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What Do We Know About Base Erosion and Profit Shifting? A Review of the Empirical Literature

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Abstract

The issue of tax-motivated income shifting within multinational firms – or "base erosion and profit shifting" (BEPS) – has attracted increasing global attention in recent years. This paper provides a survey of the empirical literature on this topic. Its emphasis is on reviewing and elucidating what is known about the magnitude of BEPS. The paper discusses different empirical approaches to identifying income shifting, describes existing data sources, and summarizes the findings of the empirical literature. A major theme that emerges from this survey is that in the more recent empirical literature, which uses new and richer sources of data, the estimated magnitude of BEPS is typically much smaller than that found in earlier studies. The paper seeks to provide a framework within which to conceptualize this magnitude and its implications for policy. It concludes by highlighting the importance of existing legal and economic frictions as constraints on BEPS, and by discussing possible ways in which future research might model these frictions more precisely.

JEL Classification: H25

1) Introduction

The esoteric world of international taxation, and in particular the taxation of multinational corporations (MNCs), has recently gained an unprecedented degree of political salience and public attention.[1] Following their meeting in Los Cabos, Mexico in June 2012, the G-20 leaders issued a communiqué declaring that: "We reiterate the need to prevent base erosion and profit shifting and we will follow with attention the ongoing work of the OECD [Organization for Economic Cooperation and Development] in this area."[2] A central element of this ongoing work is the OECD's initiative on "base erosion and profit shifting" (BEPS). The issues surrounding BEPS were described in a major OECD report in February 2013 (OECD, 2013a). Subsequently, an action plan on BEPS was produced in July 2013 (OECD, 2013b). This action plan consists of fifteen specific action items that are intended to facilitate multilateral cooperation among governments with regard to the taxation of MNCs. The general aim is to "better align rights to tax with economic activity" (OECD, 2013b, p. 11).

In analyzing these proposals, an important consideration is the magnitude of tax-motivated income shifting (i.e. BEPS activity) by MNCs. This paper provides a survey of the empirical literature on tax-motivated income shifting within multinational firms. Its emphasis is on discussing the empirical approaches that have been used in this literature, on describing what is known about the magnitude of BEPS, and on interpreting the implications of these findings. It focuses particularly on the dominant approach within the economics literature on income shifting, which dates back to Hines and Rice (1994) and which we refer to as the "Hines-Rice" approach. However, other approaches within economics and accounting are also surveyed, including methods recently proposed by Dharmapala and Riedel (2013) and by Dyreng and Markle (2013).

A major theme that emerges from this survey is that a shift from aggregate country-level datasets to firm-level microdata has greatly enhanced the credibility of more recent estimates of BEPS. In the recent literature, the estimated magnitude of BEPS is typically much smaller than that found in earlier studies. For instance, early studies in the 1990's found estimates that

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[1] This has been exemplified by, for instance, the hearings held by the Public Accounts Committee of the House of Commons – see e.g. M. Gilleard "Google Hauled Before UK PAC Again, But International Tax Framework Cited as Real Villain" *International Tax Review*, May 21, 2013, available at:
http://www.internationaltaxreview.com/Article/3208706/Google-hauled-before-UK-PAC-again-but-international-tax-framework-cited-as-real-villain.html

[2] See the full text of the G-20 communiqué at:
http://www.telegraph.co.uk/finance/g20-summit/9343250/G20-Summit-communique-full-text.html

correspond to a tax sensitivity of reported income that is about three times larger than currently accepted estimates. A representative consensus estimate from the literature, based on a meta-regression study by Heckemeyer and Overesch (2013), is a semi-elasticity of reported income with respect to the tax rate differential across countries of 0.8. This entails that a 10 percentage point increase in the tax rate difference between an affiliate and its parent (e.g. because the tax rate in the affiliate's country falls from 35% to 25%) would increase the pretax income reported by the affiliate by 8% (for example, from $100,000 to $108,000).

The paper also surveys the existing evidence (or in some cases the lack thereof) with regard to several specific issues relating to BEPS that have attracted considerable attention in recent policy debates and in academic discourse. Finally, the paper seeks to provide a framework within which to conceptualize the magnitude of BEPS and its implications. In particular, while the estimated magnitude of BEPS is clearly smaller than that found in early studies, it is not obvious whether this magnitude should be viewed as being "large" or "small" for policy purposes. The findings of the empirical literature are to some degree in contrast to a widespread policy discourse which points to descriptive statistics regarding the fraction of income reported by MNCs in tax havens as indicating *ipso facto* that BEPS is large in magnitude and importance. The paper discusses how these two parallel but seemingly contradictory discourses might be reconciled, and what types of evidence may be pertinent in achieving greater consensus on these issues.

The findings also suggest the importance of existing legal and economic frictions as constraints on BEPS. One approach to understanding these frictions is for future research to model more precisely the costs of tax planning in a way that explains the apparent heterogeneity among firms in their tax planning behavior (in particular, by taking account of the possibility that tax planning involves fixed costs). Such future research may shed new light on the role of these frictions, and on their implications for the efficiency of the current international tax regime and various proposed reforms.

The paper proceeds as follows. Section 2 discusses the various conceptual approaches taken within the empirical literature that seeks to measure BEPS. Section 3 describes the findings of this literature. Section 4 provides an interpretation of the implications of these findings, while Section 5 concludes.

2) Approaches used in the Empirical Literature

The primary approach to the empirical estimation of BEPS in the economic literature is directly derived from the early pioneering research on multinational income shifting, notably Hines and Rice (1994) and Grubert and Mutti (1991). These important and widely-cited studies established a conceptual framework that continues to be highly influential. The basic premise of Hines and Rice (1994) is that the observed pretax income of an affiliate represents the sum of "true" income and "shifted" income (where the latter can be either positive or negative). True income is generated by the affiliate using capital and labor inputs. Thus, measures of the capital and labor inputs used by the affiliate (such as fixed tangible assets and employment compensation, respectively) are included in the analysis, to predict the counterfactual "true" level of income. Shifted income is determined by the tax incentive to move income in or out of the affiliate. In the simplest scenario, this would be the tax rate difference between the parent and the affiliate. However, more complex versions take account of the overall pattern of tax rates faced by all the affiliates of the MNC (e.g. Huizinga and Laeven, 2008). Income reported by a low-tax affiliate that cannot be accounted for by the affiliate's own labor and capital inputs is attributed to income shifting.

This approach (which we will refer to as the "Hines-Rice" approach) can be represented by the following equation:

$$\log \pi_i = \beta_0 + \beta_1 \tau_i + \beta_2 \log K_i + \beta_3 \log L_i + \mathbf{X}_i \gamma + \varepsilon_i \qquad (1)$$

Here, π_i represents the profits of multinational affiliate i. The typical specification in the literature is log-linear – i.e. the natural logarithm of the affiliate's pretax profit is modeled as a linear function of the tax rate differential. It is thus customary in this literature to omit loss-making affiliates (i.e. those with negative income) from the sample.[3] Affiliate i's capital inputs are represented by K_i (proxied for instance by fixed tangible assets) and its labor inputs by L_i (proxied for instance by employment compensation). $\mathbf{X}_i$ is a vector of additional affiliate-level controls, ε_i is the error term, and β_0 is a constant.

