Annex 3.A1

Economic implications of multinational tax planning

Box 3.A1.1. Summary of main findings

This annex provides robust evidence of tax planning by multinational enterprises (MNEs). The analysis is based on a sample of data that are considered to be the best available cross-country firm-level information. Yet, the data have significant limitations in their representativeness in some countries, do not include all MNE entities and are based upon financial accounts rather than tax returns.

The focus of this annex is broader than the OECD/G20 Base Erosion and Profit Shifting (BEPS) Project.[1] The BEPS Project focuses on "instances where the interaction of different tax rules leads to double non-taxation or less than single taxation" and it also relates to "arrangements that achieve no or low taxation by shifting profits away from the jurisdictions where the activities creating those profits take place". The analysis contained in this study assesses the fiscal and economic implications of international differences in statutory and effective corporate tax rates and as such it also covers domestic tax incentives.

Tax planning is widespread among MNEs and entails tax revenue losses.

- **Robust empirical evidence shows that MNEs engage in international tax planning**. MNEs shift profit from higher to lower-tax rate countries. Large MNEs also exploit mismatches between tax systems (e.g. differences in the tax treatment of certain entities, instruments or transactions) and preferential tax treatment for certain activities or incomes to reduce their tax burden.
- **Transfer price manipulation, strategic allocation of intangible assets and manipulation of internal and external debt levels are important profit shifting channels**.
- **The empirical patent analysis suggests that preferential tax treatment of intellectual property (IP) influences the location of intangible assets**. Preferential IP regimes attract research activities and the ownership of patents invented in other countries. Preferential regimes may also encourage the relabeling of certain incomes to benefit from the regime.
- **Tax planning reduces the effective tax rate of large MNEs by 4-8½ percentage points on average**. The reduction is even greater for very large firms and firms intensive in the use of intangible assets. Small MNEs also engage in tax planning but to a lesser extent.
- **The net tax revenue loss from tax planning is estimated at 4-10% of global corporate tax revenues.** These estimates based on 2000-10 data are surrounded by uncertainty and should be interpreted with caution.

Box 3.A1.1. Summary of main findings *(continued)*

- **Strict anti-avoidance rules reduce tax planning**. Strict anti-avoidance rules, such as transfer pricing, interest deductibility, GAARs and CFCs rules, are found to reduce profit shifting. However, complex rules generate compliance costs for all firms, hampering profitability, as well as administrative and enforcement costs for tax authorities. These costs could be reduced by international co-ordination.

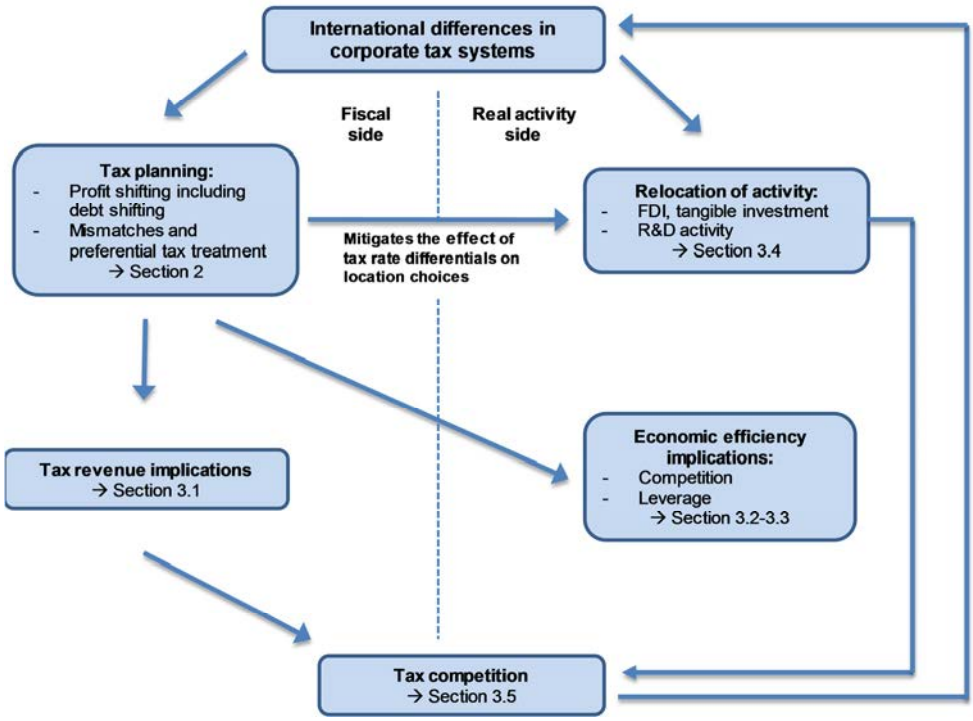
Tax planning effects on economic efficiency are unclear.

- **Tax planning may allow certain MNEs to increase their market power**, resulting in more concentrated markets. The reduced competitive pressure may entail welfare losses. However, these losses may be partially offset by the associated reallocation of resources to high-productivity MNEs.
- **The possibility to manipulate the location of internal and external debt lowers the cost of debt for MNE groups and can compound the "debt-bias" present in most tax systems**. Even so, domestic firms have on average higher external leverage than MNE groups. Information on internal debt is not available.
- **International tax planning reduces effective tax rates and the effect of cross-country corporate tax differences on the location of investment by tax planning MNEs.** However, this is achieved at the cost of additional distortions (e.g. uneven playing field between tax-planning MNEs and other firms) as compared with a situation in which corporate tax rates were cut across the board.

Introduction

The design of corporate tax systems influences the behaviour of multinational enterprises (MNEs). International differences in taxation can lead MNEs to locate a larger share of their economic activity in lower-tax countries. In addition, it can lead to international tax planning by MNEs to reduce their tax burden. MNEs may locate profits in lower-tax countries, independently of where the profit-generating activity takes place, for example by manipulating the price of intra-group transactions or the location of external and related-party debt. They may also exploit differences in the tax treatment of certain entities or instruments (henceforth called mismatches between tax systems) or preferential tax treatment for certain activities or incomes to reduce their tax burden. In some cases, MNEs may also defer repatriation of profits from abroad indefinitely to avoid taxes. This raises a number of fiscal, redistributive and economic efficiency concerns, which are discussed in this study (see Figure 3.A1.1 for an overview).

