Estimating the fiscal effects of base erosion and profit shifting: data availability and analytical issues

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The multilateral efforts, led by the Organisation for Economic Cooperation and Development (OECD), to address base erosion and profit shifting (BEPS) have attracted much attention from tax policy makers, practitioners and academics. In 2012, the OECD/G20 BEPS Project was launched to address BEPS through a range of international tax policy measures. A key part of the BEPS package was the Action 11 report, which considered the fiscal and economic impacts of BEPS and produced an empirical estimate of the global corporate income tax (CIT) revenue losses arising from BEPS of between 4 per cent and 10 per cent of global CIT revenues. This research note highlights some of the data-related and methodological challenges facing researchers attempting to estimate the fiscal impacts of BEPS, discusses some of the methodological approaches that have recently been applied to this end, and provides a preview of the forthcoming release of the first edition of the OECD Corporate Tax Statistics.

Keywords: international taxation, corporate income tax, base erosion and profit shifting, BEPS

1. Introduction

Recent efforts by the Organisation for Economic Cooperation and Development (OECD) to address corporate tax base erosion and profit shifting (BEPS) have been driven by the common understanding that a major renovation of the international tax rules was necessary to bring them into line with ongoing structural changes in the global economy arising from globalisation, digitalisation and the increased reliance on intangible assets. As part of the OECD/G20 BEPS Project launched in 2012, an action plan was developed to address BEPS through a range of international tax policy measures. The work undertaken under Action 11 of the OECD/G20 BEPS Project was directed towards gaining an understanding of the adverse fiscal and economic impacts of BEPS and the development of new tools and data to improve the measurement and monitoring of BEPS into the future.

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The Action 11 report (OECD, 2015a), published in 2015, built on a review of the academic literature on profit shifting and produced an empirical estimate of the global corporate income tax (CIT) revenue losses due to BEPS of between 4 per cent to 10 per cent of global CIT revenues or the equivalent of between US$100 billion and US$240 billion (based on 2014 figures). These results have attracted much attention from tax policy makers, practitioners and academics.

This research note builds on the analysis presented in the Action 11 report. It provides a more concise discussion of the data-related and methodological issues to be addressed by any study producing fiscal estimates of the scale of BEPS. It also includes a review of the most significant studies published in this area since the release of the Action 11 report. More specifically, it aims (i) to outline recent developments in international taxation, especially in the context of the OECD/G20 BEPS Project and the establishment of the Inclusive Framework on BEPS; (ii) to highlight some of the data-related and methodological challenges facing researchers attempting to estimate the global scale of BEPS; (iii) to provide an overview of some of the methodological approaches that have been applied by researchers to obtain empirical estimates of the fiscal impacts of BEPS; and (iv) to provide a preview of the forthcoming release of the first edition of the OECD Corporate Tax Statistics.

