	**23.0%**	**1.6%**	**5.3%**	**38.8%**
EU Country Average without Patent Box	**5.4%**	**3.7%**	**11.9%**	**2.5%**	**1.7%**	**14.0%**

Table 2: Comparing change in innovation outcomes in patent box nations in Europe, 2008-2009 (Source: Innovation Union Scoreboard, 2010)

Patent box countries also made faster progress than countries without patent boxes in the growth of trademarks and patents from abroad, which increased by 24.5 and 38.8 percent, respectively, compared to 11.9 percent and 14 percent in non-patent box countries.[28] However, it is beyond the scope of this paper to evaluate whether or not there is a clear causal link between the creation of patent boxes and macroeconomic factors.

However, patent box countries made less progress than non-patent box ones in growth in venture capital and employment in knowledge-intensive sectors. This may be in part because the countries that adopted patent boxes did so because they were already lagging in innovation compared to other EU nations and sought to catch up. In fact, in the period prior to the introduction of patent boxes, the growth in industry R&D was lower between 2004 and 2008 for patent box nations (5 percent) than for the non-patent box EU-15 nations (6.5 percent).

The nations with patent boxes (with the exception of China) have not made lower tax revenues on income from patented products dependent on requirements for the R&D or the production of the product or service upon which the IP to be conducted at home.

While patent boxes have not been around long enough to conduct a full evaluation of their impacts, the R&D tax credit has and offers analogous data. The evidence from the R&D tax credit suggests that it does work, and that it not only spurs more R&D but also the relocation of R&D from jurisdictions with less generous R&D tax incentives to ones with more generous incentives. Bloom, Griffith, and Van Reenen found that the credit stimulates $1.10 of research for every dollar of lost tax revenue. Other studies have found even greater benefits, an estimated research investment to tax-cost ratio of between 1.3 and 2.9.[29] For example, Hall examined the credit from 1981 to 1991 and found that approximately two dollars in research were generated for every one dollar in tax expenditure. Klassen, Pittman, and Reed found that the R&D tax credit induces $2.96 of additional R&D investment for every dollar of taxes foregone.[30] Gregoire and Lebaeu find that in Quebec the creation of an R&D tax credit increased the number of small and medium-sized firms performing R&D by 100 percent and that the credit also increased the number of foreign-owned MNCs performing R&D in Quebec.[31] Similarly, Bloom et al. find that increases in R&D tax credits increase the R&D from foreign companies investing in the nation with the credit.[32]

Would Patent Boxes be More Effective if They Were Redesigned?

The data paint 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."[33] To be sure, the data are limited due to the newness of the patent box policies. However, one reason why the data may not be clearer is because the nations with patent boxes (with the exception of China) have not made lower tax revenues on income from patented products dependent on requirements for the R&D or the production of the product or service upon which the IP to be conducted at home. As a result, without this requirement some firms have patented in the patent box nation while doing R&D and/or production in another nation(s). So while the existing patent box regimes clearly show unalloyed success in allowing nations to capture more patenting, this has not always translated into broader economic benefits.

A better approach would be for nations with patent boxes to require R&D and/or production associated with qualifying IP to be performed in-country in order to qualify for the full patent box rate. This approach seems to hit the sweet spot for innovation-based tax incentives because it would incentivize back-end R&D while at the same time tie R&D to commercial outcomes through patent revenues. If this is the superior approach, why haven't the EU patent box nations adopted it? Initially one did. Originally, Ireland's patent box only allowed royalties and profits earned on patents to be exempt if research leading to the patent was carried out in Ireland. However, in 2007, the European Commission ruled

that Ireland's patent box violated the freedom of establishment and free movement of services clauses in Article 226 of the EC Treaty.[34] Since the European Commission's ruling, no European nation's patent box has required R&D to be performed domestically as a condition of receiving the tax benefit.

The Commission made this decision based on its political goal of continued European Union unification. Under their logic, why let the Spanish government require firms to perform R&D at home in order to receive the patent box tax rate if there is a chance it may be performed more efficiently in Estonia? Europe wants these decisions to be based on the internal characteristics and advantages of the European market. While it sounds like a noble goal, it is in fact fundamentally flawed when it comes to implementation. There are three reasons why.

