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INTEGRATED TAX POLICY APPROACH TO DESIGNING RESEARCH & DEVELOPMENT TAX BENEFITS

Noam Noked

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Harvard Law School
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INTEGRATED TAX POLICY APPROACH TO DESIGNING RESEARCH & DEVELOPMENT TAX BENEFITS

Noam Noked*

Competition between countries on research & development (R&D) investments has never been fiercer as more countries try to increase their domestic R&D and become innovation-based economies. At the same time, the effort to curtail the ability of multinational entities to avoid taxation by shifting income to low-tax jurisdictions has become a top priority in the United States, the G20 and the OECD. The tension between these trends has received little attention from policy makers and analysts. This article contributes to the literature by presenting an integrated approach to designing optimal R&D tax benefits and assessing the effect of tax reform proposals on incentives for R&D investment.

According to the approach suggested here, we should fully analyze the effect of the tax system and of proposed reforms on incentives to invest in domestic R&D, as different tax rules create different incentives. Given the effect of the tax system, we should adopt a subsidy equal to the marginal positive externality from additional investment in R&D. In designing the subsidy, we should explore what structures and features would optimize domestic spillovers from R&D, whether it would be desirable to administer the subsidy through the tax system, and how to do so.

Applying the approach suggested in this article could lead to policy recommendations substantially different from the tax reforms currently promoted in Congress and the OECD.

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* Terence M. Considine Fellow at the Center for Law, Economics and Business, Harvard Law School. I am grateful to Louis Kaplow, Kobi Kastiel and Stephen Shay for helpful comments. Support was generously provided by the John M. Olin Center for Law, Economics, and Business at Harvard Law School.

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I. OVERVIEW

Competition between countries on research & development (R&D) investments has never been fiercer as more countries try to increase their domestic R&D and become innovation-based economies. At the same time, the effort to curtail the ability of multinational entities (MNEs) to avoid taxation by shifting income to low-tax jurisdictions has become a top priority in the United States,[1] the G20 and the OECD.[2] The tension between these trends has received little attention from policy makers and analysts. This article contributes to the literature by presenting an integrated approach to designing optimal R&D tax benefits and assessing the effect of tax reform proposals on incentives for R&D investment.

According to the approach suggested here, we should fully analyze the effect of the tax system and of proposed reforms on incentives to invest in domestic R&D, as different tax rules create different incentives. Given the effect of the tax system, we should adopt a subsidy equal to the marginal positive externality from additional investment in R&D. In designing the subsidy, we should explore what structures and features would optimize domestic spillovers from R&D, whether it would be desirable to administer the subsidy through the tax system, and how to do so.

This approach follows the stipulation that optimal corrective subsidy should equal the marginal positive externality in the presence of income taxation as well, as shown by Kaplow.[3] It also draws on Weisbach and Nussim[4] in examining the questions of whether and how to structure the subsidy as a governmental spending program or as a tax benefit, as a question of institutional design.

This article suggests a different approach to that adopted by Graetz and Doud, a recent article that analyzes the same topic using a different methodology.[5] Graetz and Doud conduct two substantially separate

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[1] The U.S. Senate Permanent Subcommittee on Investigations has recently conducted an investigation on income shifting practices used by Apple, Microsoft and Hewlett-Packard, and suggested tax reforms to ban these practices; President Obama's Framework for Business Tax Reform also includes proposals to limit income shifting practices, as further discussed in part III below.

[2] *See* Organisation for Economic Co-operation and Development, Action Plan on Base Erosion and Profit Shifting, *available at* http://www.oecd.org/ctp/BEPSActionPlan.pdf (last visited Jan. 29, 2014). The Action Plan is further discussed in part III below.

[3] *See* Louis Kaplow, *Optimal Control of Externalities in the Presence of Income Taxation*, 53(2) INT'L ECON. REV. 487 (2012).

[4] *See* David A. Weisbach & Jacob Nussim, *The Integration of Tax and Spending Programs*, 113 YALE L.J. 955 (2004).

[5] *See* Michael J. Graetz & Rachael Doud, *Technological Innovation, International Competition, and the Challenges of International Income Taxation*, 113 COLUM. L. REV. 347, 395-401 (2013).

analyses: one on the efficacy, cost-effectiveness and desirability of current R&D tax incentives; and another on how to eliminate practices that MNEs use to shift intellectual property (IP) income to low-tax jurisdictions. Graetz and Doud's approach overlooks some important considerations as it does not properly address the effect of the tax system and proposals to eliminate IP income shifting on incentives to invest in domestic R&D. As further discussed below, these differences in methodology lead to substantially different conclusions and policy recommendations regarding the desirability of various tax reforms and the required adjustments to R&D tax benefits.

Ignoring the different effects of various proposals currently considered by the OECD, the United States and other countries on incentives to invest in domestic R&D may have significant ramifications for national welfare. As discussed below, in its recent investigation of IP income shifting by Apple, Hewlett-Packard and Microsoft, the Senate Subcommittee on Investigations did not address the effect of the tax system and possible reforms on R&D investment incentives. A recent OECD report from October 2013 suggests a model that analyzes the full effect of the tax system on incentives to invest in domestic R&D—similar to the approach promoted in this article.[6] However, the OECD report fails to provide useful guidance on how to optimally design R&D tax benefits given the effect of the tax system.

The second part of this article briefly reviews trends in R&D and provides background on R&D tax benefits. The third part analyzes how the tax system affects incentives to invest in domestic R&D. Where the tax system reduces incentives to invest in domestic R&D, a larger subsidy would likely be needed to reach the social optimum. An income tax system imposed territorially or with a deferral for undistributed foreign income reduces incentives to invest in domestic R&D, whereas a consumption tax system does not create such locational distortion. Another advantage of a destination-based consumption tax system (such as VAT) is that it taxes some of the profits from foreign R&D as part of the domestic consumption of imported goods and services, while not taxing the return from domestic R&D used for export. If the subsidy is granted through the tax system as a tax expenditure, larger tax benefits would be needed to offset a higher tax burden on the return from R&D in order to reach a similar after-tax subsidy level.

This article does not make a general recommendation for a particular tax system. An income tax system might be preferred on other grounds that are

[6] *See* Organisation for Economic Co-operation and Development, Supporting Investment in Knowledge Capital, Growth and Innovation, at 131-2 (2013) [hereinafter: *OECD report*]. This report was published after an earlier draft of this article was written.

outside the scope of this article. The only margin analyzed here is the effect of a tax system on incentives to invest in domestic R&D. The incentives created by the rest of the tax system should be taken into account when designing R&D tax benefits.

Contrary to the prevalent negative view of income shifting, the availability of income shifting opportunities might mitigate investment disincentives created under the income tax system, and may be socially desirable under certain conditions, as Hong and Smart and other economists contend.[7] Changes in the tax system, such as eliminating the ability to shift IP income, might change incentives to invest in domestic R&D. If such changes reduce these incentives below the social optimum, a larger corrective subsidy may be needed.

Various proposals to eliminate income shifting would result in different effects on R&D investment incentives, and therefore would require different adjustments to the R&D subsidy. These proposals can be divided into three groups. First, proposals to strengthen the taxation of domestic income—such as limiting the ability to shift income through transfer pricing manipulations and cost-sharing agreements, and sourcing IP income to locations where the R&D is conducted—would increase the cost of conducting R&D in high-income-tax countries and create incentives to shift R&D to low-income-tax countries. Second, proposals that change the tax system in the direction of consumption taxation—such as adopting a formulary apportionment of MNEs' income based on the location of sales, or sourcing income to the place of consumption—would reduce incentives for income shifting without increasing the relative cost of domestic R&D and therefore would not create similar investment disincentives for resident and foreign MNEs. Third, proposals that strengthen the current taxation of worldwide income—such as tightening CFC rules and imposing minimum income tax on worldwide income of MNEs—would not create incentives for resident MNEs to locate R&D in low-income-tax countries but would increase incentives for corporate inversions. As various proposals would affect R&D investment incentives differently, the required level of the optimal R&D subsidy would be different under each proposal.

The fourth part of this article addresses the design of an optimal corrective subsidy for investment in R&D. Designing the optimal subsidy requires further analysis of important questions, such as what activities should be targeted by the subsidy (e.g., targeting investment in human capital), what entities should be eligible for the subsidy, whether it should treat mobile and immobile capital differently, what would be the best timing

[7] *See* Qing Q. Hong & Michael Smart, *In Praise of Tax Havens: International Tax Planning and Foreign direct investment*, 54(1) EUR. ECON. REV. 82 (2010). *See* the discussion below in part III on the positive and negative views of income shifting.

for granting the subsidy, and whether it should be granted only to successful R&D. After deciding on these questions, we should explore how to structure the subsidy: as a direct subsidy or as a tax benefit. This is a question of institutional design. It appears that much of the current R&D tax benefits are not the product of a design process, but an arbitrary consequence of the structure of the tax system, its standard concepts and mechanisms such as tax credits or exemptions. It is possible that an explicit process in which subsidy design questions were addressed would result in adopting different subsidy structures.

For example, if the aim was that the subsidy should treat mobile and immobile capital differently, there would be a stronger case for granting the subsidy through tax rules that benefit MNEs that have greater capital mobility, such as nonrefundable tax credits, profit exemption, and IP income shifting opportunities. If the subsidy was to create greater incentives for small, early-stage companies, this could be achieved through refundable tax credits or direct grants, as these companies are more credit constrained and their future profits might be less certain. If the subsidy was to target investment in human capital, it could be structured as an employment tax benefit or as a corporate income tax benefit, calculated based on the investment in human capital.

The fifth part identifies the differences between the approach suggested in this article to that in Graetz and Doud's analysis. The sixth part concludes.

As the OECD, the United States, and other major economies are currently considering steps to eliminate IP income shifting practices, it is important to analyze how these would affect incentives for conducting R&D domestically and assess if adjustments to R&D subsidies are required. Eliminating IP income shifting in ways that decrease incentives to invest in domestic R&D without adjusting R&D subsidies to their optimal level might increase tax revenues in the short run, but create large social losses in the long run. Applying the approach suggested in this article could lead to policy recommendations substantially different from the tax reforms currently promoted in Congress and the OECD.

II. BACKGROUND ON R&D TAX BENEFITS

Economists and policy makers have long recognized the importance of technological innovation to economic growth.[8] In addition, it has been widely accepted that without governmental intervention, firms underinvest in R&D because they internalize only a part of its benefits, as R&D induces positive externality in knowledge spillovers that can be used by others.[9] However, in an international setting, knowledge spillovers may not be fully internalized by the country where the R&D activities that produced the knowledge took place, and other countries can benefit from the newly developed technological innovation. Nonetheless, R&D activities generate domestic benefits as well. Countries compete on attracting R&D activities to their borders because of positive externalities that are internalized domestically.

The National Science Foundation defines R&D as "activities comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."[10] Other definitions of R&D are discussed in part IV below. The economic literature shows that R&D activities have significant influence on employment, human capital, productivity and economic growth. One analysis estimates that the 465 billion dollar projected expenditure on R&D in the United States in 2014 will generate an additional 860 billion dollars in the U.S. economy, employ 2.7 million people directly, and support the employment of additional 6 million people indirectly.[11] Some studies estimate that the public returns from R&D are significantly larger than the internalized private return.[12] Other studies found that R&D activities create local spillovers that stimulate nearby economic activity. For example, Housman shows a significant effect of research universities on employment and

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[8] *See* Robert M. Solow, *Technical Change and the Aggregate Production Function*, 39 REV. ECON. & STAT. 312 (1957), and the literature that followed this article.

[9] *See*, e.g., Laura Tyson & Greg Linden, Ctr. For Am. Progress, The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness: Gauging the Economic and Fiscal Effectiveness of the Credit 7 (2012); Graetz & Doud, *supra* note 5, at 349.

[10] This definition includes administrative expenses for R&D, and excludes "physical assets for R&D such as R&D equipment and facilities"; "routine product testing, quality control, mapping, collection of general purpose statistics, experimental production, routine monitoring and evaluation of an operational program, and the training of scientific and technical personnel." *See* National Science Foundation, Definitions of Research and Development: An Annotated Compilation of Official Sources, *available at* http://www.nsf.gov/statistics/randdef/fedgov.cfm (last visited Feb. 24, 2014).