2. Recent developments in international taxation

2.1 The BEPS package

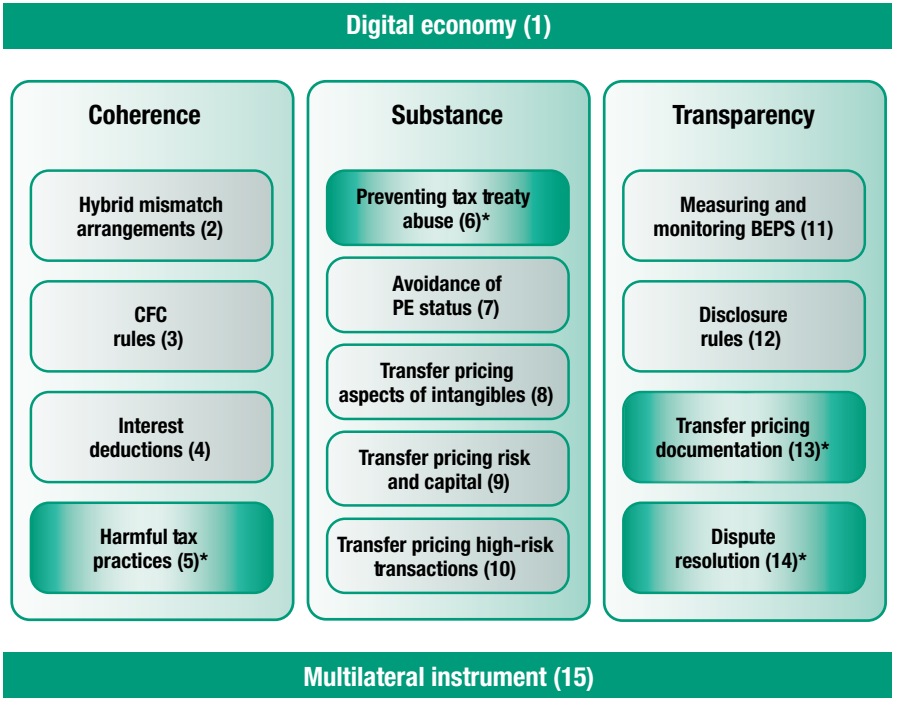
The OECD report *Addressing Base Erosion and Profit Shifting* (OECD, 2013) noted that no single rule or provision could be identified as the cause of BEPS, and that adverse fiscal impacts resulted from a series of weaknesses in the international tax rules as well as gaps and mismatches arising from the interplay of domestic laws and a lack of coordination across borders. Organised on three pillars, the stated objectives of the BEPS Project were to (i) reinforce the coherence of the corporate income tax rules at the international level; (ii) realign the taxation of profits with the location where the economic activities generating those profits occurred; and (iii) improve transparency. The OECD/G20 BEPS package, which was endorsed by the G20 leaders at the end of 2015, consisted of 13 reports addressing the 15 action points of the BEPS Action Plan (Figure 1); it included a comprehensive package of new and reinforced international standards as well as concrete measures to help countries tackle BEPS.

Under the BEPS package, countries agreed to a comprehensive set of measures and committed to their consistent implementation. Among the measures agreed were four minimum standards, involving measures to fight harmful tax practices (Action 5); prevent treaty shopping (Action 6); introduce Country-by-Country

Reporting (Action 13); and improve dispute resolution (Action 14). The minimum standards were agreed in particular to tackle avoidance in cases where no action by some countries would have created negative spillovers on other countries, with broader implications for the level and distribution of welfare across nations. The package also involved updated standards relating to tax treaties (e.g., Action 7) and transfer pricing (Actions 8–10), recommendations on hybrid mismatch arrangements (Action 2) and interest limitation rules (Action 4), as well as guidance on controlled foreign company (CFC) legislation (Action 3) and mandatory disclosure initiatives (Action 12). In addition to these specific tax policy measures, the BEPS package also focused on the measurement and monitoring of BEPS (Action 11). The Action 11 report reviewed empirical evidence on the scale and economic impact of BEPS through different tax planning strategies, outlined a dashboard of indicators of BEPS, and produced an estimate of the global CIT revenue losses arising from BEPS. The work undertaken under Action 11 will be the main focus of this note.

In addition, the BEPS package also included a number of analytical reports, including one that assessed the feasibility and recommended the development of a multilateral instrument – known as the Multilateral Convention to Implement Tax Treaty Related Measures to Prevent Base Erosion and Profit Shifting – to provide a concrete means by which governments can incorporate the measures agreed as part of the BEPS package into their bilateral tax treaties (Action 15). As part of the work on digitalisation (Action 1), another analytical report was published: *Addressing the Tax Challenges of the Digital Economy*. This report provided the basis for ongoing work, which was further advanced in the recent Interim Report to G20 Finance Ministers, *Tax Challenges Arising from Digitalisation* (OECD, 2018).