The coefficient of interest is β_1, which reflects the extent to which the multinational shifts profits into or out of affiliate i. It is important to note that this estimate represents a *marginal* effect – that is, the change in reported profits associated with a small change in tax rates, holding

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[3] It is possible to include negative observations using a simple rescaling of the variables. However, incentives for BEPS activity are typically attenuated for loss-making firms due to tax law asymmetries such as limitations on loss offsets.

all else constant. The tax variable τ_i represents the tax incentive to shift profits into or out of affiliate i. Generally, this would be the tax rate difference between the parent and the affiliate, although more complex versions use the tax rate difference between the affiliate and a measure of the average tax rate faced by all the affiliates of the MNC. It is typical to use statutory tax rates in computing τ_i, even though actual tax rates faced by an affiliate (often referred as "effective" tax rates) may differ from statutory tax rates due to various deductions. Effective tax rates in part reflect endogenous choices made by the firm, such as its decisions about the use of debt, whereas statutory tax rates are determined by governments and are thus generally exogenous to the firm's choices. Hence, statutory tax rates provide a more credible source of identification, albeit with some possibility of mismeasurement of actual tax rates.

Hines and Rice (1994) estimate a model similar to that in Equation (1) using data for 1982 from the Bureau of Economic Analysis (BEA) of the US Department of Commerce, aggregated up to the country level (i.e. representing the aggregate profit, capital and labor inputs of all US affiliates in a given country). More recently, the increasing availability of affiliate-level datasets (as discussed in Section 3) has enabled researchers to move from aggregate country-level analysis to the micro-level analysis of the behavior of individual multinational affiliates. Because these affiliate-level datasets are longitudinal (i.e. report information on the same affiliates over multiple years), panel data techniques can be used to control for both observable and unobservable determinants of income reported in different jurisdictions. The ability to control for potential confounding factors has resulted in more credible estimates of the presence and magnitude of BEPS.[4]

To illustrate these empirical issues, consider an affiliate with substantial intangible assets that reports high profits but low (tangible) K_i and L_i. If this affiliate also happens to have a high τ_i (i.e. a high tax rate difference *vis-à-vis* the parent), then the affiliate's high profits may be misattributed to BEPS activity, whereas in reality they are due to the mismeasurement of K_i. The use of affiliate fixed effects (which control for the unobserved characteristics of an affiliate – such as high "intangibility" – that do not change over time) can correct this misattribution. Similarly, country characteristics that tend not to change over time (such as the quality of infrastructure or governance) would also be accounted for by affiliate fixed effects.

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[4] The geographical coverage of these studies varies considerably. Some use data on all affiliates (wherever located) of MNCs resident in a single country. Others use data on the European affiliates of European parents. An important issue – discussed in Section 4 below - is thus the extent to which these datasets include tax havens.

Some persistent features of countries may arguably be due to their time-invariant tax characteristics. For instance, a country that has low tax rates throughout the sample period may as a result have large amounts of intellectual property located there throughout the sample period. However, it is not possible to disentangle the time-invariant tax characteristics of countries from their time-invariant nontax characteristics, at least using the standards for the credibility of evidence that are *de rigueur* in contemporary empirical economics.

With panel data (i.e. with repeated observations of the same affiliates over time), we can modify Equation (1) as follows:

$$\log \pi_{it} = \beta_1 \tau_{it} + \beta_2 \log K_{it} + \beta_3 \log L_{it} + \mathbf{X}_{it}\gamma + \mu_i + \delta_t + \varepsilon_{it} \qquad (2)$$

Here, π_{it} represents the profits of multinational affiliate i in year t, and the other variables can be reinterpreted in analogous fashion. The new terms μ_i and δ_t represent an affiliate fixed effect (which controls for the unobserved characteristics of affiliate i that do not change over time) and a year fixed effect (which controls for unobserved common changes in the profitability of all affiliates in a given year), respectively.

The tax incentive variable τ_{it} is now the tax incentive for profit shifting to or from affiliate i in year t. Changes in the tax differential between affiliate i and its parent (or other affiliates in its group) are typically generated by tax reforms in either affiliate i's country or in the country of the parent or those of the group's other affiliates. Thus, they are unlikely to be attributable directly to the affiliate's own behavior or choices. However, a remaining concern with the approach in Equation (2) is the possibility that changes in a country's corporate tax rate that change τ_{it} may be correlated with other changes in the policy or economic environment that also independently affect affiliate i's profits. It is feasible to add country-by-year fixed effects to Equation (2) to account for any unobserved common change in profitability, for instance, to all multinational affiliates located in Estonia in 2008. If τ_{it} is measured as the tax rate difference between affiliate i and its parent, it is not possible to include country-pair-year fixed effects (which would account for any unobserved common change in profitability to all German-owned affiliates located in Estonia in 2008).[5]

The preceding discussion summarizes the primary approach used in the economic literature on BEPS. There are, in addition, some other approaches that have been implemented.

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[5] If the tax incentive variable uses the tax rates uses information on the tax rates faced by all of the group's affiliates, then it may be possible to control for country-pair-year fixed effects, but extensive variation in the tax rates of third countries would be required.

For instance, a quite distinct tradition in the tax accounting literature uses data from Compustat on the worldwide operations of US firms to analyze BEPS (e.g. Collins, Kemsley and Lang, 1998). As Compustat does not provide detailed information on each foreign affiliate, the objective is to test whether US-based MNCs shift income from the US to their foreign affiliates (considered as a whole). This involves regressing the ratio of foreign pretax income to foreign sales (FRoS) on measures of the foreign tax rate (FTR, interpreted as a measure of the strength of the incentive to shift income abroad). FTR is weighted by the distribution of the firm's activities across jurisdictions, based on its current mix of operations. The regression controls for the ratio of worldwide income to worldwide sales, and the unit of observation is a (US-based) MNC in a given year. The premise of this approach is that accounting rates of return would be equalized across US and foreign operations in the absence of income shifting; differences in accounting rates of return that are related to FTR are interpreted as being attributable to income shifting.

There are some significant empirical challenges that confront this approach. The amount of income shifted and the mix of operations that give rise to the FTR measure are all endogenous choices of the firm. In contrast to the estimation of Equation (2) with affiliate-level data, it is not possible to use changes in local tax rates as a source of arguably exogenous variation. In particular, suppose that a firm has an especially high (unobserved) propensity to engage in tax planning. This firm may both choose to operate in lower-tax countries (leading to a low FTR) and to shift large amounts of income out of the US (leading to a high FRoS). The high FRoS may be misattributed to the low FTR rather than to the unobserved propensity for tax planning that drives both variables. Thus, estimates of BEPS using this approach may be subject to a potential upward bias. Despite this potential upward bias, Collins, Kemsley and Lang (1998) found no evidence of income shifting out of the US over the 1984-1992 period. In a recent extension of this approach, Klassen and Laplante (2012) analyze a panel of US firms with foreign income over 1988-2009. They seek to address the empirical challenges facing this approach by using multiyear variables (averaging FTR over 5-year periods) and by using an instrumental variable (IV) strategy based on lagged FTR.

A novel development of this approach from the accounting literature is represented by Dyreng and Markle (2013). Their method of estimating income shifting is based on the premise that the allocation of a US-based MNC's sales between US customers and foreign customers is relatively nonmanipulable, given the fixed location of final consumers. Based on this premise,

they argue that it is possible to directly estimate the direction and extent of income shifting by analyzing differences between the location of US MNCs' sales and the location of their reported earnings. This approach does not require imposing the assumption that accounting rates of return would be equalized across US and foreign operations in the absence of income shifting. However, it relies heavily on the premise that the location of sales is nonmanipulable and that it is not influenced by income shifting strategies.