[11] *See* Battelle, 2014 Global R&D Funding Forecast, at 9 (December 2013), *available at* http://www.rdmag.com/articles/2013/12/2014-r-d-magazine-global-funding-forecast

[12] *See* Graetz & Doud, *supra* note 5, at 349.

economic activity, and that the impact of university innovation increases with geographic proximity to the university.[13] Similar findings were shown in other studies as well.[14] There is also evidence that business investment in knowledge-based capital has a significant contribution to labor productivity growth.[15]

Not surprisingly, many countries have adopted policies that aim at increasing investment in local R&D as a strategy to promote employment and growth. The European Union, as part of its strategic long-term plan to increase growth and job (titled "Europe 2020"), has adopted a goal to increase the combined public and private R&D expenditure to 3 percent of the European Union's gross domestic product.[16] China has more than quadrupled its R&D expenditure since 2000. At the current rate of growth and investment, China's total funding of R&D is expected to surpass that of the United States by 2022. China's high growth rates of R&D expenditure are expected to continue in the next few years as China strives to transition its economy from manufacturing-driven to innovation-driven by 2020.[17]

Governments support R&D directly and indirectly in various ways, including providing intellectual property rights and legal protection, governmental grants and funding for research conducted in universities, national laboratories and other entities, funding for education and professional training. Subsidies given to private entities, including those given through the tax system as tax benefits, are one policy tool available to governments when trying to stimulate R&D activities. There are two main methods traditionally used for subsidizing R&D through the tax system. One method is to provide a preferential tax treatment based on R&D expenditure, mainly by granting R&D tax credits or "super deductions."[18]

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[13] Naomi Hausman, *University Innovation, Local Economic Growth, and Entrepreneurship* (working paper, 2012).

[14] *See*, e.g., A. Jaffee et al., *Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations*, 108(3) Q. J. ECON. 577 (1993); Adam B. Jaffe, *Real Effects of Academic Research*, 79(5) AM. ECON. REV. 957 (1989); Shawn Kantor & Alexander Whalley, *Do Universities Generate Agglomeration Spillovers? Evidence from Endowment Value Shocks* (working paper, 2009).

[15] *See* OECD report, *supra* note 6, at 17. .

[16] For information on Europe 2020, *see* the European Union's website, *available at* http://europa.eu/legislation_summaries/employment_and_social_policy/eu2020/em0028_en.htm (last visited Jan. 18, 2014).

[17] *See* 2014 Global R&D Funding, *supra* note 11, at 15. Even if the numbers reported by Chinese authorities regarding investments in R&D are inflated, there is still substantial evidence showing rapid growth in R&D conducted in China.

[18] A "super deduction" allows the taxpayer to deduct an amount that exceeds the actual expense, which is usually in proportion to the actual expense—such as 125 percent deduction of R&D expenses in Austria or double deduction in Hungary. *See* Graetz & Doud, *supra* note 5, at 353.

The United States and many European countries adopted this method, and in recent years some countries have increased the benefits granted.[19] Some European countries, such as The Netherlands, Belgium and Hungary, have also enacted employment tax benefits for R&D workers. These tax benefits include tax credit for R&D salary costs, payroll tax deduction and exemption for withholding tax on salaries to researchers.[20] Arguably, under income tax regime, R&D expenses should be capitalized and amortized during the economic life of the knowledge. Therefore, there is also a tax benefit in allowing full expensing of R&D costs.[21]

Another method of subsidizing R&D through the tax system is to exempt the return on investment in R&D by not taxing IP income derived from knowledge developed in R&D, in addition to allowing deductions of the R&D expenses. Some European countries have adopted "patent boxes" or "innovation boxes" that offer preferential tax treatment to income from patents or other intangibles produced through R&D activity. These tax benefits are structured differently in different countries. The preferential tax treatment is usually limited to a certain qualifying income.[22] Some countries, such as the United Kingdom, Spain and The Netherlands, limit this tax benefit to income from self-developed R&D, or further developed if acquired.[23] An attempt by Ireland to limit this tax benefit to domestic corporations and only to patents for which the underlying R&D took place locally was not successful as it was declared incompatible with the European Union's rules regarding freedom of establishment and free movement of services.[24] Several proposals for patent boxes have been raised in the United States Congress but have not been adopted.[25] One concern regarding patent boxes is MNEs' ability to use transfer pricing techniques to allocate more income to patent boxes. It is hard to conduct an arm's length evaluation of the income attributable to innovations and therefore this attribution is susceptible to tax planning manipulations.[26]

It is unclear how effective R&D tax credits and patent boxes are—to what extent these tax benefits increase domestic R&D activities and whether this increase is cost-effective. Studies assessing these effects have

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[19] *See* Graetz & Doud, *supra* note 5, at 352-5.

[20] *See id.* at 354.

[21] Under standard assumptions, current expensing is equivalent to exempting the normal rate of return. *See* Alvin C. Warren, *How Much Capital Income Taxed under an Income Tax is Exempt under a Cash-Flow Tax?*, 52 TAX L. REV. 1 (1996).

[22] *See* Graetz & Doud, *supra* note 5, at 362-9.

[23] *See id*. at 365-8.

[24] *See id.* at 366.

[25] *See id.* at 369-371.

[26] *See id.* at 368-9.

found a wide range of cost-benefit ratios and elasticities, some very small.[27] There is little evidence on the extent to which R&D tax credits affect decisions of MNEs where to locate their R&D activities, although the well-documented responsiveness of MNEs to tax rates in general may indicate that there should be an effect.[28] Much of the difficulty in gauging the actual effect of R&D tax credits stems from the inability to measure long-term effects accurately.

There is less economic evidence on the efficacy of patent boxes, as they are relatively new. However, due to the mobility of MNEs' IP ownership and income, it is likely that patent boxes mostly induce income shifting to countries that offer this tax benefit, without increasing the underlying R&D activities in these countries.[29] Among E.U. countries, their inability to limit the tax benefit to R&D that was performed domestically makes patent boxes a vehicle that promotes tax competition between E.U. members, and its effect on increasing domestic R&D is questionable.

It is worth noting that in practice the income that derives from R&D is usually not heavily taxed, even without granting special tax benefits or using IP income shifting methods discussed in depth below. According to a method some tax authorities use to attribute MNEs' income to their R&D centers, the taxable income equals the R&D centers' expenses plus a small profit margin, usually calculated as a percentage of the expenses. This way the R&D center is taxed only on a small and arbitrary profit, which might be much smaller than the actual contribution of the R&D activities to the MNE's overall profits. Possible arguments in support of this method include its simplicity and certainty, and the fact that it prevents recognition of losses by the R&D centers. As mentioned above, immediate deduction of R&D expenses also lowers the effective tax and practically exempts the normal rate of return on the investment.[30]

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[27] For a review of these studies, *see id.* at 355-62.

[28] *See id.*

[29] *See id*. at 372-4. It is possible that in the aggregate the availability of patent boxes makes the European Union more attractive to R&D investments, in comparison to other parts of the world. However, an individual country might not increase its R&D level by adopting a patent box.

[30] *See* Warren, *supra* note 21.

III. HOW DOES THE TAX SYSTEM AFFECT INCENTIVES FOR R&D

In order to find the optimal R&D corrective subsidy, it is crucial to understand the influence of the tax system on MNEs' incentives to invest in domestic R&D. Arguably, income taxation creates different incentives than consumption taxation. In addition, the availability of tax planning methods, such as IP income shifting, could also affect MNEs' decisions where to locate R&D activities. Only after assessing these effects, can one determine what the optimal R&D corrective subsidy should be. A recent OECD publication from October 2013 implemented a similar approach, as it suggested examining the influence of domestic and international tax policy—including the effect of IP income shifting—on business decisions on how much to invest in domestic R&D, where to locate the ownership of capital-based knowledge, and where to undertake production that exploits it.[31] However, the OECD report failed to provide useful guidance regarding how to optimally design R&D tax benefits. This article further develops the analysis of this question.

A. Income Taxation, Consumption Taxation, and the Location of R&D

An income tax system creates different incentives for investment in domestic R&D than does a consumption tax system. Consumption of goods and services is considered to be less mobile than reported income, capital and labor.[32] In other words, if we were to impose a tax on consumption, it would likely decrease consumption to some extent, but it would result in relatively low locational distortions as most people will not change the place of where they consume goods and services as a result of imposing a consumption tax. Grubert analyzed data on 754 large MNEs from 1996 to 2004 and found that profits, rather than sales, are being globalized. He found that tax differentials between countries have a significant impact on the foreign share of an MNE's worldwide income through a change in profit margins rather than changes in location of sales. He found it difficult to identify any significant positive or negative effect of lower effective foreign tax rates on domestic sales.[33]

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[31] *See* OECD report, *supra* note 6, at 131-2.

[32] *See*, e.g., Kimberly A. Clausing & Reuven S. Avi-Yonah, *Reforming Corporate Taxation in a Global Economy: A Proposal to Adopt Formulary Apportionment*, at 12 (The Hamilton Project, June 2007).

[33] *See* Harry Grubert, *Foreign Taxes and the Glowing Share of U.S. Multinational Company Income Abroad: Profits, Not Sales, Are Being Globalized*, 65(2) NAT'L TAX J. 247 (2012).

Individuals have different ways to reduce consumption tax liability.[34] *First*, they can change consumption patterns toward items that are subject to lower taxes, including increasing leisure and working less.[35] If a consumption tax were levied uniformly on all goods it would distort consumption choices less. Substitution between labor and leisure would also occur under an equivalent income tax. *Second*, they can self-provide otherwise taxable goods and services, as imputed income is usually not taxed. This distortion would also occur under an equivalent income tax. *Third*, individuals can try to circumvent a domestic consumption tax by making their purchases tax in low-tax jurisdictions. However, this ability might be limited both by geographical boundaries and by tax rules.[36] *Fourth*, they can choose to reside in a low-tax region.[37] However, changing residency might involve high monetary and nonmonetary costs and might be subject to various constraints. In addition, if we hold the tax burden and distribution constant, there should not be much difference in individuals' incentive to expatriate between income and consumption tax. Therefore, although individuals would probably reduce consumption under a consumption tax, it would create a relatively low locational distortion, as consumption is likely less mobile than capital and production of income.

Under a destination-based consumption tax system, the goods consumed locally are taxed locally regardless if resident companies or foreign companies produced the goods. In addition, goods produced locally, but exported and consumed overseas are not subject to the domestic destination-based consumption tax as export is not subject to this tax. Therefore, this tax does not create an incentive for domestic companies to accrue income or move activity abroad. Moreover, there is no disincentive for foreign companies to open branches and subsidiaries in that jurisdiction. Therefore, consumption taxation induces less locational distortion and no incentives to move income and income production offshore.[38]

An origin-based consumption tax is imposed based on the location of

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[34] *See* Matthew N. Murray, *Would Tax Evasion and Tax Avoidance Undermine a National Retail Sales Tax?*, 50(1) NAT'L TAX J. 167, 172 (1997).

[35] This is a substitution effect between leisure and labor.

[36] Examples for this include people who purchase goods while traveling to low tax jurisdictions, such as neighboring states that impose lower tax on liquors or gasoline. Online retailers such as Amazon—that did not charge sales tax until recently—are facing a growing number of states that require charging these sales with sales tax determined by the address of the purchaser.

[37] See, e.g., Charles M. Tiebout, *A Pure Theory of Local Expenditures*, 64(5) J. POL. ECON. 416 (1956).

[38] It is important to note that destination-based value added tax does not function as a trade subsidy. *See* Martin Feldstein & Paul Krugman, *International Trade Effects of Value-Added Taxation, in*: TAXATION IN THE GLOBAL ECONOMY 263 (Assaf Razin & Joel Slemrod eds., 1990).

the business selling the goods, even if the goods are exported and consumed in a different country. Under this tax, which resembles income tax in the sense that it follows the location of production and not consumption, local and foreign companies will have an incentive to locate production outside counties that impose a high origin-based consumption tax. Throughout this article, the term "consumption tax" refers to destination-based consumption tax.

An income tax creates different incentives than a consumption tax. If we were to introduce a corporate income tax, some corporations and especially MNEs that are more mobile, well advised, and globally integrated, would shift their reported income or even their real activity to jurisdictions with lower taxes. This would reduce tax revenues, and where real activity is relocated it would reduce labor and other domestic spillovers from that activity.[39] This is why some analysts, such as Clausing & Avi-Yonah, support adopting a formulary apportionment of MNE's income based on the location of sales, without including in the formula the location of the MNE's workers and property that are considered to be more mobile.[40] It is worth noting that not all income can be easily shifted, as the country where the sales and consumption took place can impose taxes on a portion of the income that is attributable to sales and marketing. However, it would be harder to impose income tax on income attributable to the R&D and manufacturing if these took place elsewhere.

Under a territorial tax system, or under a worldwide tax system that provides deferral until income is repatriated, a resident company has an incentive to avoid income taxation by shifting income to a lower-income-tax jurisdiction. Shifting income can be achieved by using tax planning techniques or by relocating real activity to a lower-income-tax jurisdiction. Corporate inversion—becoming a foreign corporation—is another way a corporate resident in a high-income-tax country could use to reduce income tax costs. It is important to note that the lower-income-tax jurisdiction's overall tax burden might be very high because of other taxes, such as consumption taxes, but these would not have an effect on the MNE's decision where to locate its R&D activities.