Figure 1: The 15 points of the BEPS action plan



*Minimum standards

2.2 The inclusive framework on BEPS

In anticipation of the release of the BEPS package, the G20 finance ministers called on the OECD to build "a framework by early 2016 with the involvement of interested non-G20 countries and jurisdictions, particularly developing economies, on an equal footing."[1] Today, more than 115 countries and jurisdictions have joined the Inclusive Framework, and, having all committed to the implementation of the BEPS package, are now advancing the Inclusive Framework's mandate, which is to (i) review the implementation of the four BEPS minimum standards; (ii) gather data for the monitoring of the other aspects of implementation, including the tax challenges of the digital economy (Action 1) and measuring and monitoring BEPS (Action 11); (iii) finalise the remaining technical work to address BEPS challenges;

[1] Communiqué of G20 Finance Ministers and Central Bank Governors from the meeting in Ankara on 4–5 September 2015, paragraph 11.

and (iv) support jurisdictions in their implementation of the BEPS package, including by providing further guidance on the standards and by developing tool kits for low-income countries.

3. Measuring BEPS: data availability and analytical issues

The 2015 BEPS Action 11 report focused on the measurement and monitoring of the fiscal impacts arising from the tax planning strategies of multinational enterprises (MNEs), including through the various profit-shifting channels outlined in the BEPS Action Plan. In presenting an extensive literature review of the most relevant profit-shifting studies, the report presented evidence of more than 100 studies confirming the existence of BEPS. The Action 11 report also outlined a dashboard of BEPS indicators and produced an original empirical analysis leading to an estimate of the total amount of CIT revenue losses at the global level arising from BEPS, as well as some recommendations for better data and tools to measure BEPS. The net revenue loss was estimated to amount to between 4 per cent and 10 per cent of global CIT revenues or between US$100 billion and US$240 billion, in 2014 figures.

The Action 11 report highlights the inherent difficulties associated with such an estimation task. In particular, the report notes the considerable data and methodological limitations that any such endeavour encounters. As with many other complex policy issues, analysts wanting to inform policy making must choose between several imperfect approaches depending on the precise question that they are seeking to answer and the available data. For this reason, the remainder of this research note discusses some of the key issues relating to data availability and the analytical issues to be addressed to estimate BEPS.

3.1 Currently available data

The data currently available for BEPS analysis ranges from highly aggregated data such as those in national accounts to more granular information available in company financial statements, and very detailed, country-specific and firm-specific data revealed through media reporting and parliamentary and congressional enquiries. The Action 11 report considers the various data sources available for analysing BEPS and assesses the strengths and limitations of these data sources. It identified national accounts, balance of payments, foreign direct investment, trade and customs data as well as aggregate CIT revenues as the main sources of macroeconomic data. All these data sources are publicly available through national statistical offices or international organisations.

Whereas macroeconomic data have the advantage of being readily available with broad coverage, many recent academic studies of profit shifting (e.g., reviewed

by Heckemeyer and Overesch, 2017, as well as in the Action 11 report, OECD, 2015a) make use of the growing availability of firm-level microeconomic data. This development has enabled academics to go beyond aggregate country-level analyses to study profit-shifting behaviours at the level of individual MNE affiliates. The most relevant macroeconomic and microeconomic data sources are listed in Table 1.

As Dharmapala (2014) points out, the move towards affiliate-level microeconomic data has significantly improved the ability to analyse multiple dimensions of profit shifting, in particular because many studies are now able to draw on panel data. This development has enabled researchers to control for observable and unobservable determinants of an MNE affiliate's income, such as, unreported intangible assets or quality of infrastructure or labour force, by including fixed effects in their econometric specifications.