Dharmapala and Riedel (2013) propose a new approach to measuring BEPS that departs in significant respects from the Hines-Rice approach. In the thought experiment underlying the test in Equation (2), the tax rate differential between country i and the parent country (or the various other countries in which the MNC operates) changes for exogenous reasons; the coefficient β_1 captures the sensitivity of profits reported by affiliate i to this change. An alternative thought experiment that also has the potential to identify the presence of BEPS activity is to imagine that a dollar were to exogenously appear, like manna from heaven, in affiliate i's parent. Given some structure of profit shifting that is already in place, it would then follow that some fraction of this dollar would be shifted to affiliates facing a lower tax rate than the parent. This would not apply, however, to affiliates facing a higher tax rate than that of the parent. Thus, high-tax affiliates serve as a control group in this approach, to take account of nontax reasons – such as risk-sharing within the MNC, or the operation of internal capital markets – that increases in the parent's income may be reflected in the reported income of its affiliates.[6]

A challenge facing this approach is to isolate a source of exogenous changes to the income of the parent firm ("income shocks"). Dharmapala and Riedel (2013) adapt an approach developed in a different context by Bertrand, Mehta and Mullainathan (2002), and construct an expected earnings shock variable based on the earnings of firms that operate in the same industry and the same country as the parent firm. This provides a measure of the parents' exogenous income before taxes and before profit shifting activities.

The basic specification estimated in Dharmapala and Riedel (2013) is:

$$\log \pi_{it} = \beta_1 \log \widehat{\pi_{it}} + \beta_2 (d_{it} * \log \widehat{\pi_{it}}) + \mathbf{X}_{it}\gamma + \mu_i + \delta_t + \varepsilon_{it} \tag{3}$$

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[6] It is possible that positive income shocks to the parent may be reflected – *via* internal capital markets – in increased real investment in affiliates, which eventually results in higher profits. Dharmapala and Riedel (2013) focus on contemporaneous changes in affiliate profits – i.e. those that occur in the same year as the shock to the parent. These contemporaneous effects are unlikely to represent real responses, and so may be viewed as evidence of income shifting.

Here, $\widehat{\pi_{it}}$ is the "income shock" experienced by affiliate i's parent in year t (computed using the approach outlined above). The indicator variable $d_{it} = 1$ if affiliate i faces a lower tax rate than its parent, and is 0 otherwise. The coefficient of interest here is β_2, which represents the extent to which an income shock to the parent is reflected in the pretax income of a low-tax affiliate, relative to the extent to which it is reflected in the pretax income of a high-tax affiliate of the same parent. The other variables are as defined previously, with $\mathbf{X}_{it}$ including various controls for other factors that may affect affiliates' reported profits. This approach also readily allows for the inclusion of country-pair-year fixed effects, which account for any unobserved common change in profitability among all German-owned affiliates located in Estonia in 2008.

3) An Overview of the Findings of the Empirical Literature

3.1) The Magnitude of BEPS

We now turn to a summary of the findings of the literature, focusing on the magnitude of the estimated extent of BEPS. For this purpose, the coefficient β_1 in Equations (1) and (2) has a particularly straightforward economic interpretation. Recall that specifications of this type regress the log of pretax income (π_{it}) on a measure of the tax incentive for BEPS (τ_{it}). If the analysis were to regress the level rather than the log of pretax income on τ, then the estimated coefficient would be interpreted as the effect of a 1 unit change in τ (typically, a change of 1 percentage point in the tax differential) on pretax income (measured in monetary units). However, as the dependent variable is the log of pretax income, the coefficient β_1 represents what is known as the "semi-elasticity" of pretax income with respect to τ.

The semi-elasticity represents the percentage change in pretax income associated with a 1 percentage point change in τ. For instance, an estimate that $\beta_1 = 0.8$ would imply that a 10 percentage point increase in the tax rate differential between affiliate i and its parent (for instance, because the tax rate in affiliate i's country falls from 35% to 25% while the tax rate in the parent's country remains unchanged) would increase the pretax income reported by affiliate i by 8% (for example, from \$100,000 to \$108,000).[7] It is important to note that the semi-elasticity

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[7] Note that the precise interpretation depends on the definition of τ (which can represent the affiliate's tax differential *vis-à-vis* its parent, or a more complex measure of its tax rate relative to the rates faced by other affiliates within the same multinational group). When the tax incentive is measured as a tax rate difference (whether between the affiliate and its parent or between the affiliate and all other affiliates), β_1 would be expected to be positive in sign (i.e. a larger tax differential is associated with higher reported income). If the tax incentive were to be measured

varies for different values of τ. Typically, the reported semi-elasticity is evaluated at the sample mean. For instance, if the mean tax rate in the data were 35%, then the semi-elasticity that is reported in the literature and that we discuss below pertains to small changes in τ around the mean value of 35%. The reported semi-elasticity cannot necessarily be extrapolated to changes in τ that are large, or that take as their starting point values of τ that are far from the mean.

A convenient starting point for our description of the findings of the BEPS literature is Huizinga and Laeven (2008). Their work reflects a trend towards the use of commercial databases that provide unconsolidated (i.e. affiliate-level rather than consolidated worldwide MNC-level) financial and ownership information for multinational affiliates. The most prominent of these databases in international tax research are Orbis and Amadeus, both compiled by the Bureau van Dijk. Orbis is a global database that provides information on about 100 million individual firms (including multinational affiliates). Amadeus is similar in nature, but provides detailed data only for affiliates located in Europe.[8]

Huizinga and Laeven (1999) use cross-sectional firm-level data for 1999 on European firms from the Amadeus database to estimate a regression analogous to that in Equation (1). They compute a measure of τ that takes account of the tax rates faced by all of the multinational group's affiliates. Using this approach, they estimate both an overall semi-elasticity of BEPS across Europe, and also a set of BEPS estimates for each country in their dataset (representing the extent of profit shifting out of that country by affiliates located there).[9] The overall estimate of the semi-elasticity is 1.31 (i.e. a 10 percentage point increase in the tax incentive to shift income to affiliate i is associated with a 13.1% increase in the income reported by affiliate i). An illustrative example of their country-specific BEPS estimates is the inference that approximately

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as the affiliate's local tax rate (as in some studies), β_1 would be expected to be negative in sign (i.e. a lower local tax rate is associated with higher reported income).

[8] While these affiliate-level datasets are extremely useful for research on international tax issues, they have some drawbacks. For instance, Orbis and Amadeus report ownership information only for the final year of their data. This creates the possibility of misclassification of ownership structures (i.e. of which affiliates belong to which parents in years prior to the final year). Budd, Koenings and Slaughter (2005) argue that under reasonable assumptions, such misclassification would primarily create a bias against finding significant results. Another important point to bear in mind is that these datasets report financial statement information rather than tax return information. This distinction is important, though its significance is somewhat mitigated in countries with a high degree of book-tax conformity.

[9] While Huizinga and Laeven estimate income shifting across all affiliates, other studies using Amadeus data distinguish between foreign-to-foreign and parent-to-foreign shifting - see Dischinger, Knoll and Riedel (2014).

17% of income generated in Austria by multinational groups with Hungarian affiliates is shifted to Hungary across the two halves of the erstwhile Habsburg Dual Monarchy.[10]

The magnitude of the effect in Huizinga and Laeven (2008) is substantially smaller than those estimated in earlier studies using aggregate country-level data,[11] such as the semi-elasticity of 2.25 found by Hines and Rice (1994).[12] This suggests that controlling for unobserved country-specific and industry-specific factors that may affect reported pretax income (as Huizinga and Leuven (2008) are able to do) substantially lowers the estimate of BEPS. Moreover, the literature since then has used panel data from Amadeus and elsewhere to estimate regressions similar to Equation (2).