Figure 3.A1.1. Issues covered by the analysis



This annex provides an estimate of tax planning based on financial account data from the largest commercially-available firm-level database (ORBIS).[2] The study estimates the relationship between tax rate differentials and profit shifting using financial account data. It is well known that the legal accounting standards for firms differ between public financial accounting and confidential tax accounting (e.g. Lisowsky, 2010) and improved access to data, especially tax return data, would enable refined estimates of the effects of tax planning. In the absence of such data, this study relies on the best cross-country firm-level financial account data currently available.

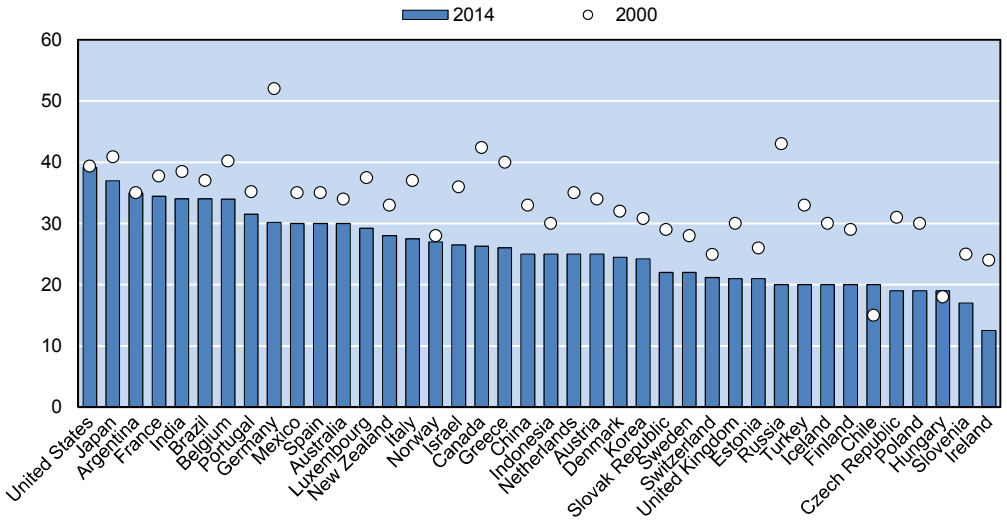
The study looks at both fiscal and efficiency issues related to tax planning behaviour by MNEs. Tax planning affects the distribution of tax bases and revenues among countries, thereby entailing fiscal considerations. By reducing the effective corporate tax rate of certain MNEs relatively to other MNEs and domestic firms, tax planning may also distort competition and lead to efficiency losses (e.g. if domestic firms are hindered from growing). Tax planning opportunities may also be one factor altering firms' financing decisions by reinforcing the debt bias present in most countries' tax system at the expense of equity financing, with potential effects on firms' investment choices and bankruptcy risks at the MNE group level.

The location of MNE investments in tangible and intangible assets depends, among other factors (e.g. labour taxation, regulations, access to market, agglomeration effects, labour force skills, quality of infrastructure, etc.), on corporate taxation. All else equal, countries with lower tax rates or preferential tax regimes for certain investments attract more foreign investment including R&D investments than higher-tax countries. These investments can create technological spillovers, with positive effects for productivity and growth (and in turn reduce such positive spillovers in higher-tax countries) (e.g. Blomström and Kokko, 1998; Markusen and Venables, 1999). They can also influence trade patterns (Dahlby, 2011).

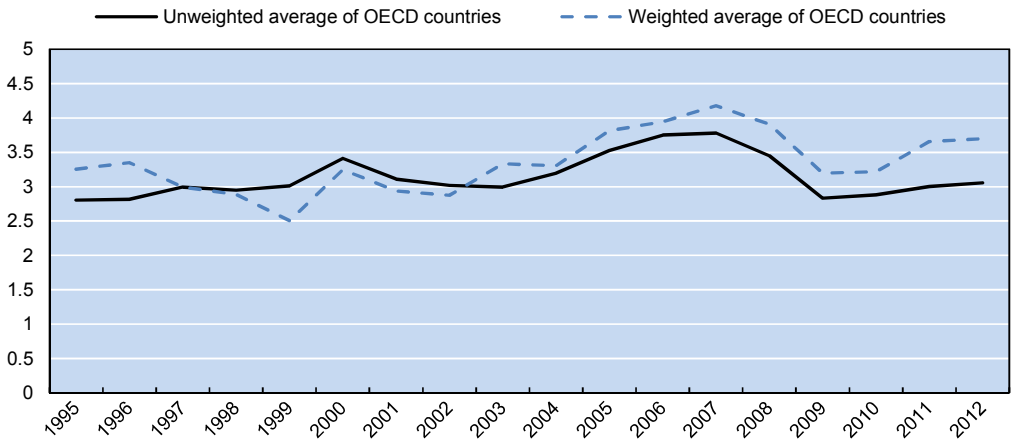
Globalisation and the ongoing integration of world capital markets may further increase the mobility of corporate tax bases and the sensitivity of investment to international tax differences (Braconier et al., 2014). This may intensify tax competition. Indeed, evidence suggests that an increasing mobility of capital is associated with lower statutory corporate tax rates (Devereux et al., 2008; OECD, 2009; Arnold et al., 2011; IMF, 2014), which is consistent with the reduction in corporate tax rates that occurred over the past decades (Figure 3.A1.3, Panel A). Even so, corporate tax revenues of OECD countries have remained fairly stable on average as a share of GDP, suggesting that in many countries a broadening of the base has accompanied the cuts in the rate (Figure 3.A1.2, Panel B). In some countries, the corporate tax base was supported by an increase in the profit rate and also possibly by substitution effects between personal and corporate income tax.

Figure 3.A1.2 Corporate tax rates and tax revenues

Panel A: Statutory corporate tax rate, %[3]



Panel B: Corporate tax revenues in OECD countries, % of GDP[4]



Source: OECD Tax Database and KPMG.