First, the entire European Union is rife with "distortions" that affect the location of economic activities. The fact that the EU allows Ireland to have a corporate tax rate of 10 percent while Germany's is 24 percent has clearly been a factor in the rapid growth of foreign direct investment in Ireland as opposed to Germany. The fact that the EU allows the Czech Republic to have an R&D tax credit (a credit for R&D conducted in the Czech Republic) nearly three times higher than the Belgian credit means that, at the margin, R&D investments will flow to the Czech Republic rather than to Belgium. There is no economic justification for singling out patent boxes when other even more significant tax differences exist.

Second, while Europe is right to want to limit unproductive, zero-sum subsidies between its members whose only effect is to move one kind of activity from one place in Europe to another, it is wrong to treat innovation incentives the same as tax breaks for simply opening up a factory or office in one nation. Simply giving money to a firm to move from one location in Europe to another provides few or no net benefits to Europe. But patent boxes are not the same as a simple subsidy to induce a firm to move a factory. It is an incentive to produce more innovation, which spurs, not retards, economic growth. In fact, the current design of patent boxes imposed by the European Commission makes patent box regimes more like a simple subsidy to affect relocation of activities (in this case, patents) than a spur to greater innovation.

Finally, Europe needs to understand that the European Union is not the only game in town. If the choice for Spanish firms was solely between performing R&D in Spain or another EU nation, the net impact of the patent boxes under the imposed limitation would still likely be modestly positive (because it would still incent firms in Europe to conduct more R&D). However, the reality is that Spain is not competing solely with the rest of Europe for R&D but with the United States, Canada, and rapidly emerging Asian nations. In this case, with this restriction on patent boxes, Europe misses the chance to retain even more high-value-added R&D activities within its borders.

A potential rebuttal would be that regardless of where firms perform R&D, innovative firms produce value throughout their supply chain. Therefore, so long as some portion of an innovative firm's production or commercialization occurs domestically countries will benefit. Moreover, if a patent box incentivizes R&D abroad, firms may locate abroad to

access more advanced technologies or specific foreign-worker skill sets. Then, some of the benefits accrued offshore could be transferred back to a home country.[35] In such a scenario, geographic location of R&D is less important. While this is true, there is a growing body of economic literature which argues that when it comes to spillovers from knowledge production, most knowledge is tacit, and must be shared through close interactions. Moreover, several authors have found that manufacturing and other parts of a firm's value chain follow R&D abroad, not the other way around. Gregory Tassey, senior economist for the National Institute of Standards and Technology, writes:

> When technological advances take place in the foreign industry, manufacturing is frequently located in that country to be near the source of the R&D. This phenomenon occurs because much of the knowledge produced in the early phases of a technology's life cycle is tacit in nature and such knowledge transfers most efficiently through personal contact. An economy that initially controls both R&D and manufacturing can lose the value added first from manufacturing and then R&D in the current technology life cycle—and then first R&D followed by manufacturing in the subsequent technology life cycle. This is the economics of decline.[36]

Countries that have patent boxes but that do not require domestic R&D and/or production are not reaping the full benefits of their patent box policies. European patent boxes likely help reduce the market failure surrounding innovation and do increase firms' incentive to innovate. However, they do less to determine where that activity will take place. The lion's share of economic value from innovation to society comes from R&D, a high-skilled workforce, and domestic high-value manufacturing, not simply housing a greater number of patents.

So, if designed appropriately, patent boxes would likely complement R&D tax credits by promoting commercialized innovation, which would foster economic growth. On the other hand, if designed inappropriately, firms, may adopt legal but not innovation-promoting strategies. However, even if the outcome of patent boxes is simply to lower taxes on innovative firms without directly impacting their decision to invest more in R&D, this would still help the economy, particularly in the United States. The United States has one of the highest corporate tax rates in the world, putting it at a significant competitive disadvantage.[37] Higher corporate taxes reduce investments, new business start-ups, and inward foreign direct investment. Even if a U.S. patent box did not alter a U.S. firm's behavior, it would at minimum still constitute a reduced corporate tax rate on mobile, innovative firms. As mentioned above, corporate tax rates should be designed such that the tax burden is shifted from traded to non-traded sectors and away from innovation-driving firms. From a tax competition perspective, there is little reason to reduce the corporate tax rate on firms in non-traded sectors like groceries or electric utilities because they are geographically tied to the areas where their customers are located. But high-tech firms have a large and increasing number of global options with respect to location. Lowering corporate taxes on these firms would help countries like the United States become more globally competitive.