The estimates of BEPS using panel data and affiliate fixed effects are considerably smaller than those found by Huizinga and Laeven (2008). Dischinger (2010) uses Amadeus data on a panel of European affiliates over the period 1995-2005 to estimate a model that resembles Equation (2), and finds a semi-elasticity of 0.7. This is an overall estimate; for profit shifting between parents and their lower-tax affiliates, the Amadeus data implies a lower semi-elasticity of about 0.5 (see Dischinger, Knoll and Riedel (2014), as discussed below). Lohse and Riedel (2013) use a more recent panel of Amadeus data (over 1999-2009) and find a semi-elasticity of about 0.4. The estimates from this literature are summarized in Table 1.

There are a large number of other studies that use various approaches and datasets to obtain estimates of BEPS. Heckemeyer and Overesch (2013) collect 238 estimated semi-elasticities from 25 separate academic studies of profit shifting. They use this meta-dataset to

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[10] Austria has a tax rate of 34%, which is close to the mean tax rate in their sample, and the semi-elasticity for income shifting out of Austria is estimated to be 1.07. Hungary has a tax rate of 18% (and is the lowest-tax country in the sample). The 17% result is obtained by multiplying the tax rate differential between the two countries of 16 percentage points by the semi-elasticity of 1.07 for Austria, and is subject to the caveat that using the semi-elasticity in relation to large tax rate changes or differences may be misleading.

[11] Hines and Rice (1994) obtained their country-level data from the Bureau of Economic Analysis (BEA) of the US Department of Commerce, which collects data on the foreign activities of US firms by means of surveys that these firms are required to complete. The forms that firms are required to complete vary depending on factors such as the year, the size of the parent and affiliate, and the parent's ownership stake. The most extensive data are collected in benchmark years, such as 1982 (used by Hines and Rice (1994)), 1999 and 2004. Data at the aggregate country and year level are made publicly available by the BEA at www.bea.gov. Individual firms' responses to the BEA surveys are confidential. Nonetheless, researchers have been able to obtain access to the affiliate-level data under certain conditions, and this data has been vital for academic research on various aspects of US multinationals' responses to international taxation (e.g. Desai, Foley and Hines, 2003, 2004, 2006; Dharmapala, Foley and Forbes, 2011).

[12] Hines and Rice (1994) report a number of different estimates using different approaches. However, a representative estimate using ordinary least squares (OLS) is a semi-elasticity of 2.25 (see Table II, Column 2, p. 163; the coefficient is reported as being negative in sign because the tax variable is the local tax rate rather than a tax differential). Heckemeyer and Overesch (2013) report that many other early studies using country-level data found even larger magnitudes.

conduct what is known as a "meta-regression." This involves regressing the semi-elasticities on various identifiable characteristics of the dataset (e.g. whether it is cross-sectional or longitudinal) and of the empirical approach (e.g. whether firm fixed effects are included). The meta-regression approach enables them to pinpoint the specific characteristics of different studies that are responsible for the widely varying magnitudes of the estimates. Not surprisingly in view of our discussion so far, the innovations introduced in the more recent studies (such as the use of panel data and affiliate fixed effects) are strongly associated with smaller estimated magnitudes of BEPS.

Heckemeyer and Overesch (2013) also use the meta-regression approach to identify a "consensus" estimate from this extensive literature - a semi-elasticity of approximately 0.8 (as shown in Table 1), when controlling for the various potential sources of bias. Thus, although the meta-sample assembled by Heckemeyer and Overesch (2013) includes many of the early studies that used aggregate country-level data and found very large effects, the consensus estimate of the literature as a whole is much closer to the smaller effects that have been estimated by recent studies. We will use this 0.8 semi-elasticity for illustrative purposes to summarize the current consensus that emerges from the literature that uses the general approach encapsulated in Equations (1) and (2). However, it should be borne in mind that, as shown in Table 1, the latest estimates using the most current data are considerably smaller than this consensus estimate.

Another dataset that has been used in this literature is collected by the German central bank (*Deutsche Bundesbank*) on the foreign affiliates of German-based multinational firms, and also covers the German affiliates of non-German multinational firms. This is referred to as the MiDi (*Mikrodaten Direktinvestitionen*) dataset. Weichenrieder (2009) uses this data to analyze profit shifting into and out of Germany, using a panel of affiliates over the period 1996-2003. In particular, he studies the impact of foreign home-country tax rates on the return on assets (ROA) reported by German affiliates of foreign multinationals. An increase in a foreign parent's home country tax rate of 10 percentage points (e.g. from 25% to 35%) entails an increase in the ROA of its German affiliates of about half a percentage point (e.g. from about 5.5%, the approximate mean in the sample, to about 6%). This is a magnitude that is broadly comparable to the consensus estimate discussed above, but is only of borderline statistical significance.

Büttner *et al.* (2012) use the MiDi data on foreign affiliates of German-based multinationals, in particular a panel of affiliates over the 1996-2004 period, to analyze the effects

of tax rates and rules on the use of debt by multinational affiliates. They find a modest impact of tax rates on the use of inter-affiliate debt. A 10 percentage point increase in the local statutory tax rate (e.g. from 25% to 35%) is associated with an 8% increase (around the sample mean) in an affiliate's ratio of internal debt to total capital. The mean debt ratio in this sample is 0.28, so this corresponds to an increase from a debt ratio of 0.28 to one of 0.30. Moreover, the income shifting associated with this change would be even smaller, as the semi-elasticity of the debt ratio would have to be scaled by the interest rate to determine the amount of income shifted *via* the increase in internal debt.[13] While the underlying effect of taxes on internal debt is small, Büttner *et al*. (2012) find a relatively large impact of thin capitalization rules. These rules deny interest deductibility when the debt ratio (typically, the internal debt ratio) exceeds some specified threshold (for instance, the US threshold is a debt to equity ratio of 1.5 to 1). When thin capitalization rules are introduced or tightened, Büttner *et al*. (2012) find that the tax sensitivity of the internal debt ratio falls by about a half.

Dharmapala and Riedel (2013) use the Amadeus dataset described above. The sample – which consists of over 18,000 observations on approximately 4800 multinational affiliates over the period 1995–2005 – is restricted to affiliates that operate in a different industry and country from their parent firms, so that the earnings shocks experienced by the parents do not directly impact the affiliates. Controlling for a variety of potential confounding factors (including unobserved affiliate and year effects, industry-year effects and country-pair-year effects), the baseline specification suggests that a 10% increase in a parent's profits (before taxes and before shifting) is associated with an increase of 0.4% in the profits reported at that parent's low-tax affiliates (relative to the increase in the profits reported at that parent's high-tax affiliates).[14] At the sample mean, this estimate implies that of the original $22 million increase in the parent's income, a total of $420,000 is shifted to low-tax affiliates throughout Europe. This represents about 2% of the increase in the parent's income.[15]

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[13] The effect found by Büttner *et al*. (2012) is comparable to that reported by Desai, Foley and Hines (2004): using the confidential firm-level BEA dataset, they find a corresponding semi-elasticity of 10% for the internal debt of affiliates of US multinationals (i.e. a 10 percentage point increase in the local statutory tax rate is associated with a 10% increase in internal debt).

[14] The focus of the analysis is on profit shifting from parents to low-tax affiliates. However, it is possible to use the same approach to analyze the impact of income shocks to all high-tax affiliates of a multinational group on the income reported by low-tax affiliates. This leads to fairly similar, albeit statistically weaker, results (Dharmapala and Riedel, 2013).