Assessing tax planning of MNEs

Main tax planning channels

Tax planning, as defined in this annex, is somewhat broader than BEPS behaviours identified in the OECD/G20 BEPS Action Plan (OECD, 2013). The BEPS project focuses on *"instances where the interaction of different tax rules leads to double non-taxation or less than single taxation"* and it also relates to *"arrangements that achieve no or low taxation by shifting profits away from the jurisdictions where the activities creating those profits take plac*e*"* (OECD, 2013).

In this study, tax planning refers to situations in which there is a disconnection between the location of profits and the real activity generating them. It also includes situations where the effective tax rate (ETR) of MNEs is artificially reduced – compared to that of similar domestic firms – due to exploitation of tax planning schemes involving loopholes in tax systems and preferential tax treatment. Some behaviours included in the measure of tax planning in this study are not BEPS behaviours, such as the decision to carry out substantial activity in a country to benefit from certain preferential tax treatments (e.g. R&D tax subsidies). This reflects the limitations of the available data, which make it impossible to disentangle certain BEPS from non-BEPS behaviours. Still, most tax planning channels covered by the analysis in this study overlap with BEPS behaviours and represent artificial financial flows that are not related to the location of real activity. Below is a non-exhaustive and simplified description of the tax planning channels covered in the analysis in this study:

- **Profit shifting channels:** MNEs have different ways to reduce their corporate tax burden by locating in lower-tax rate countries their profit generated in higher-tax rate countries.[5]

  - **Transfer price optimisation:** Optimising the price of transactions between related entities within the range of possible market-based so-called "arm's length" prices to achieve tax advantages. For example, by selecting a low price in the range for rights, products and services transferred from high to low-tax entities or *vice versa*.
  - **Allocation of intangibles, assets and risks:** Allocating through intra-group arrangements the ownership of income producing intangibles, assets and risks in low-tax countries to divert profit from high-tax countries. Operational functions are more difficult to re-locate and the main value-creating activities which manage and exploit those intangibles, assets and risks may be performed in higher-tax locations under contract to the legal owner.
  - **Manipulation of the location of debt:** Interest payments on debt are generally deductible from taxable income. Locating MNE external and internal debt (and the associated interest payments) in an entity in a higher-tax rate country allows offsetting profits and reducing tax payments of this entity.

- **Mismatches between tax systems, including preferential tax treatment and negotiated tax rates:** MNEs may exploit differences in the tax treatment of entities, instruments, or transfers between countries to reduce their corporate tax burden (OECD, 2014b). This is possible even in the absence of a difference between

statutory tax rates. MNEs may also be able to reduce their tax burden via preferential tax treatment and negotiated firm-specific reduced tax rates.

- **Hybrid instruments and transfers:** Instruments which are treated differently in two countries, for example as debt in one country and as equity in another country. This can result in an interest deduction in the first country and non-taxable income in the second country (as the income is treated as a tax-exempt dividend).

- **Hybrid entities:** The same entity can be treated differently in two countries for tax purpose. For instance, an entity may be considered as tax resident by no country (so called "stateless entities") and in this way achieve double non-taxation of profit. Alternatively, an entity can be treated as a non-taxable entity such as a partnership (where the partners are taxed instead of the entity itself) in one country and a taxable entity in another. This can result in a deduction in the first country and non-inclusion of the income in the second country.

- **Preferential tax treatment:** MNEs may shift certain incomes to benefit from special tax treatment offered by some countries (or areas within them), such as for intellectual property (e.g. patent boxes) or financial services. Domestic firms can also benefit from preferential tax treatment, but to a lesser extent than MNEs since they cannot shift incomes across borders to enjoy these treatments on a larger scale.[6]

- **Negotiated tax rates:** Firm-specific reduced tax rates for individual MNEs through negotiation between the MNE and the tax authority.

Tax planning schemes are often complex and can involve several of these channels in combination. To take this complexity into account, this study relies on a systematic top-down approach. It first focuses on where profits of MNEs are reported (profit shifting), and second it assesses the effective taxation of reported profits in each country (mismatches between tax systems, including preferential tax regimes). This ensures consistency and that there is no double-counting between the two. The exploitation of preferential tax regimes and negotiated tax rates are included in the mismatches analysis since they cannot be disentangled from them with the available data.

The approach also takes into account potential interactions between profit shifting and mismatches between tax systems. For instance, if profits are shifted to a country to enjoy a preferential tax treatment, the ETR differential resulting from this treatment is applied to the complete tax base (i.e. including the shifted profits) when assessing the fiscal implications of tax planning.

MNEs engage in international tax planning

The empirical analysis, covering a large sample of firms from 46 countries (mainly OECD and G20) based on financial accounts data, supports the hypothesis that MNEs engage in international tax planning. This confirms the existing anecdotal insights, case studies of specific firms and findings from other firm-level studies. These studies most often cover only one specific country – or only European countries – and are based on much smaller samples of firms (e.g. Huizinga and Leaven, 2008; Clausing, 2009; Fuest and Riedel, 2010; Heckemeyer and Overesch, 2013). Both profit shifting and the

exploitation of mismatches between tax systems (including the exploitation of preferential tax treatment) are found to be important tax planning strategies.[7]

Profit shifting analyses in the literature rely either on financial account data (e.g. the ORBIS database or its regional subsamples) or tax returns (e.g. Grubert, 2012 for the United States), the latter being only available at the country level and on a non-harmonised and confidential basis (Dharmapala, 2014). The analysis in this report is based on commercially-available financial account data that offers the advantage of wide cross-country coverage and largely consistent accounting rules across countries (see Box 3.A1.2 for details on the data). However, one caveat is that reported profits in financial accounts may differ from taxable profits due to divergence in accounting standards and tax planning.[8] More specifically, reported profit can differ from taxable profit due to differences in the timing of recognition of income and expenses (e.g. different capital depreciation rules), in the definition of income (e.g. Hanlon, 2003; Boynton et al., 2014), because taxable profit may reflect past losses being carried forward or because tax residence of an affiliate is different from its country of incorporation. Nevertheless, profit reported in financial accounts and taxable profit is expected to be generally affected in the same direction by profit shifting, justifying the use of reported profit as a proxy for taxable profit. Still, differences in profits and taxes reported in financial accounts and tax returns are a limitation of currently available firm-level information.