Despite the advantages of microeconomic data, especially when investigating specific BEPS channels, it has some drawbacks when attempting to derive global fiscal estimates of BEPS. For example, commercial databases of firm financial statements such as Orbis or Amadeus contain non-random samples of MNEs. The sample selection may affect the estimate of profit shifting, and then, to arrive at a global fiscal estimate, it may be necessary to adjust for types of firms and countries not covered in the original data set. Alternatively, if the data set builds on the complete population of firms in a country, such as tax return data or financial information collected by governments, it may be better suited to estimating semi-elasticities of profit shifting in that country. A global estimate would require making the assumption that firms elsewhere behave similarly to those observed in the data.

One final shortcoming of almost all available data sources is the underrepresentation of developing countries. This may lead to underestimates of global profit shifting, especially given the significance of BEPS in developing countries found by some recent studies (UNCTAD, 2015; Crivelli et al., 2016; and Reynolds and Wier, 2016.

3.2 Analytical and methodological issues

In addition to issues associated with data availability, there are several key methodological issues to consider when undertaking empirical analysis of BEPS or evaluating existing studies. In this note, we focus on two of the most significant issues: the challenge of separating BEPS from real activity and the choice of the tax rate to use.

These are significant issues because almost all empirical studies examine differences in corporate profits across countries or firms, and most studies look at correlations between measures of corporate profits and taxation. Empirical studies of BEPS must attempt to separate high profits linked to BEPS and high profits linked to non-tax factors, such as high amounts of capital, skilled labour, or high-quality

Table 1: Types of data available for BEPS analysis

Data type	Access	Source	Level	Representativeness	Coverage	Example
Macroeconomic data series	Open	National statistics	Country-level	Broad coverage of countries	-	BoP, NA, FDI
Aggregated foreign affiliates statistics	Open	National statistics	Firm-level aggregated to country pairs	Full population	Foreign affiliates in specific country (inward FATS) or controlled by MNEs headquartered in a specific country (outward FATS)	FATS (US/ Eurostat, OECD)
Financial information	Open	Commercial databases	Firm-level	Non-random sample	MNEs headquartered in a large number of countries (including foreign subsidiaries)	Orbis, Amadeus
Financial information	Limited	Government	Firm-level	Full population or random sample	MNEs headquartered in a specific country; possibly including foreign and/or domestic subsidiaries of foreign MNEs	MiDi Database (Germany)
CIT tax returns	Limited	Government	Firm-level	Full population or random sample	Domestic and multinational firms filing tax returns in a specific country; typically not including detailed information on foreign subsidiaries	Anonymised taxpayer information from filed tax returns

infrastructure. Analysts also face the difficult task of separating high reported profits due to BEPS from other corporate activity motivated by taxation, since taxation plays a role in the location of investment regardless of any opportunities for BEPS. The choice of an appropriate tax rate indicator in empirical studies is important in capturing firms' incentives to engage in BEPS and in accurately measuring the relationship between profits and tax costs faced by firms.

a. Separating BEPS from real economic activity

BEPS refers to tax avoidance strategies that exploit gaps and mismatches in tax rules to artificially shift profits to low or no-tax locations. How to define BEPS and how to separate it from real economic activity is one of the major challenges in measuring BEPS. The mere fact that an MNE or its affiliates take advantage of different countries' tax rates does not, in itself, amount to BEPS. For example, an MNE that decides to locate real economic activities such as a plant or factory in a jurisdiction on account of that jurisdiction's tax rate is not engaging in BEPS.

It is, therefore, important to disentangle BEPS behaviours from real economic activities. However, this results in both a conceptual challenge of deciding which economic activities to take into account and a measurement challenge of determining which variables best reflect the chosen economic activities. The challenge of defining and measuring economic activity has become even more difficult with the increasing importance of intangible assets and risk management in global value chains. Intangible assets are clearly an important driver of value creation, but they are also highly mobile and difficult to value, and the ability of MNEs to separate intangible assets from other economic activity may be viewed as one factor exacerbating BEPS.