[15] The average parent profit in the sample is $220 million, so a 10% increase at the sample mean represents an increase of $22 million (e.g. from $220 million to $242 million) as a result of the arguably exogenous shock. The

The Hines-Rice approach to measuring BEPS (represented by studies implementing Equations (1) and (2)) is primarily designed to answer the question of how an affiliate's reported profits will change in response to a change in the tax rate that it faces. The approach in Dharmapala and Riedel (2013), on the other hand, yields a more direct answer to the question of what fraction of a parent's (or high-tax affiliate's) profit is shifted to low-tax affiliates, a question of great relevance to the current debate on BEPS. An estimate that only 2% of parents' income is shifted to low-tax affiliates may seem quite small, and raises the question of how it relates to the estimates derived from the Hines-Rice approach. With some additional assumptions, it is possible to use the estimates from the Hines-Rice approach to infer the fraction of income that is shifted. In the Amadeus data, the semi-elasticity of income shifting from the parent to its low-tax affiliates is about 0.5 (Dischinger, Knoll and Riedel, 2014). This implies that a little under 4% of the parent's income is shifted.[16] Thus, the Dharmapala and Riedel (2013) approach yields smaller quantitative estimates of BEPS than does the Hines-Rice approach. However, the difference (between 2% of parent profits and under 4% of parent profits being shifted) does not seem dramatic.

One reason for the lower estimates in Dharmapala and Riedel (2013) may be that their dataset is restricted to affiliates that operate in a different industry than the parents (so that the income shocks that affect the parent's industry do not directly affect affiliates). This potentially reduces the scope for the use of strategic transfer pricing between the parent and its affiliates. Indeed, supplemental analysis in Dharmapala and Riedel (2013) suggests that much of the profit shifting captured by this approach is attributable to the use of debt across affiliates. This does not imply, however, that in reality transfer pricing is unimportant to BEPS; rather, it is more difficult to measure using this particular approach. This limitation of the approach in Dharmapala and

average profits reported at low-tax affiliates is $7.7 million, so a 0.4% effect entails an increase of $30,000 in the profit reported by a given low-tax affiliate. On average, each parent has 14 low-tax affiliates in the Amadeus dataset. No financial data is available in Amadeus for non-European affiliates. However, assuming that the income shifting behavior estimated among EU-25 affiliates can be straightforwardly extrapolated to subsidiaries outside Europe, a parent would on average shift profits of $564,000 to affiliates globally, representing 2.6% of the pre-shifting profit shock of $22 million (Dharmapala and Riedel, 2013).

[16] The average tax rate differential between parents and their low-tax affiliates in the Amadeus data used by Dharmapala and Riedel (2013) is 7.7 percentage points. Multiplying the semi-elasticity by this tax rate differential approximates the fraction of income that is shifted from the parent to its low-tax affiliates. For instance, imagine a simple world in which an MNC has two affiliates, one at home and one in a foreign country, and both affiliates face a 30% tax rate (so there is no tax-motivated profit shifting). Suppose initially that both affiliates report $100 of income. Now suppose that the foreign jurisdiction lowers its tax rate to 22.3%: the 0.5 semi-elasticity implies that income reported in the foreign jurisdiction will rise by a little under 4% (to about $104), and this will also represent the fraction of the parent's income that is shifted.

Riedel (2013) should be borne in mind - although it may be suitable for detecting the existence of BEPS, the magnitude may not fully encompass all forms of income shifting.

Dyreng and Markle (2013), using the approach described in Section 2, provide an estimate of the fraction of US parents' income that is shifted to all foreign affiliates collectively. Their empirical approach involves comparing the foreign sales of US MNCs (assumed to be relatively nonmanipulable) with the income reported at home and abroad. The Compustat data that they use (a panel of US firms with significant foreign income over the period 1997-2011) does not permit affiliate–level analysis, but includes information on foreign and domestic sales, income and tax expense. The baseline estimate of outbound shifting entails that about 10% of US MNCs' domestic income (measured in pretax and pre-shifting terms) is shifted to foreign affiliates. As the authors concede, this may represent an overestimate because direct sales from foreign affiliates of US MNCs to US customers will be captured in the data as domestic sales (Dyreng and Markle, 2013, p. 25). However, these sales will at the same time give rise to foreign income, and thus this empirical method will attribute this pattern (i.e. the combination of domestic sales and foreign income) to income shifting out of the US. In fairness, however, it should be emphasized that the primary purpose of Dyreng and Markle (2013) is not to estimate the magnitude of BEPS *per se*, but to test whether income shifting differs across different subsets of US MNCs, for instance those that are financially constrained versus those that are not.

The empirical literature has also sought to identify the channels through which BEPS occurs. The primary channels are generally thought to be strategic transfer pricing (for instance, charging relatively low prices for goods and services transferred from high-tax to low-tax affiliates) and the strategic use of inter-affiliate debt (for instance, financing the activities of high-tax affiliates using debt issued by low-tax affiliates).[17] One approach that has been adopted in the literature to distinguish between these channels is to compare the effect of the tax variable on pretax profit (which includes financial income and payments) with the effect of the tax variable on earnings before interest and taxes (EBIT). The effect on pretax profit represents the combination of strategic transfer pricing and the strategic use of debt, whereas the effect on EBIT isolates the consequences of strategic transfer pricing. The meta-regression study by Heckemeyer and Overesch (2013) seeks to calculate the fraction of BEPS that is attributable to strategic transfer pricing, using the results of studies that distinguish between pretax profit and

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[17] See Dharmapala (2008) for a simple discussion.

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EBIT. They argue that the consensus among these studies is that about 70% of the estimated magnitude of BEPS is due to strategic transfer pricing, with the remainder attributable to the strategic use of debt. However, it should be borne in mind that this is based on a smaller sample of studies than the calculation of the consensus magnitude. Many studies do not distinguish between pretax profit and EBIT, while others (by design or construction) only aim to estimate one or the other of these channels.[18]

3.2) *Other Issues Related to BEPS*

The previous discussion has presented an overview of a number of different approaches to estimating an overall magnitude of BEPS. Next, it is helpful to briefly survey the existing evidence (or in some cases the lack thereof) with regard to five specific issues relating to BEPS that have attracted considerable attention in recent policy debates and in academic discourse.

3.2.1) *Parent-to-Foreign versus Foreign-to-Foreign Shifting*

It has been established in the literature using Amadeus data on European firms that the magnitude of income shifting from parents is significantly lower than that of income shifting from other affiliates. In particular, Dischinger, Knoll and Riedel (2014) run a regression similar to Equation (2) where the tax variable represents the tax difference between the affiliate and its parent and where they consider separately MNCs where the parent has a higher tax rate than the affiliate. They find that the semi-elasticity for income shifting from parents to low-tax affiliates is 0.5, whereas the magnitude of shifting from high-tax affiliates to parents is substantially larger. This asymmetry suggests the existence of disincentives to shift income out of parents. These may be attributable to tax or nontax reasons: for instance, agency costs between the managers of the parent and managers of affiliates may make the former reluctant to shift income to the latter, while repatriation taxes may raise the costs of returning funds to the parent.

In discussions of US MNCs, there generally seems to be a presumption that foreign-to-foreign shifting is more prevalent than shifting out of the US. For instance (although this issue is not the focus of their paper), Desai, Foley and Hines (2003) find a sensitivity among US MNCs to tax rate differences within Europe that is substantially greater than their sensitivity to tax rate differences elsewhere. The 1997 "check-the–box" (CTB) regulations – which allowed US MNCs

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[18] For instance, Büttner *et al.* (2012) focus on debt ratios, while Bartelsmann and Beetsma (2003) and Clausing (2001; 2003) focus on the impact of tax differentials on transfer prices. As previously noted, the approach in Dharmapala and Riedel (2013) may be more suitable for capturing the effect of debt-shifting rather than that of strategic transfer pricing.

wider latitude in choosing the tax status of affiliated entities – are generally thought to have facilitated foreign-to-foreign shifting.[19] However, there appears to be no explicit test with firm-level US data that mirrors the Dischinger, Knoll and Riedel (2014) findings.