Under a worldwide tax system with current taxation of offshore income, there would be no incentive for resident companies to shift income and real activity to foreign low-income-tax countries, as the MNE's income would still be taxed similarly in the country of residency. However, incentives for corporate inversion would increase and so would the competitive disadvantage for resident companies that are subject to higher taxes. The example below demonstrates how different tax systems create different

[39] *See*, e.g., Grubert, *supra* note 33, at 39-40.
[40] *See* Clausing & Avi-Yonah, *supra* note 32.

incentives.

Example 1

Assume that a country called Income-land imposes an income tax of 20 percent and no consumption tax, whereas a country called Consumption-land imposes a consumption tax of 20 percent and no income tax. The income tax is a standard tax on current worldwide income with no deferral, and the consumption tax is a standard destination-based consumption tax. The demand for widget X is 1,000 in each country if the consumption tax is not levied and 900 when a consumption tax of 20 percent is imposed. The production of widget X for *both countries* can be located in either country, and export and import are costless. In other words, one factory located in either of these countries can produce the widgets and sell them to markets in both countries for gross revenues of 1,900. The cost of production is 10 percent of the price for which widget X is sold (100 for sale of 1,000 or 90 for sale of 900).

A foreign investor from a different country wants to open a factory in either Consumption-land or Income-land to produce widget X and sell it in both countries. The location of the factory does not affect the tax liability in Consumption-land: it would be 900 and 180 respectively, regardless of the factory's location. However, the factory's location would affect the tax liability in Income-land. If the factory is located in Income-land, all of the factory's worldwide income will be subject to an income tax of 20 percent. This income includes revenues from sales of 1,000 in Income-land minus deductible production costs of 100, and sales of 900 in Consumption-land minus deductible production costs of 90, for a total of 1,710. Therefore, if the factory is located in Income-land, it would be subject to income tax of 342 and the after tax income would be 1,188.[41] This calculation assumes that the factory would not get a deduction or a credit for the consumption tax paid in Consumption-land. In fact, most tax systems do not allow deducting indirect taxes from corporate taxable income.

If the factory is located in Consumption-land, the widget could be sold to a subsidiary or a third party in Income-land to sell the widget in that market. Income-land might still tax some income, as some profits should be attributed to sales and marketing that are sourced to Income-land. However, the income attributable to sales and marketing is only a part of the income. If, for example, the share of sales and marketing in the revenue is 25 percent, the taxable income in Income-land would be 225[42] and the income tax liability would be 45.[43] Consumption-land would not impose

[41] 1,710*(1-0.2)-180
[42] (1,000-100)*0.25
[43] 225*0.2

any tax on the export to Income-land as it applies a destination-based consumption tax system. Therefore, the total after tax income if the factory is located in Consumption-land would be 1,485.[44] This saves 297 in tax in comparison to locating the factory in Income-land.

Therefore, an outside investor would locate her factory in the country that taxes her income at a lower rate. The tax levied on consumption is unavoidable, and thus does not affect the decision where to locate production. From the countries' perspective, Consumption-land would have tax revenues of 180 from this activity, whereas Income-land would have only 45. If both have the same budgetary needs, Income-land would have to levy other taxes on immobile factors in order to raise more revenue. In order to make the investor indifferent to the higher income tax rate in Income-land, so she would choose to invest there, immobile factors such as labor should carry the tax burden. However, it is not clear whether his investment could fully avoid income tax if invested in Income-land, assuming tax avoidance opportunities are not available. Where some of the capital would be taxed, or if there is uncertainty regarding this concern, investors might prefer investing in countries with low income tax rates.

In this example, as in many instances, income tax can be avoided, whereas consumption tax cannot be escaped regardless of the location of production. This would be different if the country of residency imposes immediate taxation on corporations' worldwide income. In this case, resident MNEs would pay the same taxes if they decide to locate production in Income-land or Consumption-land. If there is competition from other investors that locate their factories in jurisdictions with lower income tax, such as Consumption-land, they may be able to outperform and push the high-tax-paying investor out of the market because she incurs higher tax costs.

Therefore, as demonstrated in this basic and simplified example, it is possible that countries that adopt higher consumption tax rates and lower corporate income tax rates would have an advantage over similar countries that have higher corporate income tax rates and lower consumption tax rates. The former countries would have higher tax revenues, would attract more foreign direct investments, and provide a competitive advantage to their resident corporations' exports. It is possible that the worldwide increase in the use of consumption taxes, and the simultaneous decline of statutory and effective corporate income tax rates, can be explained at least partially by countries' reactions to these considerations and the increase in capital mobility.

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[44] 810+900-180-45

R&D is a part of the income production process. Consumption taxation usually does not affect MNEs' decision where to locate their R&D activities. Under an income tax, if a firm is allowed to deduct R&D expenses without paying taxes on the profits gained from that R&D activity, then there will be an incentive to locate R&D in high-income-tax jurisdictions. However, if high-income-tax countries were successful in their efforts to tax the profits from R&D, this would increase MNEs incentives to shift R&D activities to low-income-tax countries.

An important relevant question is how mobile MNEs' R&D is: would MNEs move their R&D centers to lower-income-tax countries if forced to pay higher income tax on R&D in higher-income-tax countries? It is likely that the answer to this question is positive for a large part of the R&D conducted by MNEs, especially in the long run. There is not much evidence on mobility of R&D and its responsiveness to tax rates. However, there is ample evidence that MNEs respond to production costs and move real activities to cheaper countries. MNEs' responsiveness to real costs has been demonstrated in the last few decades in shifting manufacturing and outsourcing services from developed countries to developing countries with cheaper labor, such as China and India. In high-tech industries between 2000 and 2010, there was a sharp decline of 28 percent in the number of high-tech manufacturing jobs in the United States and a significant increase of these jobs in Asia, especially China.[45] High-tech manufacturing has different characteristics than R&D, but this trend may indicate that U.S. MNEs are willing to relocate large-scale operations overseas to save costs.

The current trend in R&D indicates that MNEs already develop their R&D operations in countries in which R&D is cheaper. Although the United States is still the world largest R&D spender, the current trend might indicate that Asia is becoming more attractive as an R&D investment destination, in comparison to the United States and Europe.[46] Since 2004, about 85 percent of the growth in R&D workers employed by U.S. MNEs has occurred in foreign countries. The overseas portion of their R&D employment grew from 16 percent in 2004 to about 27 percent in 2009.[47] Ireland and Israel are two examples for small and developed countries that use tax policy and subsidies to attract investment in domestic R&D. The labor costs in these countries are comparable to these in the United States.

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[45] *See* National Science Board, SCIENCE AND ENGINEERING INDICATORS DIGEST 12 (2012), *available at* http://www.nsf.gov/statistics/digest12/nsb1202.pdf

[46] *See* NATIONAL SCIENCE BOARD, RESEARCH & DEVELOPMENT, INNOVATION, AND THE SCIENCE AND ENGINEERING WORKFORCE, chapter 4 at 40-1 (2012).

[47] *See* NATIONAL SCIENCE BOARD, RESEARCH & DEVELOPMENT, INNOVATION, AND THE SCIENCE AND ENGINEERING WORKFORCE, introduction at 17 endnote 1 (2012), *available at* http://nsf.gov/nsb/publications/2012/nsb1203.pdf

Yet, it is likely that low effective tax rates and governmental subsidies increase these countries' attractiveness for MNEs. These trends indicate that MNEs try to maximize their return on investment in R&D and locate their R&D activities in countries that offer the best return.[48]

Countries that compete on attracting investment in R&D should be interested in their overall attractiveness. A country with poor education systems that train low quality engineers would not attract R&D investments even if it has low tax rates. However, when comparing two countries that are different only in their taxes, it is likely that the country with the higher tax burden on investment in R&D would attract less R&D investments.

This raises the question of how countries with very high corporate tax rate, such as the United States, have managed to retain significant R&D activities. The next part discusses the possible role of tax avoidance opportunities in maintaining R&D activities in high-income-tax countries.

B. Income shifting and Incentives for R&D

1. Overview of Income shifting Practices

MNEs use various ways to legally lower their tax liability. A major tax avoidance method is called income shifting. An MNE is involved in income shifting when it locates profitable functions and accumulates income in low-tax jurisdictions while conducting the less profitable activities and reporting expenses in high-tax jurisdictions. Without going into much detail, IP income shifting usually involves transfer of IP through a sale, licensing, or a cost-sharing agreement. Under a cost-sharing agreement, the U.S. parent enters into an agreement with a subsidiary or an affiliate to share the costs of developing an intangible. The entire development can take place in the United States, while the foreign subsidiary contributes a portion of the development costs. In many cases, the portion the subsidiary contributes was received by it as a capital contribution from its parent. If the development is successful, the subsidiary is entitled to a portion of the profits from the intangible or to rights to exploit it.[49]

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[48] The inceasing quality of the education and skills of the human capital in some developing countries may be the main factor that makes them more attractive for investment in R&D. There are additional reasons why MNEs locate some of their R&D activities in developing markets, apart from saving on costs. These reasons include the customizing products to the local markets and understand demands and trends better, as well as meeting regulatory requirements for investment as a precondition to access to the market.

[49] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S.

According to tax rules, when a U.S. corporation sells an asset or licenses the use of an asset to an offshore affiliate, it is required to report a sale price, or a royalty rate, based on the price or royalty that would be expected if the transaction had occurred between the U.S. corporation and an unrelated party (the arm's length principle). However, there are inherent difficulties in applying this rule to situations where a U.S. company shifts to a foreign affiliate the rights to its core intangible property. According to the IRS Chief Counsel, applying the arm's length rule in such circumstances has been the IRS's most significant international enforcement challenge.[50] The reasons for this difficulty are twofold. *First*, there are rarely any comparable transactions between unrelated parties. *Second*, because the core intangible property rights of a business are risky assets, assessing their value depends on projected cash flows and a discount rate to account for the associated risk. Transfer pricing rules allow a range of allowable alternatives, based on reasonable assumptions, and do not block IP income shifting effectively.[51] Moreover, tax authorities might also lack the ability and resources to successfully challenge many transactions between related parties, even if their adherence to the arm's length principle is questionable.

These income shifting techniques work effectively for taxpayers whose profits depend primarily on valuable intangibles. Other corporations have less access to these tax planning practices. Therefore, the varying abilities of corporations to use IP income shifting create significant disparities among corporate taxpayers with respect to their tax burdens.[52] Clausing estimated that in 2004 alone income shifting practices cost the U.S. government approximately 35 percent of the overall corporate income tax revenues, over 60 billion dollars.[53] Although some income shifting practices do not involve intangibles, such as interest deductions and other financial planning methods, IP income shifting represents a large portion of the overall income shifting phenomenon.

Permanent Subcommittee on Investigations (Sep. 20, 2012) (statement of Reuven Avi-Yonah).

[50] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations (Sep. 20, 2012) (statement of William Wilkins, IRS Chief Counsel); *see* also Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations (Sep. 20, 2012) (statement of Stephen E. Shay).

[51] *See* Wilkins, *id*.

[52] *See id.* at 5.

[53] *See* Kimberly A. Clausing, *Multinational Firm Tax Avoidance and Tax Policy*, NAT'L TAX J. 703-4 (2009); *See* Graetz & Doud, *supra* note 5, at 395-401. Some estimates are lower. See, for example, Martin A. Sullivan, *U.S. Multinationals Shifting Profits Out of the United States*, 1078 TAX NOTES 43 (2008) estimated annual revenue loss of 17.4 billion dollars.

2. The G20 and OECD's Reaction to Income shifting

Governments of major countries usually view income shifting as a negative phenomenon that erodes the tax base and enables highly profitable MNEs avoiding paying fair taxes.[54] In 2013, the OECD adopted its ambitious Action Plan on Base Erosion and Profit Shifting (hereinafter: *Action Plan*), in which eliminating all income shifting practices is a top priority.[55] The Action Plan notes that MNEs ability to lower their tax burden by shifting profits has harmed governments as they have to cope with less revenue and a higher cost to ensure compliance, damaged the integrity of the tax system, increased the tax burden on individual taxpayers, and disfavored smaller domestic business as they are put at a competitive disadvantage.[56]

Under the Action Plan, the OECD is expected to develop international tax standards to assure that profits are taxed where the underlying activities generating the profits take place and where the value is created. It concerns all kinds of income shifting practices and not only IP income shifting practices. The Action Plan notes that transfer pricing outcomes should be in line with value creation, and that new rules should prevent profit shifting by moving intangibles among group members.[57] The Action Plan also notes that the new rules should strengthen CFC rules. It would be interesting to see what standards the OECD will develop and how will they influence international tax norms and practices.[58]

The G20, an executive level forum that includes representatives from the world's largest economies, fully supports the OECD's Action Plan. A G20 statement from September 2013 notes that "[p]rofits should be taxed where economic activities deriving the profits are performed and where value is created. In order to minimize [base erosion and profit shifting], we call on member countries to examine how our own domestic laws contribute to [base erosion and profit shifting], and to ensure that international and our own tax rules do not allow or encourage multinational enterprises to reduce

[54] *See* Graetz & Doud, *supra* note 5, at 401-3.