The analytical challenges flow from the fact that there is neither agreement on how to define real economic activity nor agreement on what economic activities generate profits. The current international tax rules generally use a fact-specific approach that addresses a company's functions, assets and risks. However, without access to the detailed data necessary to engage in a more granular transfer pricing analysis, empirical studies must rely on much broader measures of economic activity. Many economic studies rely on capital (through assets) and labour (through number of employees or levels of staff compensation) as the factors of production, to measure economic activity. Other studies suggest that the location of sales should also be used.

Even if there was agreement on which economic activities should be taken into account, there are many measurement challenges. For example, intangible assets are defined, for accounting purposes, as identifiable non-monetary assets without physical substance that are controlled by an entity and from which future economic benefits can be expected. This definition includes all forms of intellectual property

such as patents, copyrights, trademarks, utility models, and software or web pages. In addition, certain intangible commercial assets, such as brands, fall into this definition.

However, the value of total assets typically underestimates the value of intangible capital assets. First, this definition excludes certain intangible assets that are often important value drivers, such as know-how or human capital, because they cannot be separately identified from the firm. Second, below certain cost thresholds, investments in internally generated intangible assets, such as research and development (R&D) expenditures, are generally deducted or expensed in the year of the investment for financial statement accounting, and thus intangibles are not included in the value of total assets. Third, there are often considerable challenges associated with the valuation of intangible assets acquired in an acquisition or purchase, especially where it may be difficult to find suitable comparables.

There are also difficulties with measuring labour. Using the number of employees may not distinguish between full-time and part-time employees. The number of employees also does not take into account employees' differing skill levels and productivity. Measuring labour by reference to employee compensation should better account for differences across employees; however, issues are still likely to arise where employees work across multiple jurisdictions, which may not be adequately accounted for in the data. However, at a time when firms are increasingly shifting from human labour to automated processes, reliance on labour as the principal metric of a firm's economic activities may also be misleading.

The location of sales may also be difficult to measure. Sales are often measured in the countries where the sales originated (i.e., origin or production location) rather than where the final consumers are located (i.e., market perspective). In addition, the digitalisation of the economy and the growth of business models that rely upon multi-sided markets – especially where one side of the market involves barter-like transactions – presents challenges as to whether the location of sales fully captures other user-based contributions that may be made as part of transactions that do not involve the payment of any financial consideration.

b. Choice of countries' tax rate

Another major analytical issue is the appropriate tax rate to use when analysing BEPS. In general, analysts would prefer to use a tax rate that captures the marginal tax rate applicable to the shifted income.

Statutory corporate tax rates are often used in empirical studies of BEPS, and, in the absence of other provisions in the tax code, statutory rates should capture the marginal incentive to shift profits between countries. For example, if €100 of taxable income is shifted from a country with a 25 per cent statutory tax rate to a country

with a 0 per cent statutory tax rate, then the MNE's tax liability would be reduced by €25. However, headline statutory corporate tax rates may not fully capture the tax incentives to shift income. Some countries may legislate lower tax rates on certain types of income or may offer lower negotiated rates to some taxpayers. Therefore, MNEs may still face incentives to shift income into countries with high headline statutory tax rates. In the same way, statutory corporate tax rates do not capture the impact of withholding taxes, which may also have a significant impact on an MNE's incentives to shift income from one jurisdiction to another.

Another type of tax rate used in BEPS analysis is the backward-looking average effective tax rate. It is generally calculated as the ratio of tax paid over pre-tax profits. Depending on the data being used, this may be calculated for individual firms, from financial statement or tax return data, or at a more aggregate level, such as from data from foreign affiliate statistics (FATS). Compared with statutory corporate tax rates, backward-looking average effective tax rates may better reflect the tax burden that companies actually face, by taking into account the various aspects of the corporate tax system, including concessionary rates and instances where the base has been deliberately narrowed by legislated incentives. However, some of the provisions captured by backward-looking effective tax rates may not be related to the profit-shifting incentives faced by MNEs. Backward-looking rates may reflect the historical behaviour of firms and capture the tax effects of depreciation from prior investments and loss deductions carried forward from previous years. They also capture non-BEPS tax incentives, such as R&D credits and energy tax credits. In addition, backward-looking effective tax rates calculated from financial statement data may not accurately reflect the tax burden a firm faces in a specific country. A firm's country of incorporation may differ from its country of tax residence, and the tax expense reported on financial statements may include tax paid in multiple countries.