10 FREQUENTLY ASKED QUESTIONS ABOUT PATENT BOXES

1. ***What is a patent box?*** No, it's not a box companies put their patents in. A patent box is a tax incentive that allows business income from the sale of patented products to be taxed a lower rate than regular income.

2. ***What kind of business income qualifies for the lower patent box tax rate?*** Most patent box nations allow income from more than just patented products to qualify. Some countries have gone further and established "innovation boxes" that allow income from designs, copyrights, models and trademarks to also be taxed at the lower patent box rate. And with the broadest definition of IP-sourced income, China extends its patent box to allow income from certain types of commercial "know-how", such as process innovation, to qualify for the lower rate.

3. ***Why haven't I heard more about patent boxes?*** Patent boxes are relatively new. While Ireland was the first nation to develop a patent box in 1973, the seven other nations with them (Belgium, China, France, Luxembourg, Netherlands, Spain, Switzerland) all put them in place in just the last few years. And the UK is set to put theirs into play in 2013 with a tax rate of 10 percent from income of patented products, compared to the standard rate of 26 percent. (For reference, the U.S. federal corporate rate is 35 percent with state government corporate taxes making the effective rate even higher.)

4. ***Why have so many nations adopted patent box regimes recently?*** Most nations with patent boxes established them in the mid- to late 2000s. They did so because they recognized that the race for global innovation advantage has heated up and that if they were to retain and grow innovation-based jobs, they needed to do more to make their countries attractive for innovation. Increasingly innovation is highly mobile as the talent and infrastructure to conduct innovation-based activities are available in many nations around the world. Because of this, these countries instituted patent box policies, plus a host of other innovation policies, including in most nations boosting government support for R&D.

5. ***If a nation wants to better compete for innovation-based economic activities, why not just boost R&D incentives?*** R&D tax incentives are an important component of an effective national innovation strategy. Patent boxes differ from R&D incentives, though, because they provide firms with an incentive for commercialization of innovation, rather than just for the conduct of research. Commercialization of innovation, rather than the simple conduct of R&D, is a key driver of economic growth and jobs and therefore creating tax incentives linked to success at commercializing innovation is an important strategy for growth, competitiveness and job creation.

6. ***Don't firms already have all the incentives they need to develop patented products and services?*** No they do not. Even after patenting and successfully commercializing an innovation firms are still unlikely to capture all the benefits of their patent in the form of profits. Economists have found that some, and in many cases, much of the benefits "spill over" to other firms and consumers. A patent box thereby, not only reduces the financial risk involved in innovation, it better matches firm rewards with societal benefits, thereby inducing firms to engage in more innovation.

10 FREQUENTLY ASKED QUESTIONS ABOUT PATENT BOXES (CONT.)

7. ***Are patent boxes effective?*** Because most patent boxes have only been in effect for a few years, precisely answering this question is difficult. However, some data are available that allow, at minimum, a comparison between countries with and without patent boxes. Griffith, Miller and O'Connell analyzed the likely short-term effect of patent box regimes on the distribution and revenue from patents throughout Europe. They found that patent box policies do induce firms to patent more in the nations with the patent boxes. The data paint an 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." One reason for this is that because of EU restrictions, the European nations have not linked the receipt of the lower tax revenues on income from patented products either to the conduct of R&D or the production of the product or service upon which the IP is based in the nation. If a patent box were designed in way that links the incentive to the conduct of R&D and/or production of the patented product it would go even further in spurring the creation of more innovation-based jobs.

8. ***How does a patent box relate to more comprehensive efforts at corporate tax reform, including moving to a territorial system?*** The development of a patent box is quite consistent with efforts at more comprehensive corporate tax reform. It works effectively in a regime where global profits are taxed domestically (as is the case in the United States) or in a territorial system where only the profits earned domestically are taxed domestically. And it works in a system of lower rates and significantly reduced incentives, deductions and credits. Tax reform does not necessarily mean, nor should it, that the tax code eliminates all incentives. Rather, it should eliminate incentives that are not pro-growth and pro-innovation. The patent box is clearly pro-growth and pro-innovation. Finally, the patent box would lower the effective corporate tax rate for knowledge-based firms located in the United States, a key goal of any effective corporate tax reform effort.