[55] *See* Action Plan, *supra* note 2.

[56] *See id.* at 8.

[57] *See* the Action Plan's Action 8, titled "Intangibles": "Develop rules to prevent BEPS by moving intangibles among group members. This will involve: (i) adopting a broad and clearly delineated definition of intangibles; (ii) ensuring that profits associated with the transfer and use of intangibles are appropriately allocated in accordance with (rather than divorced from) value creation; (iii) developing transfer-pricing rules or special measures for transfers of hard-to-value intangibles; and (iv) updating the guidance on cost contribution arrangements."

[58] *See id.*, Action 3 at 16.

overall taxes paid by artificially shifting profits to low-tax jurisdictions."[59]

3. The U.S. Senate Investigation on Income shifting Practices

The U.S. Senate Permanent Subcommittee on Investigations held two hearings on this issue in October 2012 and May 2013, in which it investigated income shifting practices used by Microsoft, Hewlett-Packard (HP) and Apple. These hearings provide interesting insights on the views of ranking legislators, IRS officials, corporate representatives, and experts who testified before the Subcommittee.

The Subcommittee Chairman, Senator Carl Levin, noted in his opening statement at the October 2012 hearing that "[t]he massive offshore profit shifting that is taking place today is doubly problematic in an era of dire fiscal crisis," and that one of the reasons for the erosion of the U.S. tax base is "multinational corporations avoiding U.S. taxes by shifting their profits offshore." He noted that income shifting practices used by MNEs compromise the integrity and viability of the tax system and hurt other individuals and business that face a greater tax burden, as well as domestic industries that do not exploit tax rules to shift profits offshore.[60]

One practice that Chairman Levin found very upsetting is an agreement according to which Microsoft U.S. sells the right to market its intellectual property in the Americas to a subsidiary in Puerto Rico and then buys back from the subsidiary the distribution rights for the United States. Under the distribution agreement, Microsoft U.S. agrees to pay the Puerto Rican subsidiary a percentage of the sales revenues it receives in the United States. By doing so, it avoids U.S. tax on nearly half of its sales revenues in the American market. Chairman Levin noted that "[t]he product is developed here. It is sold here, to customers here. And yet Microsoft pays no taxes here on nearly half the income."[61] He made similar statements also regarding Apple's large scale income shifting operations.[62]

It is worth noting that the negative view of MNEs' income shifting and tax avoidance is bipartisan. For example, Senator John McCain, in his

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[59] *See* G20 Leaders' Declaration, 12 (2013), *available at* https://www.g20.org/sites/default/files/g20_resources/library/Saint_Petersburg_Declaration_ENG.pdf

[60] Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations (Sep. 20, 2012) (statement of Sen. Carl Levin, Chairman, S. Permanent Subcommittee on Investigations).

[61] *See id.*

[62] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations – Part 2 (Apple Inc.) (May 21, 2013) (statement of Sen. Carl Levin, Chairman, S. Permanent Subcommittee on Investigations).

statement at the May 2013 hearing, noted that "it is unacceptable that corporations like Apple are able to exploit tax loopholes to avoid paying billions in taxes." In addition to the fiscal ramifications of tax avoidance, McCain stated that "loopholes like these, which multinationals like Apple aggressively employ, are harmful in that they provide large corporations huge competitive advantages over smaller domestic companies. These domestic companies pay a higher tax rate because they cannot use overseas operations to lower their effective corporate rate."[63]

The Subcommittee's investigation identified the incentives and methods that were used by Microsoft, HP and Apple to shift income to low-tax jurisdictions. It found that the current weaknesses in the Code's transfer pricing regulations, Subpart F, and Section 956, as well as accounting reporting rules in FASB's APB 23, encourage and facilitate the shifting of IP and profits offshore. With respect to Apple, the Subcommittee found that the company has used offshore entities and transactions to accumulate 102 billion dollars offshore. Some of its offshore entities have no declared tax jurisdictions. Apple paid a tax rate of less than 2 percent on the income it accumulated in Ireland, and used cost-sharing agreements with its affiliates in Ireland to avoid accumulating income in the United States.[64] Apple used the "check-the-box" and "look-through" rules to circumvent Subpart F and, in doing so, it avoided, in 2009 through 2012, 44 billion dollars in taxes on otherwise taxable offshore income.[65] Regarding Microsoft, the Subcommittee noted that the company has used aggressive transfer pricing methods and transactions to shift IP to subsidiaries in Puerto Rico, Ireland and Singapore, in which little or no tax was paid. By doing so, Microsoft was able to shift offshore nearly 21 billion dollars, or almost half of its retail sales profits. Microsoft also used the "check-the-box" regulations and "look-through" rules to avoid paying tax under the CFC rules. The Subcommittee also noted that HP has used intercompany offshore loans to effectively repatriate foreign profits back to the U.S. without paying U.S. tax on these profits.[66]

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[63] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations – Part 2 (Apple Inc.) (May 21, 2013) (statement of Sen. John McCain, Ranking Minority Member, S. Permanent Subcommittee on Investigations).

[64] The Irish Government denied negotiating with Apple its tax rate, but there is no controversy that de facto Apple paid taxes of approximately 2 percent on profits accumulated in Ireland.

[65] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations – Part 2 (Apple Inc.) (May 21, 2013) (memorandum from Sen. Carl Levin, Chairman & John McCain, Ranking Minority Member, S. Permanent Subcommittee on Investigations).

[66] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S.

The Subcommittee's memorandum included the following policy recommendations: strengthening transfer pricing rules to eliminate incentives for U.S. MNE to transfer IP to low-tax jurisdictions; reforming the "check-the-box" and "look-through" rules, as well as properly enforcing the "same country" exception and the manufacturing exception, in order to strengthen taxation of Subpart F income; and disregarding sham entities and imposing current U.S. tax on income earned by CFCs that are managed and controlled in the U.S.[67]

A representative of Microsoft, in his testimony before the Subcommittee, emphasized Microsoft's enormous contribution to the U.S. economy through labor, goods and services purchases, and industry output. He further stressed that Microsoft complies with all U.S. tax rules, which according to Microsoft's view are outdated and not competitive in comparison to the tax systems of the United States' major trading partners, as they provide disincentives for investments in the United States.[68]

Apple, in its statement to the Subcommittee, noted that its cost-sharing agreement with its subsidiaries in Ireland supports high-paying, tax revenue generating jobs in the United States. Apple noted that, unlike companies that do a substantial share of their R&D in lower cost, foreign jurisdictions, Apple conducts virtually its entire R&D in the United States. Therefore, the cost-sharing agreement helps funding Apple's high-paying R&D jobs in the United States, generating domestic job growth.[69]

The question how eliminating IP income shifting opportunities would affect incentives for conducting R&D in the United States was not addressed as a central concern by the Subcommittee, even though both Apple and Microsoft had implied that the ability to shift IP income overseas helps them retain their largest R&D centers in the United States despite of its high corporate tax rate. Interestingly, although it appears that much of the Subcommittee Chairman's anger regarding IP income shifting derives from low taxation of products sold and consumed in the United States—as the "product is developed here. It is sold here, to customers here"—yet the Subcommittee's focus was how to strengthen taxation of income rather than

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Permanent Subcommittee on Investigations (Sep. 20, 2012) (memorandum from Sen. Carl Levin, Chairman & John McCain, Ranking Minority Member, S. Permanent Subcommittee on Investigations).

[67] *See supra* note 65, at 6.

[68] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations – Part 2 (Apple Inc.) (Sep. 20, 2012) (statement of William J. Sample, Corp. Vice President, Worldwide Tax, Microsoft Corporation).

[69] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations – Part 2 (Apple Inc.) (May 21, 2013) (statement of Apple Inc.).

taxation of consumption.

4. Analysts' Views on IP Income shifting

The tax professors who testified before the Senate Subcommittee held the view that income shifting by MNEs has negative consequences as it erodes the tax base and disadvantage domestic businesses. According to Professor Shay, "[r]estoring revenue lost to base erosion and profit shifting would support investing in job-creating growth in the short term and reducing the deficit over he long term."[70] Shay noted that current U.S. international tax rules are too generous to foreign income and not sufficiently strong in protecting against base erosion by foreign companies investing in the United States. This, in turn, disadvantages domestic businesses.[71] He further mentioned two possible reforms. The first concerns U.S. taxpayers—adopting a "minimum tax" imposed on the U.S. shareholders of CFCs. The second concerns foreigners—imposing a withholding tax and restricting deductions for payments of income to related persons not "effectively taxed" on that income.[72]

Professor Avi-Yonah, endorsed the negative view of income shifting and supported limiting the application of "check the box" rules and tightening the rules regarding cost-sharing agreements.[73]

Professor Harvey also supported the negative view of income shifting. He suggested a few steps to limit income shifting opportunities, including restricting the "check-the-box" rules, CFC "look-though" rules, and the contract manufacturing exemption, as well as increasing transparency. However, he noted that U.S. policy makers should be concerned about the risk that, over time, U.S. MNEs will move out of the United States through corporate inversions to take advantage of lower tax rates in other countries if the United States were to adopt full worldwide income taxation without deferral.[74] He also mentioned that it would be preferable to substantially lower the corporate tax rate, and replace the lost revenue with a value added tax or other revenue source, although this reform is not very likely to be approved in the United States for political reasons. He briefly discusses

[70] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations – Part 2 (Apple Inc.) (May 21, 2013) (statement of Stephen E. Shay).

[71] *See id.* at 12.

[72] *See id*. at 13.

[73] *See* Avi-Yonah, *supra* note 49, at 5-6.

[74] *See* Offshore Profit Shifting and the U.S. Tax Code: Hearing Before the S. Permanent Subcommittee on Investigations – Part 2 (Apple Inc.) (May 21, 2013) (statement of Richard Harvey, Jr.).

other possible reforms, such as imposing a minimum tax on income accumulated in tax havens, adopting formulary apportionment, and disallowing deductions for expenses attributable to foreign income.[75]

The question of the problems and opportunities created by IP income shifting is similar to the question of tax havens, as income shifting practices use tax havens to accumulate income. The economics literature has addressed the question of the effect of tax havens. Slemrod and Wilson developed a model of tax competition in which tax havens are depicted as "parasitic" on the tax bases of countries that are non-havens. In that model, the ability of taxpayers to lower their taxable income by using tax havens leads to a wasteful expenditure of resources, both by firms in their participation in havens and by governments in their attempts to enforce their tax rules and protect their tax base. In addition, tax havens increase tax competition by causing countries to reduce their tax rates further below levels that are efficient from the viewpoint of all countries combined. Under this model, either full or partial elimination of tax havens will improve welfare.[76]

Contrary to this negative view of tax havens, a few economists have suggested that tax havens and MNEs' tax avoidance practices may be beneficial for the MNEs' home countries.[77] Keen analyzed the effect of preferential tax regimes for foreign investors or specific sectors. Assuming that capital is heterogeneous in its mobility across countries, it would be optimal to impose a higher tax rate on immobile capital and a lower tax rate on mobile capital. However, if lower tax rates for more mobile capital were not allowed, countries would have to compete by setting a single tax rate for all forms of capital, a rate that would be too low on immobile capital. When a country can set a higher rate on immobile capital while competing with other countries only on mobile capital, this would mitigate the negative effects of tax competition by restricting it to competition over mobile capital only.[78]

Hong and Smart addressed the issue of income shifting and presented a model according to which income shifting by MNEs lowers their effective tax rate and encourages them to invest in non-haven countries, even if the latter have high statutory tax rates.[79] While income shifting may reduce revenues of high-tax countries, it may have offsetting effects on real

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[75] *See id.* at 15.

[76] *See* Joel Slemrod & John D. Wilson, *Tax competition with parasitic tax havens*, 93 J. PUB. ECON. 1261 (2009).

[77] *See* Dhammika Dharmapala, *What Problems and Opportunities are Created by Tax Havens?* 24(4) OXFORD REV. ECON POL'Y, at 661, 671 (2008).

[78] *See* Michael Keen, *Preferential Regimes Can Make Tax Competition Less Harmful*, 54 Nat'l Tax J. 757-62 (2001).

[79] *See* Hong & Smart, supra note 7.

investment that are attractive to governments. Hong and Smart argue that the investment-enhancing effects of income shifting can dominate the tax revenue erosion effects. Thus, the presence of international tax planning and income shifting opportunities may enable countries to maintain or even increase high corporate tax rates, while avoiding an outflow of foreign direct investment and real activities.