3.2.2) Real Economic Activity, Intangible Assets, and BEPS

As a general matter, the impact of taxes on the location of real economic activity and on BEPS are quite distinct phenomena. However, there may exist specific interactions between them – for example, transferring intangible property to a foreign low-tax jurisdiction may be easier if some research facilities are also moved to that same jurisdiction. The emphasis on the role of intellectual property and intangible assets in income shifting owes much to Grubert (2003). He uses a cross-section of corporate tax returns of US firms from 1996, including separate information on affiliates owned by these US firms, linked to Compustat data on these parents to generate a dataset of 1751 affiliates owned by 389 parents. He regresses the ratio of an affiliate's pretax earnings scaled by sales on a number of variables, including the local statutory corporate tax rate and measures of the parent's R&D intensity. The main finding is that the pretax earnings of affiliates with R&D-intensive parents are much more sensitive to local tax rates than are the pretax earnings of other affiliates.

Grubert (2003) conducts additional analysis on the location choices of 728 US MNCs engaged in manufacturing. A probit regression of whether a US MNC locates in each of 60 countries finds that R&D intensive firms are disproportionately attracted to both locations with very low tax rates and those with very high tax rates. Opportunities for BEPS may thus shape location choices for real activity, and not only make low-tax locations attractive but also reduce the disincentive to invest in high-tax locations (as income can be shifted out of those jurisdictions, at least by R&D intensive firms). This latter insight has been developed in a number of directions in the literature. One strand highlights the possibility that BEPS opportunities may reduce distortions to the location of real activity and thereby potentially enhance efficiency.[20]

More recent literature on the role of intangibles uses Amadeus data on European affiliates. Dischinger and Riedel (2011) use the balance sheet item "intangible fixed assets" from Amadeus to test whether intangible asset holdings are disproportionately concentrated among

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[19] Indeed, Desai and Dharmapala (2009) use the CTB regulations, interacted with various predetermined firm characteristics, as an exogenous source of variation in US MNCs' tax avoidance activities.
[20] See Hong and Smart (2010) for a formal theoretical model, and Dharmapala (2008) for an informal discussion.

affiliates in low-tax jurisdictions, controlling for unobserved affiliate effects that may influence the ownership of intangibles.[21] They find that a decrease in the average tax difference to all other affiliates by 1 percentage point raises the subsidiary's level of intangible assets by 2.2%. Karkinsky and Riedel (2012) link Amadeus data on European affiliates with data on patent applications to the European Patent Office. Their analysis tests whether (within a MNC group) a patent application is more likely to be made by an affiliate facing a lower tax rate. The results strongly confirm this hypothesis, and the estimated effect is quite large. The implied semi-elasticity is -3.5; evaluated at the sample mean, the baseline result suggests that an increase in the corporate tax rate by 1 percentage point reduces the number of patent applications by 3.5%. The mean number of patent applications is 0.9 per year, so this implies a reduction in the number of patent applications from 0.9 to 0.87 per year. These recent empirical contributions tend to reinforce the widespread idea that the location of intellectual property constitutes a major channel of BEPS.

3.2.3) BEPS under Territorial versus Worldwide Tax Systems

A question of great relevance for evaluating recent territorial reforms in the UK and Japan and for current US policy discussions is whether the magnitude of income shifting among multinational firms with parents based in countries with worldwide tax systems differs from that among multinational firms with parents based in countries with territorial systems (that exempt dividends paid to the parent by foeign affiliates from residence-country taxation). Markle (2012) uses the Hines-Rice empirical framework (Equation (2)) to address this highly policy-relevant question. The analysis uses a panel dataset from the Orbis database, which reports unconsolidated financial information and ownership data for a global sample of firms and affiliates, for the years 2004-2008. Markle (2012) also constructs bilateral tax measures (based on Huizinga and Laeven (2008)) that take account of both corporate and withholding taxes. The analysis finds that firms with worldwide parents tend to shift less income than firms with territorial parents. However, there are a number of important qualifications to this basic picture. First, there is no significant difference in shifting among firms with similar foreign reinvestment opportunities. Second, there is no difference in foreign-to-foreign shifting, but MNCs based in

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[21] Note that Grubert (2003) could not observe the R&D intensity or the ownership of intangibles by affiliates, and proxied for this by the R&D intensity of the (consolidated) MNC.

worldwide countries (including the US) shift less from their parent. This is perhaps due to costs associated with future repatriation from abroad to the parent.

3.2.4) Has BEPS Grown Over Time?

There is a widespread perception that BEPS has grown over time, and some published results tend to support this claim. Grubert (2012) uses a panel of tax returns for 754 US MNCs over 1996-2004 to analyze changes over time in income shifting. His analysis suggests that the share of US MNCs' income that is reported abroad has grown over this period. In itself, this is not a surprise given growing global activity, but Grubert (2012) argues that foreign income has grown 12 percentage points more than has foreign sales, a discrepancy that is presumed to be due to income shifting. Klassen and Laplante (2012) also claim that income shifting has grown over time. Holding tax rate differences between U.S. and foreign jurisdictions constant, their empirical estimates imply that their sample of 380 corporations with low average foreign tax rates collectively shifted about $10 billion of additional income out of the United States annually during 2005–2009 relative to the 1998–2002 period.

In contrast, estimates within the Hines-Rice approach have tended to be smaller in magnitude when using more recent time periods. For instance, Lohse and Riedel (2013) find a semi-elasticity of 0.4 using a panel of firms from Amadeus over 1999-2009. Lohse and Riedel (2013) also formally test whether the extent of BEPS has changed over time by including in their specification an interaction between the tax measure and a linear time trend. They find that the tax-sensitivity of reported income has fallen significantly in magnitude over time. In other words, BEPS has *declined* rather than grown over their 1999-2009 sample period. This finding is consistent with what might be expected based on the spread of transfer pricing regulation and thin capitalization rules around the globe in recent years. However, further analysis of changes in BEPS over time using a variety of different datasets and settings would help to shed further light on this important issue.

3.2.5) BEPS and Tax Revenue

The consequences of income shifting for tax revenue have greatly exercised governments around the world. Huizinga and Laeven (2008) use their results to infer substantial revenue consequences. According to their calculations, Germany (the highest-tax country in the sample) lost $1.26 billion in revenue in 1999, while most other sample countries gained revenue (see

their Table 8). However, as we have seen, the magnitude of estimated income shifting is smaller in subsequent studies, and the revenue consequences would be correspondingly smaller.[22]

Clausing (2009) uses a panel of aggregate BEA data at the country-year level over 1982-2004. She finds that income shifting increased in the latter part of her sample period (1993-2004 relative to 1982-1993), and estimates that in the last year of the sample (2004), the revenue loss to the US Treasury from income shifting amounted to over one third of corporate tax revenue. This conclusion is based on an analysis of the effect on the profit rate (pretax income scaled by sales) for all US affiliates in a given country in a given year of the effective tax rate differential with the US. This analysis yields a coefficient of 0.5, which implies a semi-elasticity of about 3.3.[23] Thus, the implied revenue effects in Clausing (2009) rest on an estimated magnitude of BEPS that is very large relative to those derived from firm-level studies.

It is entirely understandable that governments would be concerned about the revenue implications of BEPS. However, it is also important to place these concerns in context. Corporate tax revenues are a relatively small component of revenues for the governments of most major economies. For instance, corporate tax revenues comprised 7.4% of total revenue for the UK in 2012.[24] Consequently, there exist readily available (and surely less mobile) substitutes in the form of personal income tax or VAT revenue. Of course, there would be distributional consequences of substituting across different sources of revenue. However, this is a question that depends in part on the empirically unresolved issue of corporate tax incidence – i.e. whether workers bear a substantial share of the burden in the form of reduced wages (e.g. Arulampalam, Devereux and Maffini, 2012).