9. ***Isn't this just corporate welfare?*** Corporate welfare is giving corporations something in return for nothing. If properly designed, a patent box is an incentive linked to a company innovating and/or producing in the United States, which produces jobs, most of them paying above the median wage level. Moreover, as long as the United States is in the race for global innovation advantage, policymakers have no choice but to provide a competitive environment in which firms will choose the United States as a home to their innovative activity, including production.

10. ***Should the United States adopt a patent box?*** Yes, is the short answer. The United States is in the midst of a competitive crisis. Once the unquestioned world leader in cutting-edge technologies and high-value added manufacturing and services, today competitor nations are racing ahead at enhancing their innovation capacity while U.S. progress stagnates. In its report, *The Atlantic Century II: Benchmarking EU and U.S. Innovation and Competitiveness,* ITIF found that out of forty-four countries and regions, the United States ranks 4th in overall innovation-based competitiveness but 43rd, second from the last, in the rate of progress made over the last decade. A patent box would be one of a number of key steps policymakers can take to restore U.S. competitive advantage.

SHOULD THE UNITED STATES ADOPT A PATENT BOX?

While many attribute the United States' recent economic travails simply to a financial crisis predicated on excessive mortgage lending, the reality is that the Great Recession was caused in part by the long-term structural decline of U.S. economic competitiveness, which in turn reduced investment opportunities in the United States and increased the flow of capital coming into the nation. The truth is that the United States is in the midst of a competitive crisis. Once the unquestioned world leader in cutting-edge technologies and high-value added manufacturing and services, today competitor nations are racing ahead at enhancing their innovation capacity while U.S. progress in making its economy more competitive and innovative stagnates. ITIF found that out of forty-four countries and regions, the United States ranks fourth in overall innovation-based competitiveness but forty-third in the rate of progress made over the last decade.[38] Moreover, U.S. manufacturing is in crisis, with U.S. manufacturing output, when properly measured, declining approximately 10 percent over the last decade during a time when GDP increased 15 percent.[39]

Part of this decline is due to our failure to match competing nations when it comes to innovation policies. For example, while the majority of OECD countries have developed and implemented innovation strategies, the United States has yet to do so. Many forward-thinking countries have also recognized that the commercialization of innovation is the route to moving up the value chain and a key to boosting productivity. Moreover, virtually all developed and many developing countries use their tax code to spawn innovation. Many countries have also begun to realize the importance of technology commercialization, and in particular of linking university and public-sector research to private-sector outcomes.[40]

However, commercialization has never been a major part of the U.S. innovation agenda. The R&D tax credit focuses on the inputs to innovation in the private sector, while only a small fraction of the budgets of innovation-driven agencies like NSF, NIST, and DOE's Office of Science are allocated to commercialization efforts.[41] On the other hand, countries like Finland are taking the commercial side of innovation far more seriously. In the last two decades, Finland has transformed itself from a largely natural resource-dependent economy to a world leader in technology, with Tekes, Finland's National Agency for Technology and Innovation, playing a key role in the country's transformation. Affiliated with the Ministry of Employment and the Economy, Tekes funds many research projects in companies, multi-company partnerships, and business-university partnerships. With a budget of $560 million (in a country of only 5.2 million people), Tekes works in partnership with business and academia to identify key technology and application areas that can drive the Finnish economy.

The United States needs a hybrid approach to innovation policy. European-style patent boxes that do not require domestic R&D or production will not induce enough R&D or high-tech manufacturing, while the U.S. R&D credit, useful as it is, does not go far enough to promote commercialization and domestic production. A patent box that reduces the corporate tax rate on revenue from qualifying IP to a significantly lower rate, coupled

with an incentive for corresponding R&D and production to be located in the United States, would provide firms with a much stronger incentive to innovate and to produce in the United States.