Hong and Smart noted that governments in small, open economies should avoid imposing taxes on mobile factors like mobile capital, because these taxes are distortionary and will ultimately be borne by immobile domestic factors, such as domestic labor. Governments may nonetheless impose corporate income taxes to redistribute rents from domestic entrepreneurs to workers. However, as the burden of multinational taxes is ultimately borne by domestic factors, revenue losses due to income shifting are irrelevant. Therefore, policy makers in high-tax countries should focus on the effect of income shifting on the level of multinational investment in high-tax countries and its deadweight costs for the economy. According to Hong and Smart's model, tax revenues are predicted to remain roughly stable at current levels in response to a rise of tax havens, rather than to decline as the standard view projects.

Desai et al. analyzed activities of a panel of U.S. MNEs from 1982 to 1999 in order to identify characteristics of firms using tax havens and the purposes that tax haven operations serve. The findings show that MNEs that are large and active overseas are the most likely to operate in tax havens. In addition, MNEs are more likely to operate in tax havens if they operate in industries in which firms typically face low foreign tax rates, if they are technology-intensive, and if they have extensive intra-firm trade. The fact that MNEs in industries that face low foreign tax rates are more likely to operate in tax havens indicates that MNEs use tax havens to defer or avoid U.S. taxation of their foreign income.[80] In another article, Desai et al., it was argued that there are complementarities between investment in tax havens and investment in neighboring non-haven countries. According to this article, reduced tax costs from using tax havens do not appear to divert real activity from non-havens. The empirical evidence indicates that firms facing low costs of establishing tax haven operations respond in part by expanding their activities in nearby high-tax countries. Therefore, the existence of tax havens can encourage investment in non-havens.[81]

Contrary to the prediction in the tax competition literature that more investment in tax havens would result in lower domestic corporate tax

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[80] *See* Mihir Desai et al., The Demand for Tax haven Operations, 90 J. PUB. ECON. 513 (2006).

[81] *See* Mihir A. Desai et al., Do Tax Havens Divert Economic Activity?, 90 ECON. LETTERS 219 (2006).

revenues, the data from 1994-2006 shows that, although there was an increase of U.S. capital diverted to tax havens, corporate tax revenues have slightly *increased* over this period, both as a percentage of GDP and as a percentage of overall tax revenues. Therefore, the argument about erosion of the tax base might be questionable.[82] Data on trends in corporate tax revenues in Europe does not show a decline in corporate tax revenues in recent decades, even though many European countries significantly reduced their statutory corporate tax rates in recent decades. However, this might have been the result of having more businesses incorporating because of other base broadening steps that were taken.[83]

According to the positive view discussed above, IP income shifting can increase welfare of high-tax countries by allowing MNEs, which have the ability to move their R&D operations to low-tax countries, to retain them in high-tax countries. Eliminating IP income shifting opportunities might result in an increase in corporate tax revenues, but also in a shift of real R&D activities overseas. It is possible that the social cost of this shift—due to the loss of domestic spillovers—might exceed the social benefit from higher tax revenues. Apple's statement before the Senate Subcommittee expressed the view that its cost-sharing agreement helps funding its high-paying R&D jobs in the U.S. and generating domestic job growth.[84] It implies that without the ability to use income shifting methods, companies such as Apple might have stronger incentives to locate more of their R&D overseas.

C. Proposals to Eliminate Income Shifting and Incentives for R&D

This part examines the effect of different proposals to eliminate IP income shifting on incentives for investment in domestic R&D. It analyzes five categories of proposals discussed in Graetz and Doud: strengthening transfer pricing rules; using formulary apportionment of MNEs' income; changing source rules; strengthening CFC rules; and imposing a minimum tax on MNEs' income.[85]

Interestingly, different ways to eliminate income shifting opportunities affect incentives for investment in domestic R&D differently. In general, proposals to eliminate income shifting opportunities can be divided into three groups: a) those that strengthen taxation of domestic income; b) those that strengthen current taxation of worldwide income; c) those that change

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[82] *See* Dharmapala, *supra* note 77, at 674.
[83] *See id.*
[84] *See* Apple's statement, *supra* note 69.
[85] *See* Graetz and Doud, *supra* note 5, at 414.

the tax system in the direction of consumption taxation.

Among the first group—proposals that strengthen taxation of domestic income—we can include proposals to strengthen transfer pricing rules, to use cost-sharing agreements, and to change source rules so that IP income would be sourced to the place where R&D was conducted. Abolishing IP shifting opportunities by strengthening taxation of domestic income would increase the relative cost of conducting R&D in high-income-tax countries and thus reduce incentives for conducting R&D domestically for both resident and foreign MNEs.

Among the second group—proposals that strengthen current taxation of worldwide income—we can include proposals to strengthen CFC rules and to impose a minimum income tax on resident MNEs' worldwide income. Strengthening taxation of worldwide income, regardless of its location, does not create incentives to locate R&D in low-income-tax countries, as the location of R&D does not affect the tax liability. However, these proposals might increase incentives for corporate inversions. It is unclear whether corporate inversions affect the location of R&D. These proposals may not influence foreign MNEs that are not subject to these rules if they can continue to shift overseas their IP income from their domestic local R&D center.

Among the third group—proposals that change the tax system in the direction of consumption taxation—we can include proposals to adopt formulary apportionment of MNEs' income based on location of sales, or to change source rules so that income would be sourced to the place of consumption. These proposals reduce incentives for income shifting but do not increase the relative cost of domestic R&D and therefore do not create similar investment disincentives for resident and foreign MNEs. This part further discusses these proposals and their effect on incentives for R&D.

1. Strengthening Transfer pricing Rules

As Graetz and Doud noted, strengthening the transfer pricing rules is easier said than done. Even though the Treasury has tried improving the enforcement of transfer pricing rules in the last two decades, it is inherently problematic to apply the arm's length standard to IP transfers, application that was described by the IRS Chief Counsel as the IRS's most significant international enforcement challenge.[86] However, it is possible that a stricter approach by tax authorities would result in limiting the ability of MNEs to use transfer pricing practices to reduce their tax liability.

[86] *See supra* note 50.

If efforts to strengthen transfer pricing rules prove successful, what would be effect on incentives for investment in domestic R&D? In this case, the country in which successful R&D activities took place would attribute higher taxable income to the MNE's domestic activities. By doing so, the cost of conducting R&D locally would increase for both resident and foreign MNEs. This would increase the income tax imposed on R&D's profits by banning a practice that was used to lower that tax. If an MNE can lower its tax liability by locating its R&D in a low-income-tax country, the motivation to do so will increase. Under a territorial tax system or worldwide system with deferral to income accumulated offshore, a domestic MNE will have a greater incentive to invest in R&D overseas. Under a worldwide system with no deferral, there would be no need to strengthen the transfer pricing rules with respect to resident MNEs as the global income is taxed currently at the same domestic rate.

2. Adopting Formulary Apportionment of MNEs' Income

Proposed formulary apportionment methods usually attribute MNE's worldwide income to various jurisdictions based on ratios of one or more factors, such as sales, wages, and physical capital. Proposals for formulary apportionment face many design challenges, as well as difficulties in adopting such reform unilaterally.[87] If formulary apportionment is adopted, its effect on incentives for R&D will depend on the factor on which the apportionment is based. As noted by a few analysts, basing the apportionment—in whole or in part—on wages or physical capital creates incentives for shifting labor and capital to low-tax countries.[88] This is why Avi-Yonah and Clausing support adopting formulary apportionment based solely on the location of sales.[89] Although proponents of a sales-based formulary apportionment argue that this is an income tax method and not a consumption tax,[90] it is hard to ignore its resemblance to a consumption tax as taxation would follow the location of consumption and not the location where the production took place.[91]

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[87] *See* Graetz & Doud, *supra* note 5, at 417-9.

[88] *See* i*d*. at 418.

[89] *See* Avi-Yonah & Clausing, *supra* note 32.

[90] Avi-Yonah & Clausing, *id.*, noted that it is important to note that despite the emphasis on the sales of MNEs in different countries, this remains a corporate income tax, not a consumption tax. For example, tax liabilities do not arise unless a multinational firm is earning profits worldwide, irrespective of their sales.

[91] Graetz & Doud, *supra* note 5, at 427, note that "[b]asing the U.S. tax on the amount of U.S. sales of goods and services also resembles the destination-based allocation of revenues typical of consumption taxes, such as the value-added taxes ("VATs") used in all

If a country imposes taxation on MNEs based on the location of their sales, it would not create a negative incentive for investment in domestic R&D because the R&D's location would not affect the tax liability. However, taxing MNEs based on location of labor or physical capital would result in incentives to locate R&D and other production activities in lower-tax countries.

3. Changing Source Rules

Source rules fix the income to a geographic location. In general, a service is sourced to the place where it is provided. Accordingly, an R&D center that performs R&D in exchange for compensation will pay tax on the compensation after deducting its R&D expenses.[92] Royalties are usually sourced to the country where the IP is used. If the IP is sold, gains from the sales are sourced in one of two ways: if the proceeds are not contingent on the use of the IP, the gain from the sale is sourced to the residence country of the seller; if the sales proceeds are contingent on the use of the IP by the purchaser, the source for the gain from the sale is the same as if the payments were royalties and they are sourced to the country where the IP is used.[93]

Graetz and Doud raise the possibility of eliminateing IP income shifting opportunities by revising the source rules. The options they identify are to source IP income to: a) the country where the R&D took place; b) the country where the IP is exploited; c) the country that grants legal protection to the IP rights; d) the country where the final product is consumed.[94]

Each of these potential source rules would affect incentives for investment in domestic R&D differently. *First*, sourcing IP income to the country where the R&D took place would create an incentive to locate R&D activities in low-income-tax countries. *Second*, sourcing IP income to the country where the IP is exploited would not affect the location of R&D if the location of the R&D and the location IP exploitation can be separated.[95] *Third*, sourcing IP income to the country where the IP is protected would not affect incentives for R&D, but might be very problematic to implement as IP might be protected in more than one

OECD countries except the United States, and around the world."

[92] *See* Graetz & Doud, *supra* note 5, at 419-20.

[93] *See id.*

[94] *See id.*

[95] Graetz and Doud, *supra* note, at 382-7, discuss this question and note that the link between R&D and manufacturing varies greatly by industry and that in high-tech companies, which perform the most R&D overall, are less likely to collocate R&D and production.

jurisdiction. *Fourth*, sourcing IP income to the country where the ultimate consumption of the product created with the IP occurs resembles consumption tax or formulary apportionment based on sales: it will not affect the location of R&D as the taxation follows the location of consumption.

4. Strengthening CFC Rules

The Senate Subcommittee's recommendations, discussed below, as well as the advice of tax experts such as Shay, Avi-Yonah, and Harvey, were to strengthen current taxation of CFC income. The OECD's Action Plan also supports tightening the taxation of CFCs.[96] If resident MNEs' worldwide IP income were taxed under more effective CFC rules, the location of their R&D would not affect the domestic tax liability. Thus, it would not encourage MNEs to locate their R&D in low-income-tax countries. However, it would create stronger incentive for corporate inversions. It is unclear if corporate inversions affect the location of R&D. It would also result in efforts to avoid classification of entities as CFCs, for example, by shifting activities generating active income to subsidiaries in low-income-tax countries. This might lead to shifting real activity from high-income-tax countries to low-income-tax countries. This proposal would affect only resident MNEs, as it would apply only to them.

5. Imposing a Minimum Tax on MNEs' Income

President Obama's Framework for Business Tax Reform proposes that all income earned by subsidiaries of U.S. corporations operating abroad would be subject to a minimum tax rate.[97] In other words, the minimum tax will be imposed if the foreign tax on the MNE's foreign income is below a particular threshold. It would apply to all kinds of income, not only IP related. If this proposal were adopted, resident MNEs would not have stronger incentives to locate their R&D overseas because it would not change the tax liability, but would increase incentives for corporate inversion. This proposal would affect only resident MNEs, as it would apply only to them.

[96] *See* Action Plan, *supra* note 2.

[97] *See* White House & Dep't of the Treasury, The President's Framework for Business Tax Reform 14 (2012); Graetz & Doud, *supra* note 5, at 420-1.