Moreover, notwithstanding BEPS activity, corporate tax revenue in large high-tax economies (measured as a fraction of GDP) has generally been robust in recent times (see e.g. Hines, 2007; Dharmapala, 2008; OECD, 2013a, p. 16). This is the case even though most OECD countries have reduced statutory corporate tax rates over this period. Of course, corporate tax revenue fell significantly during the recession that followed the financial crisis of 2008, but this decline has obvious and well-attested causes that are unrelated to BEPS. The observation that

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[22] It is worth noting that if income shifting is indeed extremely sensitive to tax rates, this would not only imply that income shifting causes large revenue losses, but also that tax rate reductions would generate large amounts of inbound income shifting (and perhaps significant additional revenue).

[23] The sample mean of the profit rate is 15%, so a 10 percentage point increase in the tax differential between a foreign country and the US is associated with an increase in the profit rate of US affiliates in that country from 15% to 20% - i.e. a 33% increase, evaluated at the mean. This implies a semi-elasticity of about 3.3.

[24] See "A Survey of the UK Tax System" IFS Briefing Note BN09, p. 5, at: http://www.ifs.org.uk/bns/bn09.pdf

corporate tax revenue has been relatively stable does not in itself establish what the counterfactual – i.e. the level of corporate tax revenue in the absence of BEPS activity – would have been. To the extent that pretax corporate profits have risen over time as a fraction of GDP, it is possible that this counterfactual may have involved a pattern of increasing corporate tax revenues. However, corporate tax revenues typically form less than 10% of revenues for most OECD economies, and have done so for a substantial period. Thus, it is highly unlikely that any credible counterfactual pattern of corporate tax revenues would imply that BEPS activity makes a dramatic difference to overall tax revenue.

4) Interpreting the Magnitude of BEPS

4.1) Is the Estimated Magnitude of BEPS Large or Small?

We now turn to the interpretation of the magnitude of BEPS described in Section 3. For concreteness, we will focus on the estimates that emerge from the Hines-Rice approach (as summarized in Table 1), in particular the consensus semi-elasticity of 0.8.[25] Should this be viewed as a large effect or a small one? It is certainly smaller than earlier estimates using country-level data, but for policy purposes a more absolute notion of the size and importance of this effect would be helpful.

There is no generally accepted baseline for judging whether this effect of tax differences is "large" or "small". However, it is helpful to relate this question to simple descriptive statistics that have been widely cited in general public discourse and policy debates. In particular, it has become increasingly common to point to the fraction of the income of MNCs that is reported in tax havens or to various similar measures as self-evidently demonstrating *ipso facto* the existence and large magnitude of BEPS. To illustrate descriptive statistics of this type, Table 2 reports the location of various measures associated with US MNCs' foreign direct investment *via* majority-owned foreign affiliates. Column 5 of Table 2 shows that 42.6% of the (foreign) net income of US MNCs is reported in tax haven jurisdictions.[26] This large fraction of net income in havens is

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[25] A potentially significant caveat regarding the smaller estimates in Table 1 is that more recent studies use Amadeus data, which does not provide detailed information on non-European tax haven affiliates. However, the magnitudes found in these studies are not very different from those in studies using the MiDi dataset, which reports extensive data on the haven affiliates of German firms (e.g. Weichenrieder, 2009).

[26] This table uses aggregate country-level BEA data for 2011 (the most recent available year), as reported on the BEA website (www.bea.gov). The calculations use the classification of havens in Dharmapala and Hines (2009), with some minor modifications to reflect subsequent changes in the political status of some jurisdictions.

often cited in support of the claim that BEPS is large in magnitude and that it is an important problem for governments to address.

While the simple descriptive statistics appear compelling to many, the aim of the empirical literature is to identify the BEPS effect at the margin (for small changes in tax rate differentials) rather than to explain the levels of income reported in different jurisdictions. To illustrate this difference, consider a simple stylized world consisting only of a high-tax country H (with tax rate 25%) and a zero-tax country L. Suppose initially that an H-based MNC reports $90 of income in H and $10 of income in L, as shown in Scenario 1 in Table 3. Suppose that country H reduces its tax rate from 25% to 24%. Then, if we use the consensus estimate of a semi-elasticity of 0.8 from studies using the Hines-Rice approach, income reported in H will increase to $90.7 and income reported in L will fall to $9.3 (as shown in Table 3). Consider instead Scenario 2 in Table 3, where the initial allocation of income is $60 in H and $40 in L. If we again consider a fall in H's tax rate from 25% to 24%, the allocation of income changes to $60.5 in H and $39.5 in L. The marginal effect is identical across the two scenarios. However, it is clear that policymakers will be much more concerned about the BEPS phenomenon in Scenario 2 relative to Scenario 1.

In the policy discourse described above, it would be common to point to the reporting of 40% of the MNC's income in L in Scenario 2 as *ipso facto* constituting BEPS activity. In contrast, the allocation of 40% of income to country L in Scenario 2 might be termed an "inframarginal" phenomenon that is difficult to explain using the estimated elasticities. For example, suppose that the average tax rate among nonhavens is 25% while that among havens is zero. Then, a semi-elasticity in the range of 0.4 to 0.8 would (if it were possible to extrapolate from small changes in the tax rate) imply that 10% to 20% of income (rather than 40%) would be shifted to havens.

Does the large fraction of the net book income of MNCs reported in havens reflect "inframarginal" income shifting that empirical analysis cannot detect, or does it have some other explanation? One possibility is that it may be a mechanical artifact of how the use by MNCs of holding companies located in havens is reflected in government statistics. To illustrate this point, consider a US MNC that invests in France *via* a haven affiliate. It injects $1000 of equity into the latter, which lends the money to the French affiliate. The latter then uses the funds for active investment that generates a return of $100. If this $100 is paid as interest to the haven affiliate

(and not subsequently repatriated to the US parent), then the haven affiliate will have $100 of net book income while the French affiliate will have net book income of zero. It is important to note that the holding company structure here is *not* motivated by the avoidance of French taxes – the interest payment would be deductible in France (subject to thin capitalization rules and similar provisions) whether made to the haven affiliate or directly to the US parent. More generally, holding company structures may sometimes have tax motivations, but the mechanical effect highlighted here – in which the MNC's net foreign book income is attributed disproportionately to the haven affiliate – would operate regardless of the motivation for establishing a holding company structure.

Table 2 reports some evidence consistent with this possibility. The Netherlands does not appear on standard lists of tax havens (e.g. Dharmapala and Hines, 2009) and does not have a particularly low tax rate, but is widely believed to be the location of a large number of holding companies owned by MNCs. As shown in Table 2, the Netherlands shares with havens the pattern of hosting a disproportionately high share of net book income. This suggests that any jurisdiction (whether haven or nonhaven) that hosts holding companies will also appear to host a disproportionate share of MNCs' worldwide income.