Box 3.A1.2. Disclaimer on the data used in the empirical analysis

Measuring tax planning of multinationals poses a number of data challenges. Data from tax reports are confidential and not available on a cross-country basis. In addition, in most countries tax data do not include information on group activities, profits and tax payments abroad, which is necessary to properly assess profit shifting. In the absence of consistent tax data, this study relies on the ORBIS database (commercialised by Bureau Van Dijk), which is generally considered as the most comprehensive commercially-available data on (listed and non-listed) firms' financial accounts and ownership structures (Fuest and Riedel, 2012; Dharmapala, 2014).

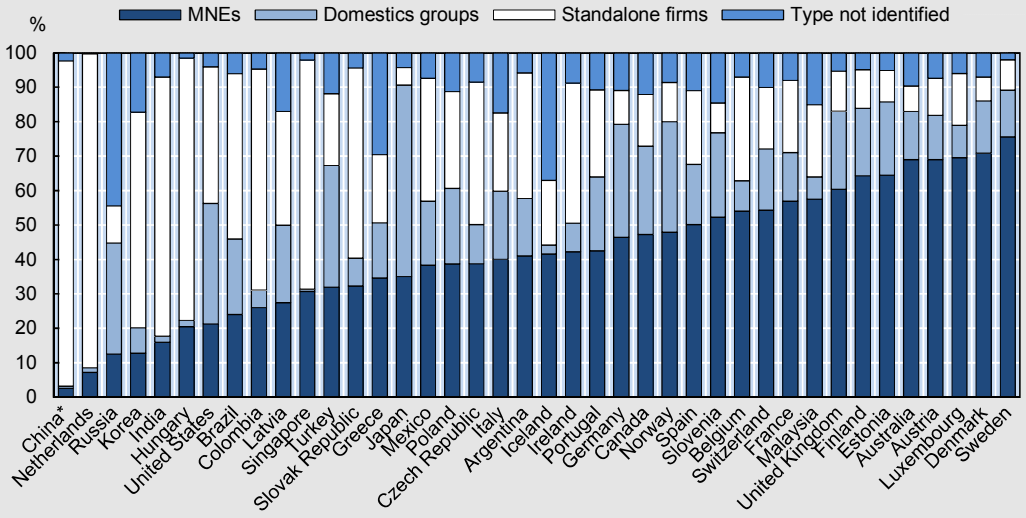
The ORBIS database and coverage of the sample

The ORBIS data is based on financial accounts of firms as reported to institutions such as business registers, chambers of commerce or local credit institutions. These data have been cleaned and checked by the OECD Statistics Directorate to ensure consistency across countries (Ragoussis and Gonnard, 2012) and further reviewed for this project by removing implausible values and outliers. The final sample consists of 1.2 million observations of unconsolidated MNE accounts over the period 2000-2010 in 46 countries. Although the economies themselves cover about 90% of world GDP, the coverage in the sample varies meaningfully across countries. Hence a smaller fraction of the activity is likely to be accounted for in countries with low representation. See below for more details on coverage. Additionally, MNEs' links to countries outside of the sample (including no-corporate-tax countries) are also taken into account. The MNE group identification iterates on the direct ownership information in ORBIS to account for missing information on the final owner of a firm. Two firms are assumed to be linked if one owns the other with a share of at least 50%. MNEs account for an important share of large firms and profits in many countries, particularly in smaller (more open) economies (Figure below).

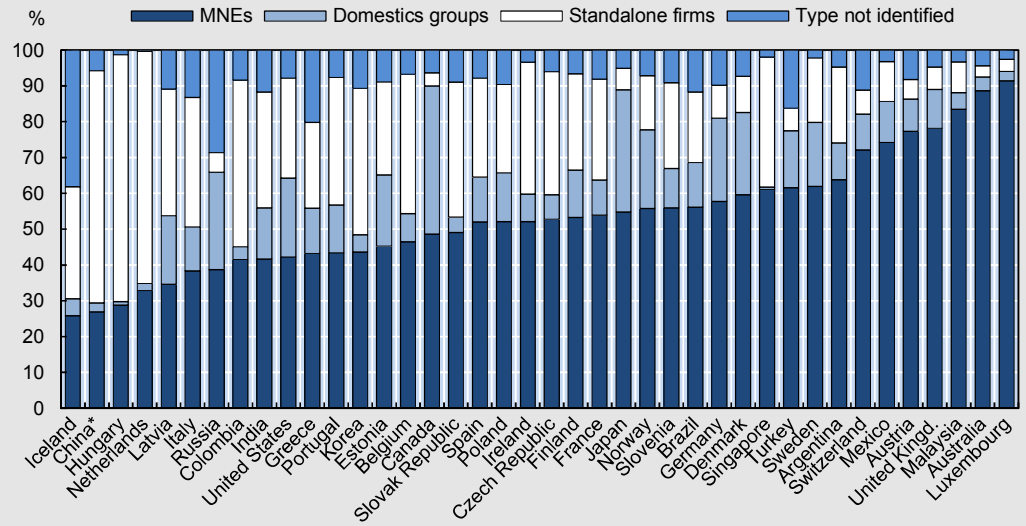
Box 3.A1.2. Disclaimer on the data used in the empirical analysis *(continued)*

Distribution of firms in the sample, by firm type[9,10,11]

Panel A: As a share of total number of firms (only firms with more than 250 employees)



Panel B: As a share of reported pre-tax profits (only profitable firms)



* People's Republic of China.