Some studies of BEPS have also used forward-looking effective average tax rates (EATRs) and effective marginal tax rates (EMTRs) calculated for hypothetical firms. The chief difference between these effective tax rates and the statutory corporate tax rate is that these rates account for the tax base as defined by country-specific corporate tax provisions, such as fiscal depreciation rules, interest deduction limitation rules, and investment tax credits. EMTRs measure the extent to which taxation increases the pre-tax rate of return required by investors to break even, which may be used to assess how taxes affect the incentive to expand investment. EATRs measure the effect of taxation on investment projects earning economic rents, which may be used to assess choices along the extensive margin, such as a firm's location decision or technology choice. However, because these tax rates are calculated for hypothetical firms with assumptions about the asset mix and use of debt, they will not be representative of all firms across the economy. They are also generally calculated for domestic investment and may not capture important aspects of the international corporate tax rules. Furthermore, they may

not be appropriate for analysing certain location decisions, such as that of an MNE in respect of a very high-return intangible asset.

4. Overview of recent studies estimating the revenue effects of BEPS

Despite the analytical and methodological challenges faced by researchers seeking to estimate the scale and extent of BEPS, this remains an active area of research interest due to its vital importance.

Although many studies confirm the existence of BEPS by reference to individual channels of profit shifting and/or individual BEPS behaviours, the number of attempts to produce a global fiscal estimate of CIT losses resulting from BEPS is relatively small. Table 2 lists the most prominent of these fiscal estimates. Although the estimates differ across studies, these recent works have contributed to creating a consensus that the global fiscal impact of BEPS is sizeable and that the fiscal and economic benefits of reducing BEPS are likely to be considerable for individual countries.

In this section, we provide an overview of three of the recent empirical studies that derive estimates of global revenue losses due to BEPS, and we discuss how they address the analytical and methodological issues described earlier.[2]

Table 2. Estimates of the fiscal effects of BEPS

Author, fiscal estimate approach (date)	Scope	Range (US$ billions)	Year (level)
UNCTAD, offshore investment matrix (2015)	Global	200*	2012
OECD, aggregate tax rate differential (2015)	Global	100–240	2014
Crivelli et al., tax haven spillover (2016)	Global	123	2013 short-term
Crivelli et al., tax haven spillover (2016)	Global	647	2013 long-term
Clausing, excess income in low-tax countries (2016)	Global	280	2012
Cobham and Janský, tax haven spillover (2018)	Global	500	2013 long-term
Janský and Palanský, offshore investment matrix (2018)	Global	80+*	2015
Tørsløv, Wier, and Zucman, high profits-to-wage ratios of foreign-owned firms (2018)**	Global	230	2015

* Includes only FDI-related BEPS.
** Most recent working paper, released 26 July, 2018.

[2] An overview of the approach taken by UNCTAD (2015) and Janský and Palanský (2018), which is a re-estimation of UNCTAD (2015), is not provided here as the approach is described in detail in Bolwijn, Casella, and Rigo (2018), also published in this volume. In addition, a more comprehensive description of the approach taken by Tørsløv, Wier, and Zucman (2018) has not been included as this paper had not been formally published at the time of writing.