D. The OECD's Approach to Assessing R&D Tax Benefits

The OECD has recently published a report on policies for promoting innovation and knowledge-based capital.[98] Knowledge-based capital, as defined by the OECD, includes a wide range of intangible assets, such as data, software patents, designs, new organizational processes, and firm-specific skills. The report identifies concerns regarding current policies that benefit MNEs investment in R&D. *First*, the overall tax relief for R&D for MNEs, when factoring in IP income shifting, could be greater than what governments estimated when they designed their R&D incentives. This might indicate that governments are losing tax revenues without sufficiently increasing spillovers. *Second*, firms that are not MNEs might be disadvantaged in comparison to MNEs, as they cannot use cross-border tax planning similarly.[99]

The OECD report identified MNEs' IP income shifting as a major factor that should affect designing of cost-effective policies to promote innovation in a globalized economy.[100] Arguably, IP income shifting practices result in losses in domestic tax revenues and smaller domestic benefits from R&D, and thus they weaken the case for special subsidies for R&D.[101] The OECD report contends that when countries estimate the tax burden on R&D, they should take into account the effect of cross-border tax planning and income shifting. The model this report suggests measures tax wedges and corresponding effective tax rates as summary indicators of the tax burden on investment in R&D and the use of knowledge-based capital.[102] The R&D tax wedge measures the minimum pre-tax net return on R&D that is sufficient to pay corporate tax—the larger the tax wedge, the larger the tax burden on R&D and the negative effect of tax on the level of R&D.[103]

The model in the OCED report defines the R&D tax wedge as the difference between "hurdle rate of return" and the return required by shareholders. The hurdle rate of return is the marginal minimum pre-tax net return on an additional dollar of R&D required to pay corporate tax and the return required by shareholders. It is derived from profit maximizations conditions. A company maximizes its profits from R&D where R&D is increased up to the point the marginal after-tax return from an additional investment in R&D equals its marginal cost.[104]

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[98] *See* OECD report, supra note 6.
[99] *See id.* at 17.
[100] *See id.* at 130-1.
[101] *See id.* at 129.
[102] *See id.* at 135.
[103] *See id.* at 136.
[104] *See id.* at 147-8. The maximization problem is defined under the OECD model as:

Under this model, taxation is predicted to be neutral and not change the level of R&D when the average effective tax rate on profits from R&D equals the tax rate at which R&D costs are recovered.[105] At that point, the R&D tax wedge is zero.[106] This model shows the effect of the tax benefit associated with the profits from R&D on the incentives to invest in R&D, whereas other models focus only on tax relief tied to the R&D expenditure when assessing the tax burden on R&D.[107]

The OECD report provides some illustrative examples to show what would be the tax wedge in different situations in which IP income shifting is used. These illustrations show the unsurprising result that using IP income shifting methods increases the benefit from investment in R&D. The report summarizes the main findings from the illustrative results as follows. *First*, it raises the possibility that the overall tax relief for R&D, especially that of MNEs, might be larger than governments intended when they designed R&D incentives as a result of not taking into account the effect of cross-border tax planning. *Second*, MNEs benefit from locating economic ownership of IP (and receiving royalties) as well as from locating use of the IP in production in jurisdictions with low-income-tax rates. Thus, countries that provide tax benefits for R&D expenditure might collect low tax revenues on the commercialization of the R&D's products. Losing production to foreign low-income-tax jurisdictions might reduce the potential positive externalities from R&D. Nonetheless, these countries still benefit from domestic spillovers where the R&D is performed. *Third*, domestic stand-alone R&D performers that are not part of an MNE may be disadvantaged compared to MNEs as they cannot use cross-border tax planning to increase their benefit from R&D. This might put them in competitive disadvantage when competing with MNEs. The OECD report

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$$\frac{\Delta q(RD)}{\Delta RD}\frac{PV\pi(1-AETR^*)}{(1-d_A)}=1+\rho$$

In this expression, the return required by shareholders is defined as ρ. $PV\pi$ measures the present value of future profits from using the knowledge produced in R&D. $AETR^*$ measures the average effective tax rate on profits from production and takes into account cross-border tax planning devices that lower the effective tax rate. d_A measures the tax relief per unit of R&D expenditure. $q(RD)$ measures the probability that R&D is successful. It is assumed to increase with the level of R&D but at a decreasing rate. The hurdle rate of return, defined as r_g^R, can be inferred from the expression above:

$$r_g^R=\frac{\Delta q(RD)}{\Delta RD}PV\pi-1=\frac{(1+\rho)(1-d_A)}{(1-AETR^*)}-1$$

The R&D tax wedge under this model measured by:

$$RDTW=r_g^R-\rho=\frac{(1+\rho)(1-d_A)}{(1-AETR^*)}-(1+\rho)=\frac{(1+\rho)(AETR^*-d_A)}{(1-AETR^*)}$$

[105] This occurs when when $AETR^*$ equals d_A.

[106] *See id.* at 136.

[107] *See id.* at 147.

argues that this strengthens the case for granting targeted R&D tax credits to small and medium companies that are not part of an MNE.[108]

While the model suggested in the OECD report makes a significant step in the direction supported in this article—to take into account the overall influence of the tax system when designing R&D incentives—it does not help in assessing whether a particular tax wedge is too low or too high. In addition, it is unclear how this model can contribute in designing a given R&D target subsidy. The next part explores how to find the optimal level of tax benefit.

E. How Does the Tax System Affect the Optimal Level of Tax Benefits?

In order to find the optimal level of R&D tax benefits, we should first find the optimal subsidy per unit of R&D. The optimal subsidy should reflect the value of marginal positive externalities from additional spending on R&D. Corrective subsidies should be set according to this simple first-best rule—equal to the marginal benefit—also in the presence of income taxation.[109] Afterwards, if we would like to grant the subsidy through the tax system, we should find which tax benefit would provide the desired after-tax subsidy.[110] The subsidy should be set at its optimal value even if it is provided through the tax system.[111] As demonstrated in the example below, larger tax benefits would be needed to offset a higher tax burden on the return from R&D in order to reach a similar after-tax subsidy level.

Example 2

Assume that the corporate tax rate on corporate income is 25 percent and R&D expenses can be deducted at that rate. A corporation that invests in R&D also has unrelated taxable income that is also taxed at 25 percent. For each dollar invested in R&D, assume there is an external benefit of 15 cent. Assuming no risks and a zero discount rate, the corporation would invest in R&D until a dollar investment in R&D would result is no less than a dollar additional income. In that situation, the corporation would spend a dollar and gain a dollar (and not be taxed as the income and expense offset each other) while producing an external social benefit of 15 cent. In order to incentivize the corporation to invest more in R&D, the government can

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[108] *See id*. at 137-8.

[109] *See* Kaplow, *supra* note 3

[110] The desired after-tax subsidy per unit of R&D can be defined as S^*. The required tax benefit, defined as d^*, should satisfy $d^* - AETR^* = S^*$. This assumes that no other distortions are caused by d^* and $AETR^*$.

[111] *See* Weisbach & Nussim, *supra* note 4.

grant a subsidy of 15 cent per dollar of R&D investment. Granting this subsidy through the tax system requires granting a tax credit or deduction that is equal, after tax, to 15 cent per dollar of R&D investment. As the tax rate is 25 percent, this subsidy could be granted as a tax credit of 15 cent on top of the regular deduction. A regular deduction at a tax rate of 25 percent equals a tax credit of 25 cent per dollar spent. Therefore, adding 15 percent on top of the regular deduction equals a tax credit of 40 cent per dollar.

If, however, the corporate income tax rate stands on 50 percent, the required tax credit to achieve after-tax subsidy of 15 percent would be 50 percent on top of the regular deduction, which is equivalent to a tax credit of 50 cent, making it a total credit of 65 cent per dollar. To achieve the same after-tax subsidy of 15 cent per dollar a greater tax benefit should be granted when the corporate tax rate is higher. Using the OECD report's tax wedge shows that the tax wedge would be a larger negative number when the corporate tax rate is higher in order to provide the same after-tax subsidy.[112]

After estimating the optimal subsidy level and calculating the effective tax burden, we can assess what the optimal level of tax benefits should be. The R&D tax wedge suggested in the OECD report is not helpful in analyzing what the optimal level of tax benefits should be. Although it might be useful in indicating which policies provide more benefits than others, is does not provide us with a tool to assess whether these benefits are desirable, too high, or too low. Estimating the optimal subsidy level might be very difficult because long-term or even short-term effects of spillovers are hard to quantify. However, this step is essential.

In an environment of countries competing on R&D investments, each country can calculate how attractive it is in comparison to other countries by taking into account many factors, including the subsidy granted for investment in R&D. Comparing one country's subsidies to other countries' subsidies would not be very useful in finding the subsidy's optimal level because each country might have a different optimum, and some countries might have adopted subsidies that are too high or too low.

If there is a race to the bottom that hurts the interests of the OECD members, who offer tax benefits too high, the OECD could try coordinating between its members to restrain harmful competition. However, it does not appear that the OECD tries to facilitate an effective mechanism to achieve that goal. Since various OECD members have conflicting interests, it is not

[112] Calculating the tax wedge based on the OECD report by using the *RDTW* expression above, and assuming ρ equals 10 percent, the tax wedge of the required tax benefit would be -0.22 when the corporate tax rate is 25 percent, and -0.33 when the corporate tax rate is 50 percent.

clear whether attempts to restrain competition between countries on R&D investments would be successful. In addition, it appears that the OECD emphasizes in its report maximization of national welfare rather than worldwide welfare. The OECD's policies are consensus based, and thus it is likely that countries would endorse OECD policies only if they improve their national welfare.[113]

Another interesting issue that can be demonstrated on the model in the OECD report is the effect of other countries on the average effective tax rate. Where a foreign country imposes consumption tax on its local consumption, it effectively taxes all producers who sell products consumed in that country.[114] Thus, consumption taxation in one country increases the effective tax (or reduces profit) for all companies that sell their products in that country. This is how a country can tax profits from foreign R&D, without suffering from a decrease in domestic spillovers (or incur the cost of increasing R&D subsidies) in the countries where the R&D takes place.

Designing the tax benefits raises many questions and considerations. Finding which activities induce positive externalities and how to cost-effectively increase these externalities is a very complicated task. The next part explores various issues concerning designing R&D tax benefits.

IV. HOW TO DESIGN R&D TAX BENEFITS

Designing the optimal tax benefits requires two stages. *First*, we should find what the characteristics of the optimal corrective subsidy should be regardless of whether the subsidy is granted through the tax system, given as a direct subsidy, or through other mechanisms such as allocation of legal rights. There are various questions that should be addressed in assessing what would be the optimal corrective subsidy, including the following: what kinds of activities and investments should the subsidy promote? Should the subsidy be granted only to successful R&D? What would be the optimal timing for granting the subsidy? Should the subsidy treat mobile and immobile capital differently? Should different incentives be granted to MNEs and smaller domestic firms? These questions are discussed below.

In the *second* stage, we should evaluate institutional design considerations to decide whether granting the subsidy through the tax system is desirable, and how should it be structured through the tax system. Following Weisbach and Nussim (2004), the question whether and how to

[113] H. David Rosevbloom et al., *The Unruly World of Tax: A Proposal for an International Tax Cooperation Forum*, 15(2) FL. TAX REV. 57 (2014).

[114] Even if formally the tax falls on the consumer, the economic tax burden might fall, at least partially, on the producer.

administer the subsidy through the tax system is a question of institutional design.[115] Questions regarding institutional design are analyzed below. The level of the subsidy should be equal to the positive externality from investment in R&D as discussed above.

A. First Stage: Outlining the Optimal Corrective R&D Subsidy

1. What R&D Activities and Investments Should the Subsidy Promote?

The subsidy should be given for investments that optimally increase the domestic spillovers from R&D. This question is tied to the question how should we define R&D. The OECD report's chapter on tax policy refers to R&D as activities undertaken in order to develop knowledge-based capital.[116] Knowledge-based capital is broadly defined: it includes a wide range of intangible assets, such as data, software patents, designs, new organizational processes, and firm-specific skills.[117] Therefore, the OECD uses a definition broader than "technological" R&D. Graetz and Doud do not explicitly define R&D activities, but refer to R&D in the context of technological advances.[118] The National Science Foundation also defines R&D broadly as: "activities comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."[119]

This article generally follows the National Science Foundation's definition of R&D. However, finding an accurate definition of R&D is much less important than identifying the specific activities that create spillovers. For the purpose of designing R&D subsidies, the definition of R&D that qualifies for a subsidy depends solely on the spillovers this R&D creates. An activity that does not create spillovers should not be entitled to a subsidy, even though it might fall within a definition of R&D.

The questions how to identify and quantify R&D spillovers, and how to link spillovers to particular activities, are very difficult. Evidence from empirical studies can provide some answers, though in many cases there are

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[115] *See* Weisbach & Nussim, *supra* note 4.

[116] *See* OECD report, supra note 6, at 128.

[117] *See id*.

[118] *See* Graetz & Doud, *supra* note 5, at 349 and throughout their article.

[119] This definition includes administrative expenses for R&D, and excludes "physical assets for R&D such as R&D equipment and facilities"; "routine product testing, quality control, mapping, collection of general purpose statistics, experimental production, routine monitoring and evaluation of an operational program, and the training of scientific and technical personnel." *See* National Science Foundation, *supra* note 10.

tremendous challenges in assessing spillover effects, especially in the long run. The discussion below elaborates on some of the issues that should be considered when identifying activities and investments the R&D subsidy should promote.