Box 3.A1.2. Disclaimer on the data used in the empirical analysis *(continued)*

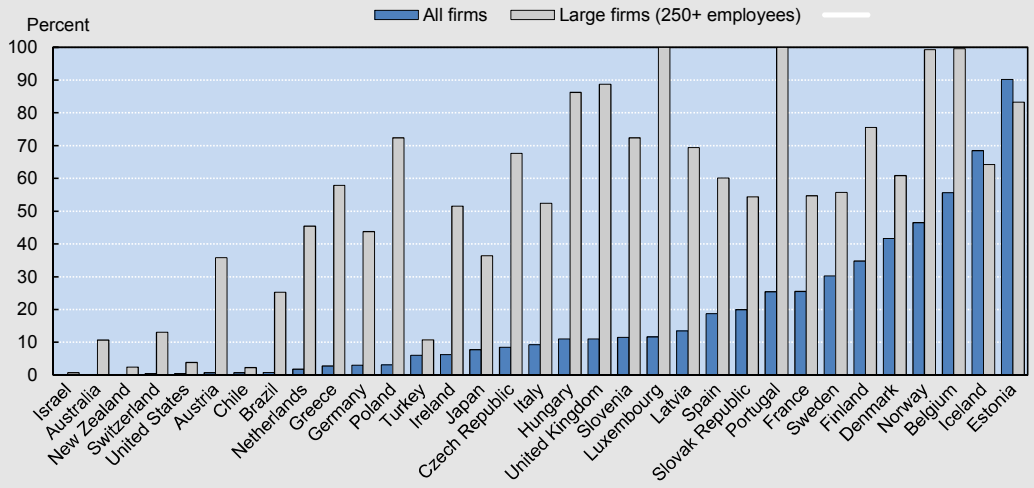
Quality of the sample and of the MNE group identification

The coverage of firms with available financial account data varies across countries. Compared with the actual population of firms (when data on the actual population is available), the coverage is above 50% in most European countries and less than 10% in most non-European countries. However, it is limited in some countries, including the United States, New Zealand and Chile (see Figure below). The distribution of observations across industries is somewhat higher in manufacturing than in services.

Representativeness of the final sample

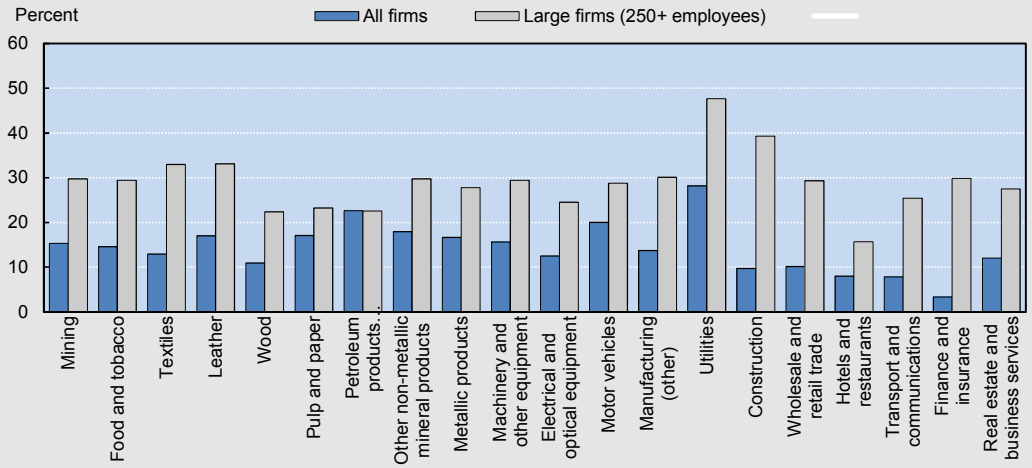
Number of firms in the final ORBIS sample, as a share of the total in STAN business demography statistics, 2006[12]

Panel A: by country



Note: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Panel B: by industry



Source: OECD calculations based on the ORBIS database and OECD STAN business demography statistics.

For an average MNE group, more than 50% of the worldwide activity is covered, which is a higher share that in other recent studies (e.g. Huizinga and Laeven, 2008). An issue is the lack of financial data in certain no-corporate-tax countries. This is mitigated by the methodological approach, which only relies on links to these countries being identified, not on the availability of financial accounts in these countries. Still not all links are identified in ORBIS. It is difficult to assess the magnitude and importance of the missing links due to general lack of data on actual links. Nevertheless, an important number of links to no-corporate tax countries is identified (see Figure below). For example, among the top-500 United States firms (Fortune 500 list for 2013), Citizens for Tax Justice (CTJ, 2014) identify 362 firms having links to "tax havens". Of these 362 firms, 266 (i.e. 72%) are in the ORBIS sample. Among these 266 firms, at least one tax haven link is identified in ORBIS in 184 cases, i.e. 69% of the times (this represents just over half of top United States firms with tax haven links).

Given that financial reporting requirements are usually stricter for large firms, the coverage of the data is generally better for these firms. This would suggest that the coverage of MNE entities is better than average as they are generally large entities, although entities in large MNE groups can be small. It is possible that MNEs heavily involved in tax planning or using complex schemes (e.g. "stateless" entities for tax purposes) opt not to disclose their financial accounts to business registers if the repercussion of not complying with reporting is limited. This may result in under-sampling of such firms, which may bias the results when there are "non-random reasons for information to be missing (e.g. accounts in low-tax jurisdictions are less likely to be included in the dataset)" (Cobham and Loretz, 2014). This issue is addressed in the sensitivity analysis.

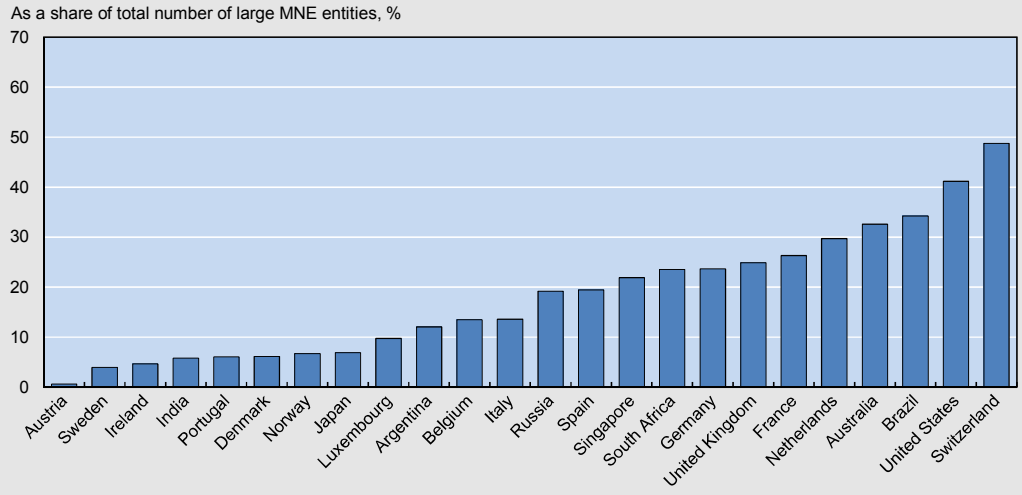
Finally, the current OECD-ORBIS database includes data up to 2010 and the analysis is based on the 2000-10 period. Since then, tax planning behaviours may have changed reflecting factors such as the growing importance of the digital economy and changes in anti-avoidance rules against tax planning and in global value chains. In addition, corporate tax rates have been cut in some countries.