Hines (2010) argues that value added (which equals sales minus the cost of inputs purchased, and excludes financial payments such as interest income or expense) is a more meaningful measure than net book income of the role of havens. Indeed, as shown in Column 6 of Table 2, the share of value added in havens (14.5%) is substantially smaller than the corresponding share of net book income. The question that follows is whether net book income or value added is a better proxy for *taxable* income. Even in the very simple example above of a US MNC investing in France *via* a haven affiliate, the answer will depend on a complex set of tax law provisions in France, the haven and the US.[27] Proponents of the *ipso facto* approach have not provided evidence that net book income is in general a better proxy for taxable income. In principle, this question can be investigated empirically, but would require more information on taxable income and tax payments than is typically available in the datasets that are widely used

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[27] For example, if the $100 interest payment from the French affiliate to the haven affiliate were fully deductible in France, then the haven affiliate's income would be $100 (of interest income) and the French affiliate's income would be zero. This would mirror the distribution of net book income across the affiliates. On the other hand, if the $100 payment from the French affiliate to the haven affiliate were nondeductible in France (due to thin capitalization rules or similar provisions), taxable income would be zero in the haven and $100 in France, which mirrors the distribution of value added across affiliates. If the interest payment is partially deductible in France, then the pattern of taxable income would fall somewhere in between the distributions of net income and value added.

in the literature. While it would not settle the issue of whether BEPS is "large" or "small" in magnitude, the question is important because if taxable income is better proxied by value added then the fraction reported in havens would be more consonant with the relatively small estimated magnitude of BEPS in the academic literature.

4.2) Some Directions for Future Research

One of the major themes that emerges from this survey is that in the more recent empirical literature, the estimated magnitude of BEPS is typically much smaller than that found in earlier studies. Yet, the newspapers are full of anecdotal evidence suggesting extensive income shifting among major MNCs. Consistent with a modest BEPS magnitude, but in some tension with this anecdotal evidence, is the "stylized" fact noted earlier about the relative stability over time of corporate tax revenues in major economies (see e.g. Hines, 2007; Dharmapala, 2008; OECD, 2013a, p. 16).

How might we reconcile these apparently contradictory facts? One feature of MNCs' tax planning activities that has sometimes been remarked upon in the literature (but only rarely been the direct focus of study) is the considerable heterogeneity in the apparent tax sophistication of MNCs. For example, Desai, Foley and Hines (2006) report that in 1999, only 59% of U.S. firms with significant foreign operations had affiliates in tax haven countries. Dharmapala and Riedel (2013) report that only 58% of the affiliates in their Amadeus sample belong to multinational entities that include at least one affiliate in a non-European tax haven. In other words, a surprisingly large fraction of MNCs do not have tax haven affiliates, a characteristic that might be seen as a fairly reliable *indicium* of tax planning activity.

The evidence on heterogeneity may be viewed as being consistent with the existence of significant fixed costs of tax planning. In this view, larger firms (or those expecting more benefits from planning) will incur the fixed cost, be highly responsive to tax differentials, and generate extensive anecdotal evidence of tax planning. Smaller firms will not incur the fixed cost and so will appear to be relatively unresponsive to taxes (and may forego even apparently obvious planning opportunities). There is some existing evidence that is consistent with this "fixed costs" view. For instance, Mills, Erickson and Maydew (1998) use data from a confidential survey about the tax planning practices of 365 large US firms. Consistent with the existence of fixed costs, tax planning expenditures are decreasing (as a proportion) in firm size. In addition, MNCs tend to invest more in tax planning than do purely domestic firms. Tax

planning expenditures are also found to generate an extremely high rate of return, raising the puzzle of why more is not invested in this activity.[28]

There is an extensive and growing literature across a number of disciplines that analyzes corporate tax avoidance. For instance, Desai and Dharmapala (2006) analyze the impact of corporate governance and executive compensation on tax avoidance activity. However, there is very little literature apart from Mills, Erickson and Maydew (1998) that directly studies the process and structure of corporate tax planning.[29] Future research in this area may shed light on the apparent puzzle highlighted above. Also highly relevant is evidence on whether or not MNCs generally operate at or near the current legal limits on BEPS activities.[30] Evidence on the extent and heterogeneity of this type of behavior would provide valuable insights about firms' tax planning activity and the prevalence of BEPS. This discussion raises the more general question of the importance of existing legal and economic frictions as constraints on BEPS. Another fruitful area for future research would be to model these frictions more precisely, and to explore how we might assess their implications for the efficiency of the current international tax regime and for proposed reforms.

5) Conclusion

The unprecedented attention currently being paid to the issue of base erosion and profit shifting creates new opportunities for reform. At the same time, it has become even more important to understand the findings of the empirical literature on BEPS. This paper provides a survey of the empirical literature on tax-motivated income shifting within multinational firms. Its emphasis is on clarifying what is known about the magnitude of BEPS. A major theme of this survey is that in the more recent empirical literature, which uses new and richer sources of data, the estimated magnitude of BEPS is typically much smaller than that found in earlier studies. The paper provides a framework within which to conceptualize this magnitude and its

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[28] This last point is related to what Weisbach (2002) terms the "undersheltering" puzzle – the apparent failure of (at least some) firms to utilize lawful tax avoidance opportunities; see also Desai and Dharmapala (2006, 2008).

[29] In a recent contribution, Armstrong, Blouin and Larcker (2012) use a confidential dataset on the structure of executive compensation to analyze whether managers face incentives to engage in tax planning activity.

[30] For instance, the thin capitalization rules studied by Büttner *et al.* (2012) are typically specified in terms of a maximum threshold of internal debt to total capital that an affiliate must remain below in order to be permitted to deduct interest payments. However, if the threshold is exceeded, it is typically only the incremental interest expense that is disallowed. If a country imposes a 0.6 debt ratio, all multinational affiliates arguably should aim to maintain a 0.6 debt ratio.

implications for policy. It concludes by highlighting the importance of existing legal and economic frictions as constraints on BEPS, and by discussing possible ways in which future research might model these frictions more precisely.

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Table 1: A Summary of BEPS Estimates

Study	Data	Period	Semi-Elasticity	Interpretation: a 10% point decrease in a country's tax rate (e.g. from 35% to 25%) is associated with an increase in reported income from $100,000 to:
Hines and Rice (1994)	BEA (country-level)	1982 (cross-section)	2.25	$122,500
Huizinga and Laeven (2008)	Amadeus	1999 (cross-section)	1.3	$113,000
Dischinger (2010)	Amadeus	1995-2005 (panel)	0.7	$107,000
Heckemeyer and Overesch (2013)	Various	Various	0.8 ("consensus" estimate)	$108,000
Lohse and Riedel (2013)	Amadeus	1999-2009 (panel)	0.4	$104,000

Table 2: Location of US MNCs' Direct Investment *via* Majority-Owned Affiliates in 2011

	Total Assets	Net PPE	Cap. Exp.	Sales	Net Income	Value Added	R&D	Empl. Comp.	No. of Empl.
All countries	20699	1202	190	5969	1115	1445	46	536	11,785
% in Havens	32.2	11.1	8.8	21.8	42.6	14.5	10.1	7.3	4.9
% in the Netherlands	8.6	1.6	2.1	3.8	13.4	2.4	3.1	3.2	1.9

Note: Based on author's calculations, using aggregate country-level data for 2011 from the Bureau of Economic Analysis (BEA) obtained from the BEA website at www.bea.gov. "PPE" is plant, property and equipment; "Cap. Exp." is capital expenditures; "R&D" is research and development; "Empl. Comp." is employee compensation; "No. of Empl." is the number of employees. All monetary variables are reported in billions of US dollars, and the number of employees is reported in thousands. Havens are defined using the classification in Dharmapala and Hines (2009). Subsequent to that classification, the Netherlands Antilles was dissolved. The jurisdictions that were formerly part of the erstwhile Netherlands Antilles (Curaçao, Sint Maarten, and what the BEA terms "Netherlands Islands, Caribbean") are classified here in the same way that the Netherlands Antilles was classified in Dharmapala and Hines (2009).

Table 3: The Response of Reported Income to Tax Rates

		Scenario 1		Scenario 2	
		Income reported in H	Income reported in L	Income reported in H	Income reported in L
H tax rate	25%	90	10	60	40
	24%	90.7	9.3	60.5	39.5

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