One question is whether the subsidy should be granted based on the overall investment in R&D or should it be targeted on particular kinds of investment. R&D expenditure may include investment in labor and human capital (through salaries and professional training for workers), tangible capital (such as equipment), and other intangible capital (such as purchases of IP rights).

It is possible to target the subsidy on spending in employment and human capital. Much of the domestic spillovers associated with R&D derive from companies' investment in their workers: it increases employment in high-paying jobs; it improves human capital through providing training and experience which can create value also after the workers leave the company that trained them (these workers may open their own companies or work elsewhere while attracting more investments in the domestic market); and it has a positive impact on tax revenues collected through the workers' personal income tax and their own consumption.

Some European countries, such as The Netherlands, Belgium and Hungary, have enacted R&D subsidies that specifically target investment in human capital by providing employment tax benefits for employing R&D workers. These tax benefits include tax credit for R&D salary costs, payroll tax deduction and exemption for withholding tax on salaries to researchers.[120] It is possible to provide targeted subsidy based on investment in human capital not through employment-related taxes, but as a direct subsidy to corporations or by reducing corporate income tax liability.

It is important to note that different industries have different investment needs and spending patterns. For example, IT companies usually spend most of their capital on salaries for workers, whereas bio-technological companies might have to incur a large initial investment in equipment and laboratories. Basing the subsidy on investment in human capital might favor some industries over others. However, in general, activities and industries that produce greater spillovers should receive a larger subsidy.

Even investment in human capital could be further specified. It is possible that the largest positive externality associated with investment in human capital occurs during the first years a worker is employed in an R&D position. During these early years of professional development, the company has to invest in training the worker to increase her skills and productivity. After gaining valuable experience, the worker might be more

[120] *See* Graetz & Doud, *supra* note 5, at 354.

attractive to other companies that would hire her without any subsidy. Alternatively, she might be able to open her own company. It is possible to grant companies a targeted subsidy based on expenditure on new workers only. Tax authorities have information both on the companies and the workers, so they can administer this subsidy. However, granting the subsidy only for new workers might create other distortions as well as enforcement and definitional problems.[121]

More research on spillovers—what induces them and how can they be maximized—as well as further analysis of distortions that might occur under different subsidy bases, would be useful in addressing this important design question.

2. Should the Subsidy be Granted Only to Successful R&D?

Current R&D tax benefits differentiate between companies who succeed in their R&D process and those who fail: non-refundable R&D tax credits, special deductions and patent boxes are valuable only if there are taxable profits. It is unclear whether rewarding only successful R&D is better than encouraging all R&D investments regardless their success or failure.

Failing R&D investments might still induce significant spillovers. Huge investments that are not economically viable, such as the United States investment in the race to the moon, resulted in large spillovers. Another example is the failing Israeli attempt in the 1980's to develop a fighter aircraft, which contributed to Israel's high-tech boom of the 1990's by releasing into the economy approximately 1,500 engineers who had been employed on this project and gained valuable training and experience, even though the project failed.[122] In some cases, a successful R&D process might induce similar spillovers to a failing R&D process. It is possible that in other cases successful R&D process might even result in lower domestic spillovers than a failing R&D process (for example, if a foreign investor purchases a successful startup company and relocates some of the local talent to other countries). In other cases, successful R&D process may

[121] Israel offers employment grants to foreign companies that open R&D centers in Israel. The grants are limited for 4 years per new employee, and decrease over that period. For example, an R&D center that employs over 45 R&D workers receives a grant equals to 45 percent of each new employee's cost of salary in the first year, 40 percent in the second year, 20 percent in the third year and 5 percent in the fourth year. However, this subsidy does not require that this would be the first R&D position this employee holds. Thus, experienced employees can qualify for this subsidy. *See* the website of the State of Israel, Ministry of Economy: http://www.investinisrael.gov.il/NR/exeres/4C64269C-15BA-4479-B261-CB861D1EC19D.htm (last visited Feb. 24, 2014).

[122] DAN SENOR & SAUL SINGER, START UP NATION 181-3 (2009).

result in larger domestic positive externalities (for example, if domestic R&D continues or expands, local investors, managers and employees receive a share of the profits that will also be taxed, knowledge is exploited locally, and so on). Therefore, success is likely to be better than failure, even though much of the spillovers—especially those from human capital—might occur also in projects that eventually fail.

Subsidizing success only would incentivize all R&D investments (including ones that will eventually fail) because ex ante, firms base their investment decisions on the prospect of success. However, tying the subsidy to success might distort investors' incentives regarding risk taking. Investing in R&D is usually risky, as it can involve many uncertainties and risks: uncertainty regarding the possibility of succeeding in developing new knowledge in the R&D process; risk of not being able to commercialize that knowledge; risk of not gaining legal protection over that knowledge; risk of changes in consumer preferences; risk of being outcompeted by other companies, and so on. It is important to note that different R&D processes might have very different levels of risks associated with them. For example, it is likely that Microsoft's investment in developing a newer version of Windows is less risky than risk levels of many small startup companies. If the subsidy is granted based on success, the possible benefit will be discounted at the rate reflecting the risk associated with the particular R&D process. Therefore, granting a subsidy on the basis of success might benefit less risky investments more than riskier ones.[123]

It is unclear if distinguishing between companies based on the risks associated with their investments would result in larger spillovers. If two businesses are identical but the risk associated with their investments, it is very possible that the spillovers they produce, such as from investment in human capital, are similar. Favoring low-risk investment would distort investment decisions, create inefficiency and reduce spillovers. In most cases, the risk associated with different R&D investment is not easily observable by the government, so it would be impractical to adjust for that risk in an attempt to mitigate this concern.

Assuming that two investments are identical at their risk level, is there a rationale for distinguishing between them based on success? If some companies are just luckier than others, distinguishing between them based on success would not contribute much. Risk neutral firms with similar predicted likelihood of success and risks and no cash flow constraints should be indifferent between receiving the full subsidy only if the project is successful and receiving a discounted present value of the subsidy, taking into account the predicted likelihood of success. If success reveals

[123] For example, compare a situation where receiving a future subsidy of 100 is certain to a situation where there is a change of 50 percent to receive a future subsidy of 100.

information that is otherwise unobservable, and if this information indicates that higher spillovers were produced, rewarding companies based on success might increase spillovers.

In addition, it is very hard to track which R&D spending has lead to which profit. MNEs and large domestic companies are likely to have various R&D projects, some are successful and some are not. It might be very hard to administer a subsidy program that traces and links each R&D investment to the related profit or loss, and companies would likely try to present all R&D expenditure as contributing to their profits. Small early-stage companies invest in a small number of projects and their R&D's failure or success in producing profits is more observable. Therefore, basing the subsidy on success would favor large profitable companies.[124] The analysis below further discusses whether preference for large profitable companies is justified.

3. When Should the Subsidy be Granted?

The timing for granting the subsidy might influence its effectiveness. Usually, even if there is no risk regarding future profits, R&D process requires investment that provides a return only after a period of time, which is the time required for developing a new product and selling it for profit. Startup companies in early R&D stages that have not yet generated profits face much greater challenges in raising funds needed to conduct early R&D. Large and profitable companies can invest in R&D more easily, even if it does not generate revenue in the short-run, as they may have funds or can raise them more easily as debt or equity. This is why small, early-stage R&D companies are more sensitive to the timing in which the R&D subsidy is granted.

There are a few options for when to grant the subsidy. One option is to grant the subsidy upfront, upon approval of a business plan or at a certain stage. Some countries adopt this approach and provide grants to selected early-stage projects. Under this approach, governments are similar to venture capital funds: they can negotiate and enter a contract on the terms and conditions of the investment, the required capital invested by other parties, limitations on future sales and transfer of IP rights, etc. This requires administering governmental processes of selecting the projects to be subsidized, and monitoring that the performance was according to the

[124] This derives from the general problem of lack of full loss offsets. *See* Roberta Romano & Mark Campisano, *Recouping Losses: The Case for Full Loss Offsets*, 76 NORTHWESTERN U. L. REV. 709 (1981).

agreement.[125]

Another option is to provide the subsidy during the life of the R&D process, in proportion to the R&D expenditure. Providing a refundable R&D tax credit for R&D expenditure is one way for implementing this approach. The government under this approach is similar to an investor with a rolling-investment who matches her investment to the investment of other parties. This approach also requires defining what R&D expenditures and which entities qualify for a subsidy, as well as verifying that the reported R&D expenditure is accurate. However, this approach is likely to require less governmental actions and oversight than the first approach of providing the subsidy upfront.

A third option is to grant the subsidy only after completion of the R&D process. A non-refundable R&D tax credit or a tax exemption for profits derived from the R&D process are ways for implementing this approach with respect to successful R&D.[126] This approach would offer little help to early-stage companies and it would likely benefit larger companies.

Implementing the first or the second approach, or a mix of both, would better incentivize R&D investments by small startup companies. It is likely that the timing of the subsidy plays a much less important role in MNEs' decision where to locate their R&D, as they are much less credit-constrained and have other profits against which they can use the tax benefits.

4. Should the Subsidy Treat MNEs and Domestic Companies Differently?

The discussion above shows that various factors would affect MNEs and smaller stand-alone domestic companies differently.[127] MNEs are likely to have a greater benefit from R&D subsidies in comparison to smaller domestic companies if these subsidies are granted after the R&D process has ended, if they are based on success or the existence of otherwise taxable profits. As noted in the OECD report, MNEs have a greater benefit

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[125] Different approaches can be taken regarding the discretion granted to the governmental agency in charge of implementing this subsidy program—there will be narrower discretion where the subsidy is granted if well-defined and easily measured criteria are met.

[126] It is possible to provide a subsidy at the end of the R&D process also to unsuccessful R&D process—for example, a refundable R&D tax credit that is granted only after a certain R&D process is completed.

[127] There are also large domestic companies that can be affected by various factors differently than MNEs. However, beyond a certain scale a company can choose whether to become a multinational enterprise, if the benefits from doing so exceed the associated costs.

from investing in R&D as they can increase their return by using cross-border tax planning and IP income shifting.[128]

One important policy question is whether we should treat MNEs and smaller domestic companies differently. As before, this question should be answered based on the positive externalities induced by each policy. We should support similar treatment if providing similar subsidies to MNEs and smaller domestic companies would result in maximizing the social gain from R&D.

The OECD report supports leveling the playing field because MNEs' larger benefits may place smaller domestic companies at a competitive disadvantage and make it harder for them to compete with MNEs. This level playing field can be achieved by targeting R&D tax benefits to smaller domestic companies, or alternatively, by curtailing MNEs' current tax advantages.[129]

Some economists cited earlier would argue otherwise. As noted above, Keen argues that if capital is heterogeneous in its mobility across countries, it is optimal to adopt a higher tax rate on immobile capital and a lower tax rate on mobile capital.[130] According to Hong and Smart, governments in small, open economies should avoid taxes on mobile factors like mobile capital, since they are distortionary and will ultimately be borne by immobile domestic factors, such as domestic labor. Governments may nonetheless impose corporate income taxes to redistributes rents from domestic entrepreneurs to workers and other residents. However, as the tax burden on mobile capital is ultimately borne by domestic factors, revenue losses due to income shifting are irrelevant.[131]

If a larger subsidy should be granted to mobile capital, this supports the case for different, more preferable treatment for MNEs, as they usually have more flexibility and mobility in determining where to invest their capital, and they are more responsive to tax rates. Assuming that the governments' purpose in imposing corporate income tax is to redistribute rents from domestic entrepreneurs to workers and other residents, higher taxes on non-MNE domestic companies might be justified.

The argument that domestic companies are put in a competitive disadvantage is questionable, and further evidence is required to prove it. Contrary to the view expressed in the OECD report and by the Senate Subcommittee, it is possible that smaller domestic companies are better off when MNEs enjoy larger and unequal subsidies for investment domestic R&D investments, in comparison to lower but equal subsidies. While

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[128] *See* OECD report, *supra* note 6.
[129] *See id*. at 138-9.
[130] *See* Keen, *supra* note 78.
[131] *See* Hong & Smart, *supra* note 7.

countries compete on attracting MNEs' R&D, it is likely that most of this R&D would take place somewhere in the world. Thus, if Taiwan losses to India an investment by Intel for a new R&D center, Taiwanese companies in that industry will still have to compete with the products of this R&D process. It is possible that in many cases small, domestic companies do not compete directly with MNEs. It is also possible that the small, domestic companies and MNEs are even complementary, and thus attracting more MNEs' investment would increase domestic companies' profits and activity. For example, if training given to workers in MNEs enables them to work later on for smaller domestic companies or establish their own companies, it is possible that leveling the playing field by reducing subsidies for MNEs would hurt smaller domestic companies.