Box 3.A1.2. Disclaimer on the data used in the empirical analysis *(continued)*

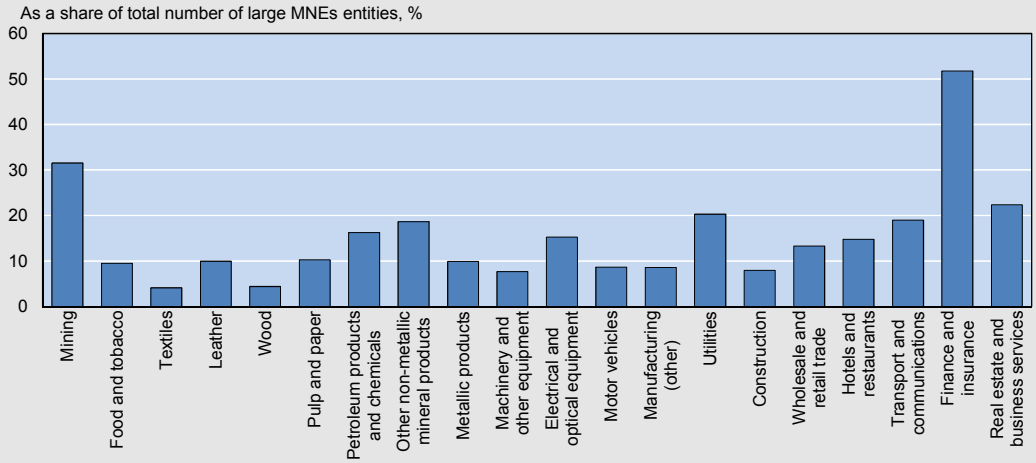
Identified links to no-corporate-tax countries of entities in the sample

Share of large MNE entities in the sample having links to countries not taxing corporate income[13,14]

Panel A: by country of headquarters



Panel B: by industry



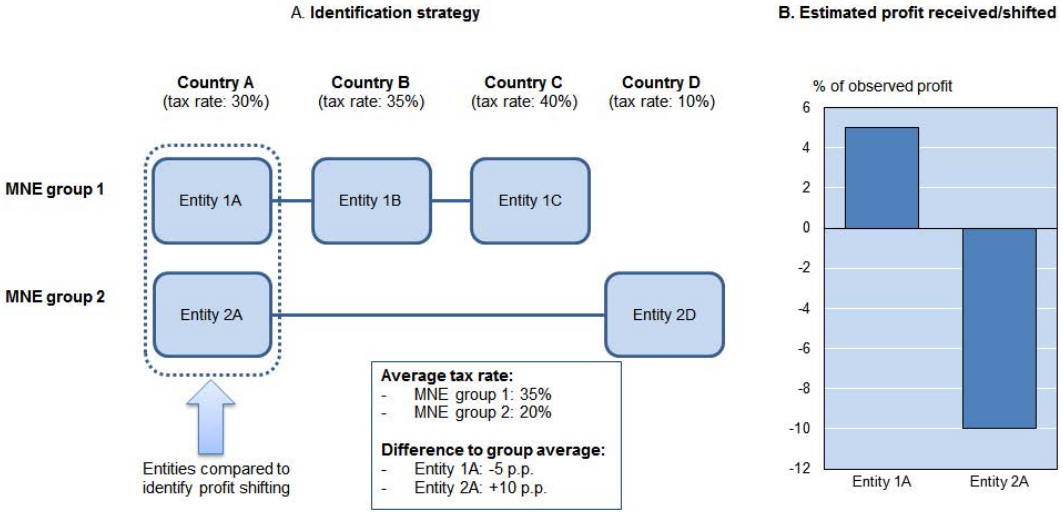
Profit shifting

The empirical strategy to identify profit shifting is to compare the profitability (measured as the ratio of pre-tax profit to total assets or employment) of MNE entities with similar characteristics (e.g. size, industry, etc.), but different opportunities to shift profits (see Box 3.A1.3 for details and Figure 3.A1.3, Panel A). These opportunities depend on the location of the other entities in the corporate group. Entities with links to lower-tax rate countries have opportunities to shift profits abroad, while entities with links to higher-tax rate countries may receive profits from abroad. In this study, the profit shifting opportunity of a MNE entity is measured by the difference between the statutory corporate tax rate in the country of this entity and the average (unweighted) statutory tax rate in the countries where its corporate group operates.[15,16,17] Links to countries outside the sample, including no-corporate-tax countries, are taken into account even in cases of missing financial information of the particular entity.

The estimated profit shifting elasticity implies that a one percentage point (or about 3%) higher statutory corporate tax rate than the average in the corporate group is associated with a reduction in reported profits of about 1% (Figure 3.A1.3, Panel B). This sensitivity is slightly higher than the estimate of a 0.8% reduction in corporate profits based on a meta-analysis of existing firm-level studies (Heckemeyer and Overesch, 2013). The two different measures of profitability (pre-tax profits to total assets or employment) yield similar results.