There are at least three key issues in the design of the patent box. The first is the rate. It's not clear what the lower rate should be. We would recommend that it be in the range of between 10 and 17.5 percent. At 17.5 percent it would be half of the current U.S. statutory rate. However, this would still be higher than that rate in all nations with patent boxes. A rate of 10 percent would be lower than or equal to the rates in around half of the nations with patent boxes.

The U.S. patent box wouldn't be the world's first, but it could be the world's best. By tying together R&D, high-tech manufacturing, and commercialization of U.S. IP, a well-formulated patent box would create a powerful incentive for firms to develop and produce innovation within the United States.

The second is the connection between the lower rate and the conduct of R&D and production of the patented product domestically. Establishing such a policy link is critical because U.S. manufacturing has been in a noticeable state of decline throughout the last decade. Between 2000 and 2010, manufacturing employment declined by almost one-third, or 5.82 million jobs.[42] In the same time period, the U.S. trade deficit in manufacturing reached $4.5 trillion and fifteen of the nineteen aggregate-level U.S. manufacturing sectors shrank in real value-added.[43] The R&D tax credit is only partially positioned to address the decline in technology-based manufacturing because R&D is separate from the production process. But because a patent box rewards revenue, it necessarily takes effect post-production.

Therefore, enabling the patent box rate to apply only to income from patented products developed and produced in the United States would likely have an important impact on supporting domestic manufacturing. The key question is the nature of the linkage between R&D and production and the lower rate. There are several possible ways to design the linkage. The tightest linkage would only allow the lower rate to be given on income from products where the IP was developed in the U.S. and the product was produced in the United States. But because of the nature of global supply chains this may significantly limit the use of the incentive, including for firms that might otherwise be willing to locate a significant amount of production in the United States, but who have to produce some overseas.

A second method would be to allow companies to receive the lower rate on all the profits from the patented product if the product was either developed in the United States or produced in the United States. This would provide more flexibility but also less incentive to produce domestically.

A third method would be to allow a share of the profits (e.g., 33 percent) to be taxed at the lower rate if the lion's share of the R&D to develop the innovation was performed here and another share (e.g., 66 percent) to be taxed at the lower rate if most of the production of the product was located in the United States. Thus for a company that developed a patented product and performed the R&D in the United States but produced the product overseas, 33 percent of the profits from the product would be taxed at the lower rate. This would provide more incentive to produce domestically, but would also provide some flexibility.

Finally, the lower rate could be pro-rated based on the share of total R&D and production which is performed in the United States. For example, if 60 percent of the value of the R&D and production costs is located in the United States, 60 percent of the profits would be eligible for the lower rate. This would provide flexibility as well as a strong incentive to produce R&D and product in the United States.

Third, because there are often a substantial time lags between investments in R&D, submission of a patent application, and the actual granting of a patent, some countries, such as the Netherlands, allow firms that have applied for a patent but not yet received it to take a portion of the patent box credit. This policy makes sense for the United States, especially given the significant rates of patent pendency at the U.S. Patent and Trademark Office.

CONCLUSION

Countries interested in winning the race for global innovation advantage need to shift the debate over domestic tax policy from one of revenue enhancement to one of global competitiveness. And most countries are doing just that. However, over the last quarter century the U.S. tax code has seen little change. More countries are entering the global race and others are running faster to keep the lead. If the United States' pace remains constant, we will slowly but surely fall further behind. Implementing a patent box is an opportunity for the United States to develop a tax code that more effectively drives innovation, competitiveness, and family-wage jobs. Many countries have patent boxes but most have significant shortcomings in design. The U.S. patent box wouldn't be the world's first, but it could be the world's best. By tying together R&D, high-tech manufacturing, and commercialization of U.S. IP, a well-formulated patent box would create a powerful incentive for firms to develop and produce innovation within the United States.

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ABOUT ITIF

The Information Technology and Innovation Foundation (ITIF) is a Washington, D.C.-based think tank at the cutting edge of designing innovation strategies and technology policies to create economic opportunities and improve quality of life in the United States and around the world. Founded in 2006, ITIF is a 501(c) 3 nonprofit, non-partisan organization that documents the beneficial role technology plays in our lives and provides pragmatic ideas for improving technology-driven productivity, boosting competitiveness, and meeting today's global challenges through innovation.

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