4.1 The BEPS action 11 report

The fiscal estimate in the 2015 Action 11 report incorporates revenue losses due to BEPS through two channels: (i) profit shifting and (ii) mismatches between tax systems and preferential treatment. The main part of the analysis was undertaken using firm-level financial accounts micro-data from the Orbis database. Although Orbis has many gaps in coverage, it continues to be one of the most comprehensive databases of company financial information available.[3]

The analysis is based on two key empirical findings. First, the analysis estimates the sensitivity of the reported profitability of MNE affiliates to tax rate differentials. Here, the tax rate differential is the difference between the statutory tax rate of the country of an MNE affiliate and the average statutory tax rate of the countries of the rest of the affiliates in the MNE group. Profitability is measured as the ratio of reported profits to total assets in the main specification; the study also measures profitability as the ratio of reported profits to the number of employees in a robustness check. Regressors, such as GDP growth and the location of the affiliate within the group, are included to control for other drivers of profitability.

The second part of the analysis measures the extent to which large entities belonging to MNE groups had lower backward-looking effective tax rates than comparable entities that were part of domestic-only groups. This difference could be due to the ability of MNEs to exploit mismatches between tax systems, such as hybrid mismatch arrangements, and could also reflect a greater ability to take advantage of preferential treatment to reduce their tax liability.

After estimates of these two effects were obtained through regression analysis of the Orbis micro-data, they were used to derive an estimate of tax revenue losses due to BEPS. In order to arrive at a global estimate, some adjustments were made to take into account firms not covered by Orbis, and the revenue effect was calculated using global CIT revenues rather than the total taxes paid as reported in Orbis. Adjustments were also made to take into account the effect of tax credits on CIT payments.

4.2 Crivelli, De Mooij and Keen (2016)

Crivelli et al. (2016) set forth an approach making use of country-level CIT revenue data and tax rate information which, unlike most data used to study BEPS, is available for many developing countries. This approach was re-estimated by Cobham and Janský (2018). The analysis in Crivelli et al. (2016) sets out to measure

[3] For a more detailed assessment of the strengths and weaknesses of the Orbis database, see the Action 11 report (OECD, 2015a).

two channels through which tax rates may affect tax bases: tax-motivated real investment decisions, where real activity is relocated to low-tax countries, and pure profit shifting, where part of the CIT base is shifted to low-tax countries but real activity is not moved.

Crivelli et al. (2016) estimate how a country's CIT base depends on its own statutory tax rate and the average statutory tax rate of other countries. They use a few measures of other countries' tax rates. In order to measure tax-motivated real capital movement, they use a GDP-weighted average of the tax rates of all other countries, with the assumption being that changes in real investment will depend on the economic size of other countries. In order to measure BEPS, they estimate the response of CIT bases to the unweighted average tax rate of countries classified as tax havens, taking the tax haven classification from a paper by Gravelle (2013). In this case, the assumption behind using an unweighted average is that, since profit shifting can be undertaken with minimal relocation of real activity, the size of tax havens' economies is not important with regard to profit shifting.

Crivelli et al. (2016) and its re-estimation by Cobham and Janský (2018) are good examples of the different tax rate measures that have been used in the literature. In addition to statutory tax rates, Crivelli et al. (2016) use forward-looking EATRs as a tax rate measure in their study. However, they do not attempt to measure pure profit shifting using EATRs since they do not have EATRs available for enough tax havens. Cobham and Janský (2018), in their re-estimation of this study, substitute backward-looking EATRs as a tax rate measure. These are computed at the country level from both the Orbis database and United States FATS. These might be expected to be better measures of the incentives to shift profits into tax havens since some tax havens have high headline rates, with lower rates available through special regimes. However, Cobham and Janský (2018) tend to find less statistically significant results with sometimes unexpected signs using these rates instead of the statutory rate.

4.3 Clausing (2016)

Clausing (2016) uses outward FATS for the United States to estimate the fiscal loss to the United States arising from BEPS. The United States compiles very comprehensive FATS, and the net income and foreign taxes of foreign affiliates of United States MNEs are available at the country level. In this study, the data are used to estimate the relationship between profits reported in foreign countries by United States MNEs and the countries' backward-looking EATRs, which are calculated from the income and tax data available in FATS. To control for real economic activity, macroeconomic variables (GDP and population) are included, as well as the number of employees and the value of plant, property, and equipment.