In addition, results are robust to a number of variants: (i) using different fixed-effects structures (e.g. country and country-interacted-with-time fixed-effects); (ii) restricting the sample to EU countries; (iii) restricting the sample to manufacturing firms; (iv) restricting the sample to sub-periods; (v) re-sampling observations to adjust for the relatively low representation of certain countries in the analysis; (vi) dropping all entities having at least one subsidiary, i.e. keeping the lowest tier in the corporate structure, (to avoid any potential bias involving dividends paid by subsidiaries); (vii) using forward-looking effective tax rates instead of statutory rates; (viii) excluding from the tax variable links to countries with below-average score on rule of law or regulatory quality indicators; (ix) using a 90% ownership threshold (instead of 50%) in the identification of corporate groups.[18] Robustness of the results to extrapolation beyond the sample is an issue that is addressed via sensitivity analysis (see below).

Figure 3.A1.3 Empirical approach on profit shifting: Illustrative example[19]



Box 3.A1.3. Empirical approach: Assessing tax planning based on firm-level data

The strategy to assess profit shifting is to compare the profitability of MNE entities with similar characteristics except for their links to countries with different tax rates. The hypothesis is that MNEs with links to lower-tax rate countries would report relatively low profits in entities located in higher-tax countries compared with similar firms that have no such links. In practice, the estimated equation is as follows:

$$Profitability_{f,g,c,i,t} = \alpha X_{f,g,c,i,t} + \beta\left(STAT_{c,t} - STAT\_group\_avg_{g,c,i,t}\right) + \delta_t + \delta_i,$$

where $Profitability_{f,g,c,i,t}$ is the profitability (the ratio of reported pre-tax profits to total assets or employment) of firm f (operating in MNE group g, country c and industry i) in year t. $X_{f,g,c,i,t}$ is a vector of determinants of true profitability, which includes both firm-specific characteristics (size, position in the group, presence of patents in the group) and macroeconomic variables (GDP growth, exchange rate, inflation, GDP per capita). $\left(STAT_{c,t} - STAT\_group\_avg_{g,c,i,t}\right)$ is the difference between the statutory tax rate in country c and year t and the unweighted average of the statutory tax rates in the countries where the multinational group g operates. Statutory rates are national averages (i.e. they do not reflect regional differences in rates) and do not take into account tax holidays. The tax sensitivity of profits is measured by the coefficient β, which is expected to be negative if profits are shifted to lower-tax rate countries. δ_t, δ_i are respectively time and industry fixed-effects to control for unobserved (non-tax) factors affecting profitability.*

Excluding country fixed-effects in the baseline estimation may bias the estimated tax sensitivity (upwards or downwards) since some unobserved country-specific factors may be captured by the tax sensitivity. However, such fixed-effects may also capture some profit shifting, which would result in underestimating profit shifting (Clausing, 2009; Buettner and Wamser, 2013). The results are qualitatively robust to including both country and country-interacted-with-time fixed-effects, although the tax sensitivity would be reduced by about 30%.

The strategy to assess (jointly) mismatches between tax systems and preferential tax treatment is to compare the effective tax rate (ETR) of a multinational entity in a given country to the ETR of a domestic (i.e. non-MNE) entity with similar characteristics. The ETR considered is the ratio of tax expenses over the profit reported in the financial statements of the firm, at an unconsolidated

level (i.e. for each entity in the group). One caveat is that tax expenses reported in financial accounts are likely to differ from tax liabilities in tax data, for example due to differences in the inclusion of deferred tax expenses, other book/tax differences and differences in the tax residence of the affiliate.

The hypothesis is that if a multinational entity exploits mismatches to reduce its tax burden, it may report a high profit in its financial statements, but its taxable profit (and thus its tax burden) would be lower, for example because of the use of a hybrid instrument or entity. A hybrid instrument can result in an interest deduction in one country as it is treated as debt in this country and a non-taxable income in another country where it is treated as equity. As compared to a standard debt instrument, this would lead to a lower ETR (as measured with financial account data) in the receiving country. However, there would be no visible difference in financial accounts as compared to a standard equity instrument. The use of a hybrid entity will generally result in a lower ETR, as it can allow a MNE entity to report profits in a higher-tax rate country while paying the tax rate of a lower-rate (or no-tax) country. Another example is a dual resident entity which may claim more than one tax deduction for the same interest expense, thereby reducing its ETR. The effective tax rate of MNE entities can also be reduced by the exploitation of preferential tax treatment for certain activities or incomes (e.g. shifting patents to a patent-box country), to the extent that they benefit more than domestic firms, or because of negotiated tax rates. One caveat is that unobserved and inherent differences between MNE and domestic entities that are not related to tax planning (e.g. capital intensity) may also influence their relative ETRs.

Exploiting mismatches between tax systems may involve complex schemes with important fixed costs, suggesting that only large MNEs may engage in it. To account for this, the empirical approach is to compare the effective tax rate of multinational and domestic entities among different size classes. The estimated equation is as follows:

$$ETR_{f,c,i,t} = \beta_1 Large_{firm_{f,c,i,t}} + \beta_2 Small_{firm_{f,c,i,t}} \times MNE_{f,c,i}$$

$$+\beta_3 Large\_firm_{f,c,i,t} \times MNE_{f,c,i} + \beta_4 X_{f,c,i,t} + \delta_i + \delta_{c,t},$$

where $ETR_{f,c,i,t}$ is the effective tax rate of firm f (operating in country c and industry i) in year t, measured as tax expenses over reported profit. $Large\_firm_{f,c,i,t}$ and $Small\_firm_{f,c,i,t}$ are respectively dummies for large (over 250 employees, in line with the EU definition) and small entities. $MNE_{f,c,i}$ is a dummy equal to one when a company is part of a multinational group. $X_{f,c,i,t}$ is a vector of firm-specific controls (position in the group, presence of patents, profitability). The coefficients β_2 and β_3 measure the ETR differential between small (respectively large) MNEs and comparable domestic firms. The hypothesis is that these coefficients should be negative if MNEs exploit mismatches between tax systems and preferential tax treatment to reduce their tax burden. δ_i and $\delta_{c,t}$ are dummies for industry and for country-interacted-with-time, which capture the effect of countries having different (and time-varying) tax rates.