Nonetheless, there might be a good case for increasing the subsidy for R&D by smaller domestic companies to the extent it would induce positive externalities. This subsidy could be targeted and designed in a manner that addresses some of the challenges of early-stage companies discussed above: difficulties in receiving funding and credit constraints, greater uncertainty with respect to future profits and other challenges these companies face. It is possible that some of the subsidy to smaller businesses would be more efficient if provided in kind, such as by granting access to use equipment in a tech-incubator instead of subsidizing purchasing this equipment.

It is important to stress that the goal of the corrective subsidy is not achieving horizontal equity or leveling the playing field between MNEs and small businesses, but bringing the positive externalities to their optimal level to maximize social welfare. If treating MNEs and smaller domestic companies is socially desirable, it can be achieved in different manners. A direct approach would be to base the subsidy on the entity's characteristics or to require investments that meet certain criteria, such as a very large size. An indirect approach would be to adopt incentives that are quite similar to policies and instruments we have in place today. As noted above, non-refundable tax credits and patent boxes benefit MNEs who can usually use them to offset otherwise taxable profits and are less sensitive to timing when the subsidy is granted. MNEs are also the beneficiaries of IP income shifting opportunities available under current international tax rules.

Israel is an example of a country that offers small startup companies and MNEs different subsidy programs to address their different characteristics and needs. Subsidies for startup companies are designed to mitigate the difficulties they face in the early stages of development. One subsidy program is designed to encourage and support an individual entrepreneur in the initial efforts to build a prototype, register a patent and design a business plan. Grants for selected projects can cover up to 85 percent of the approved expenses. The maximal grant that can be offered is of

approximately 50 thousand dollars for each project. Technological Incubators provide infrastructure and equipment for selected startups for the duration of two years. Another subsidy program provides selected newly established firms with a grant up to 60 percent of the qualified R&D expenses. This subsidy programs are designed to answer the difficulties of projects in their early stages, such as raising initial funding and getting access to equipment. The government, in exchange, receives royalties if the companies become profitable. Until recently, the government also put limitations on the ability of supported companies to shift overseas their R&D operations and IP rights. Today, companies can do so if they pay increased royalties or make a new comparable investment in Israel.[132]

Other subsidy programs are designed to attract MNEs' R&D investment. The benefits offered to foreign companies investing in R&D centers in Israel include reduced corporate and dividend tax rates, as well as employment grants, calculated as a percentage of the salary paid to qualified R&D employees during the initial four years of their employment. A foreign company can also apply for an investment grant of up to 20 percent of an approved investment.[133] In addition, large firms that meet some thresholds with respect of their annual global revenue, invest a minimum of approximately 28 million dollars in R&D projects, and hire at least 250 new employees, can enjoy corporate tax rates of 5 or 8 percent, depending on the geographical location of the investment within Israel.[134] These benefits respond to the international competition on MNEs' mobile capital and the need to attract R&D investment by offering low tax rates and by reducing the cost of employment.

5. Reporting and Enforcement Considerations

Another design issue that should be addressed is the ability of subsidy beneficiaries to use reporting manipulations to increase their benefits without increasing their domestic R&D. For example, subsidies tied to expenditure on wages or real capital are likely less sensitive to reporting manipulations, as the location of the workers and equipment is easily determined in most cases. However, investments in intangibles might create more planning opportunities and tax benefits tied to these investments might not increase domestic R&D.

In addition, granting a yield exemption in a patent box without requiring

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[132] *See* Deloitte, 2013 Global Survey of R&D Tax Incentives 20 (2013), *available at* http://www.investinamericasfuture.org/PDFs/Global_RD_Survey_March_2013.pdf

[133] *See* Ministry of Economy, *supra* note 121.

[134] *See* Deloitte, *supra* note 132.

that the underlying R&D would be conducted domestically might not result in increasing domestic R&D because the underlying R&D could be conducted overseas. This is one critique of patent boxes as they serve as vehicles to promote tax competition through income shifting without actually stimulating more domestic R&D.[135] It is possible to require, as some countries do, that the company shows that the underlying R&D took place domestically.[136] However, it will not eliminate the ability of companies to use reporting manipulations, as it might be very hard to accurately link some R&D processes to particular profits.

6. One-Size-Fits-All or a Few Targeted Subsidies?

It may be preferable to set up a few subsidy programs in order to optimize positive externalities from R&D. For example, one can imagine a mix of various subsidies targeting different entities and activities: a competitive grant program for small businesses (to mitigate their credit constraints in early-stage R&D); special grants or tax benefits for large investments by MNEs (to compete on mobile capital); and a preferential tax treatment for salaries and training for R&D workers (to induce more spillovers from human capital).

Smaller but targeted subsidy programs might be more effective in influencing different margins and better increasing spillovers from various activities and entities. Administering a few programs might be more complicated and costly than running one subsidy program. In addition, political economy problems might be worse under multiple subsidies system. However, the benefit from multiple subsidies may outweigh the complexity and administrative costs.

[135] *See* Graetz & Doud, *supra* note 5, at 375.

[136] As mentioned above, some countries, such as the United Kingdom, Spain and The Netherlands, limit this tax benefit to income from self-developed R&D, or further developed if acquired. *See* Graetz & Doud, *supra* note 5, at 365-8.

B. Second Stage: Designing the Subsidy as a Tax Expenditure

A government can provide corrective subsidies for R&D through a spending program or through the tax system. Following Weisbach and Nussim, choosing how to provide the subsidy is a question of institutional design. Weisbach and Nussim emphasize considerations relating to specialization and coordination: putting a set of activities into one governmental agency promotes specialization within that set of activities and coordination among the activities. However, it makes it more difficult to coordinate between the activities in that agency and the activities of other agencies.

In a subsidy program where grants are paid upfront upon an approval of a business plan or an agreement with the government, there would be an advantage in having a specialized agency to choose which projects to invest in, negotiate terms and monitor performance. Tax authorities would probably do worse in administering such a program as they do not specialize in this area and have no other significant advantages. In fact, countries such as Ireland and Israel that offer competitive and targeted R&D grants, administer these programs through a specialized governmental agency.

If a subsidy is granted based on companies' R&D expenditure, tax authorities can easily administer the subsidy, as they already receive reports from companies on their expenses, monitor and use enforcement mechanisms to ensure accuracy and compliance. Questions regarding classification of expenses—whether a particular expense is an R&D expense—might be handled better by a specialized agency, though tax authorities regularly deal with classification issues that are not materially different. In addition, subsidy granted based on R&D expenditure could be easily structured using traditional tax instruments: tax deductions and credits. Targeted approaches for subsidies that are tied to a particular investment, such as expenses on R&D workers, could also be administered through the tax systems easily. Setting up a new mechanism to administer this subsidy would be duplicative and less effective.

If the subsidy is based on the profits resulting from investment in R&D, it could be administered through the tax system as a profit exemption or any another benefit tied to the profit. Here as well the tax authorities already receive companies' reports and have monitoring and enforcement mechanisms. There is a significant difficulty in linking between any particular R&D process and a particular profit, especially for large companies that are involved in various activities. It is possible that people that have greater expertise in the relevant R&D fields could better assess whether a particular profit has derived from a particular R&D process.

However, tax authorities could hire people with such expertise for this matter. It is not clear whether setting up a separate agency would be beneficial.

If a greater subsidy should be granted to mobile capital, this could be done through direct grants or tax benefits. For example, Intel and the Israeli government have recently negotiated the size of a grant for Intel if it decides to build a new plant and expand its activity in Israel.[137] Apple paid an effective tax rate of 2 percent on the profit it accumulated in Ireland.[138] If the subsidy is based on expenditure,[139] tax authorities could easily administer it. A specialized agency would be preferable if there are more complicated selection, negotiation and monitoring processes.

One political concern regarding providing subsidies to MNEs is the unfavorable public view of a favorable treatment of multinationals companies. A populist attack on this subsidy, by politicians, journalists or other interest groups, could be successful in preventing such a subsidy, even if it would result in large social losses. However, as noted above, where the government could not set up preferential tax treatment to benefit mobile capital directly, a lower tax rate on mobile capital can be achieved through allowing tax planning opportunities available only to MNEs with mobile capital.[140] Therefore, if a greater subsidy to mobile capital is desirable but cannot be provided directly due to political or other constraints, it could still be granted through allowing MNEs using IP income shifting and other planning opportunities to reduce their effective tax rates on domestic investment in R&D.

This article does not contend that the current IP income shifting practices are optimal. It is possible that limiting some practices is desirable, if they do not induce positive externalities in a cost-effective manner, or if another subsidy could do it better. Nonetheless, when considering mitigating tax planning opportunities that currently serve as a de facto R&D subsidy, the effect of these changes on incentives to invest in domestic R&D should be taken into account.

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[137] *See* Meirav Ariosoroff et al., *Israel offering Intel up to $1b to build new plant and expand existing factory*, HAARETZ (Dec. 20, 2013), *available at* http://www.haaretz.com/business/.premium-1.564516

[138] The Irish government denied reaching an agreement with Apple concerning a reduced tax rate, but it does not change the fact that the effective tax rate Apple paid was lower than the standard 12.5 percent corporate tax rate in Ireland; *see Ireland rejects blame for Apple's low tax rate*, REUTERS (May 21, 2013), *available at* http://www.reuters.com/article/2013/05/21/usa-tax-apple-ireland-idUSL6N0E216O20130521

[139] For example, requiring spending 100 million on R&D annually in order to qualify for a subsidy that is proportionate to the expenditure.

[140] *See* Hong & Smart, *supra* note 7.

V. COMMENTS ON GRAETZ AND DOUD'S ANALYSIS

This article suggests a methodology that is substantially different than Graetz and Doud to evaluate and design optimal R&D tax benefits. According to the integrated approach suggested here, we should fully analyze the effect of the tax system and proposed changes on incentives for investment in domestic R&D. Given the effect of the tax system, we should set up a subsidy equal to the external marginal benefit from additional investment in R&D. In designing the subsidy, we should explore what structures and features would optimize spillovers, whether it would be desirable to administer the subsidy through the tax system, and how to do so.

Graetz and Doud provide us with two analyses that are substantially separate: one on the efficacy and cost-effectiveness of current R&D tax incentives; another on how to eliminate IP income shifting practices. This approach lacks some of the most crucial parts of the discussion on how to optimally design R&D tax incentives.

Graetz and Doud do not fully analyze the effect of the tax system on incentives for investment in domestic R&D. Their argument that IP income shifting "undermines the nation's innovation incentives" is questionable in light of the economic literature discussed above according to which income shifting might enable MNEs to retain their R&D centers in high-income-tax countries. In addition, when examining various reform proposals to eliminate IP income shifting, Graetz and Doud do not systematically analyze how each proposal would affect incentives for investment in domestic R&D.

Graetz and Doud also adopt a different approach with respect to the question how to optimally design R&D tax benefits. Instead of analyzing what would be the optimal subsidy, and then exploring whether and how to structure it within the tax system, Graetz and Doud's discussion focuses on current tax incentives and current proposals, their efficacy, advantages, and disadvantages. This approach is limited in its scope as it ignores major policy questions that should be addressed in designing the optimal subsidy. Among the issues not fully explored in Graetz and Doud's analysis is the question whether we should adopt subsidy (or subsidies) that target different activities or entities, and whether we should treat mobile and immobile capital differently. It is possible that some forms of IP income shifting could serve as a subsidy program that benefit mobile capital, though this possibility does not necessarily justify all current practices of IP income shifting and further analysis is required.

Unlike Graetz and Doud, this article does not make broad policy recommendations with respect to the desirable tax system, as it focuses only on the effect of any tax system on incentives for investment in domestic R&D. In this context, this article identifies advantages of taxation based on consumption with respect to incentives to invest in domestic R&D. Similarly, Graetz and Doud recommend that limiting IP income shifting should be based on aligning MNEs' U.S. taxable income to sales in the United States. However, in case proposals that change the tax system in the direction of consumption taxation are not adopted, this article stresses that a larger subsidy might be needed in order to offset the negative effects of income taxation on incentives to invest in domestic R&D if the relative cost of foreign R&D becomes lower.

VI. CONCLUDING REMARKS

This article contends that we should take into account the effect of the tax systems on incentives for investment in domestic R&D when designing the R&D subsidy. We should also consider this effect when evaluating merits of various tax systems and reform proposals. When a change in the tax system is made, we should evaluate what the required adjustment to the optimal subsidy should be. In the process of designing the subsidy, we should explore what structures and features would optimize domestic spillovers from R&D, whether it would be desirable to administer the subsidy through the tax system, and how to do so.

Applying these principles in practice is challenging, as many of the questions this process raises cannot be easily answered today, due to a lack of empirical evidence, uncertainty and difficulties in quantifying the value of spillovers, and the effect of various tax rules and subsidies on incentives. However, mapping the required analytical stages and better understanding the interconnectedness between the tax system and R&D investment incentives may be useful for policy makers and for identifying questions for future research.