After estimating this semi-elasticity of profits with respect to tax rates, the study calculates what the profits would have been in the countries of operation of United States foreign affiliates in the absence of differences in tax rates among foreign countries and the United States. Some of the profits in low-tax countries are then allocated to the United States on the basis of the share of intrafirm transactions that occur between foreign affiliates and United States parents relative to all intrafirm transactions undertaken by affiliates. The study assumes that these profits would be taxed at the United States statutory CIT rate less 5 per cent, allowing for some degree of tax base narrowing.

The United States is the only country that compiles and publishes such extensive data on the activities of MNEs, and thus a similar exercise cannot be performed for all countries. Using her findings from the United States data, Clausing extends her analysis to estimate a speculative global revenue loss from BEPS. The study takes the overall profits of the world's 2,000 largest corporations and makes the simplifying assumption that corporations have affiliates in two types of countries: high-tax countries (those with tax rates greater than 15 per cent) and low-tax countries (those with tax rates less than 15 per cent). The study assumes that the share of income booked in low-tax countries is proportionate to the share of United States MNE foreign income that is booked in low-tax countries. The study also assumes that the profit-shifting elasticity is the same as that calculated for the United States and allocates profits back to high-tax countries on the basis of their GDP. A revenue effect is calculated under the assumption that these profits would be taxed at the countries' statutory CIT rates less 5 per cent.

5. New OECD Corporate Tax Statistics

It is evident from the short discussion in the preceding sections that any attempt to produce an empirical estimate of the global revenue impacts of BEPS faces a range of significant challenges. On the one hand, any empirical approach is constrained by the fact that currently available data sources suffer from various shortcomings. Although increased use of firm-level data and related econometric methods have allowed researchers to produce more detailed profit-shifting estimates, these developments have not entirely overcome many of the hurdles faced by researchers seeking to derive an estimate of the global revenue losses arising from BEPS. As highlighted in the preceding discussion, a large number of assumptions are necessary, depending on the types of data used in the econometric analysis. On the other hand, a number of analytical issues remain.[4] This note has focused on

[4] The BEPS Action 11 report noted a number of future areas of economic research, including the factors contributing to group and affiliate profitability of transnational corporations; see page 122.

two of these analytical issues: First, empirical strategies should aim at disentangling BEPS from real economic activity; however, this raises issues of delineation and measurement, especially in the context of intangibles. Second is the issue of which tax rate variable is best suited to capturing the incentives to engage in BEPS. Both of these analytical issues must be addressed, regardless of the data relied upon and the econometric approach adopted.

As noted in the preceding section, the BEPS Action 11 report included an assessment of currently available data sources and methodologies, and concluded both that data limitations severely constrain economic analysis of the scale and economic impact of BEPS and that improved data and methodologies are required. Recognising the lack of relevant and currently available data, the report included a series of recommendations designed to improve the quality of available data to support ongoing measurement and monitoring of BEPS.

In particular, the BEPS Action 11 report recommended that the OECD work with the members of the Inclusive Framework on BEPS to compile a new data set, Corporate Tax Statistics. For the first release in November 2018, the data set will contain three main categories of data: tax revenues, tax rates, and tax incentives, especially in relation to R&D-related incentives. Future editions, from 2019 onwards, will also include aggregated and anonymised statistics from the Country-by-Country Reports (CbCRs), which are being filed by MNE groups with a turnover above €750 million.

The Corporate Tax Statistics data set will bring together, in an internationally consistent format, a range of aggregate country data relevant to the analysis of BEPS and the taxation of corporations generally. Although these newly collected data will not relieve researchers of the need to make the difficult methodological and analytical choices described earlier, the development of this new data set will mark a significant step forward in ensuring that improved data and statistics on MNEs will be available to researchers, policy makers, and the broader public in the future.

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