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[*] Estimating profitability of individual affiliates is very difficult with available data, as reflected in only 1.5% of the variance across affiliates being actually explained. This is common among cross-sectional firm-level studies with many observations (see for example Beer and Loeprick, 2014). It reflects the intrinsic volatility of the profit rate, which is largely driven by (unobserved) firm-specific factors. If profitability is not captured by the non-tax variables, the estimated tax responsiveness could be affected.

Mismatches between tax systems and preferential tax treatment

Mismatches between tax systems have not received as much academic attention as profit shifting and little is known about their magnitude.[20] They are more difficult to identify than profit shifting, since a mismatch can exist in any pair of tax systems (and can be aggravated by the use of a third country in a tax planning strategy) regardless of their statutory tax rate. The hypothesis is that by exploiting mismatches between tax systems, for example in the form of hybrid entities or instruments, MNEs can reduce their effective tax rate (ETR) as measured with financial account data. The empirical strategy is to compare the effective tax rate (ETR) of a MNE entity on its reported profit to the ETR of an entity in a domestic group with similar characteristics (see Box 3.A1.3 for details). Differences in ETR between MNEs and domestic entities with similar characteristics may also capture negotiated lower tax rates for MNEs. In addition, they reflect preferential tax treatment of certain activities and incomes if MNEs have structured their activities to benefit more from this treatment than domestic firms (e.g. by shifting their patents to countries with preferential treatment of patent income).

One caveat is that tax expenses reported in financial accounts can differ from actual tax liabilities or cash taxes paid. Financial tax expenses include both current and deferred tax expenses, and can be affected by changes in countries' tax rates on deferred tax assets and liabilities. In contrast, tax accounting does not include the deferred tax expense.

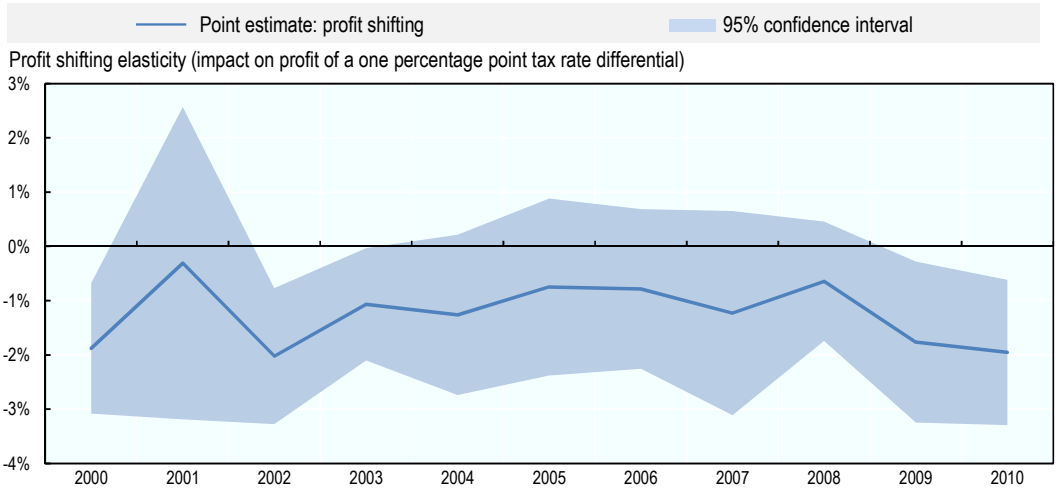
The empirical analysis shows that the ETR of large (with more than 250 employees) MNE entities is on average 3.3 percentage points lower than that of comparable large domestic groups, even after controlling for a number of factors affecting firms' ETR (size, industry, position in the group, presence of patents, profitability, etc.). There is no such difference among smaller firms (less than 250 employees), which may reflect the existence of large fixed costs of setting up schemes to exploit mismatches between tax systems (e.g. complex structures or financial instruments, tax and legal advice). Possibilities to negotiate reduced tax rates and to exploit preferential tax treatment may also be greater among large firms. As the empirical results for profit shifting, the results are robust to a number of variants using the available sample of firms.

Trends in international tax planning

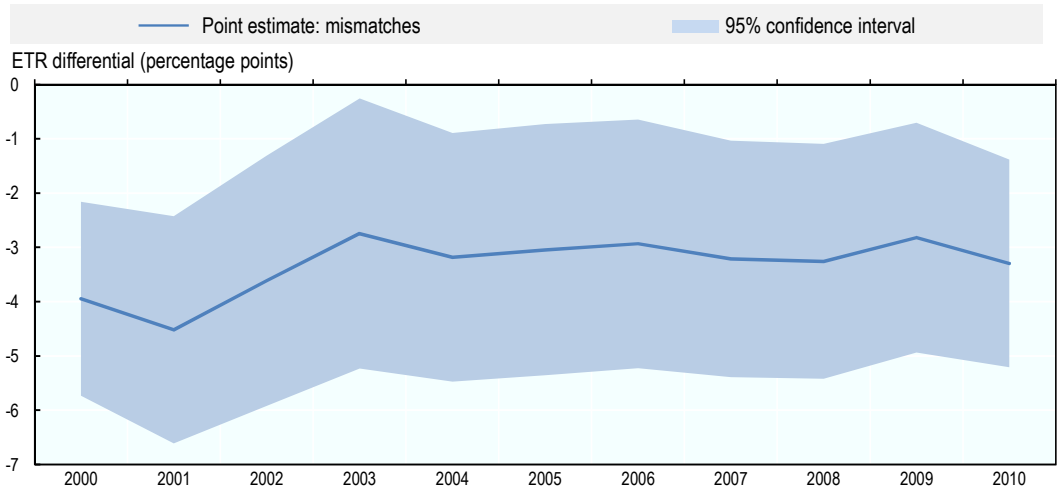
Changes in tax planning intensity can only be assessed over 2000-2010 with the available firm-level data. The empirical analysis suggests no clear trend over this period (Figure 3.A1.4). One possible explanation is that a potential increase in the tax planning intensity due to increasing globalisation and greater reliance on intangible assets has been offset by stricter anti-avoidance rules (see section 2.5).

Figure 3.A1.4 Trends in international tax planning, 2000-2010

Panel A: Profit shifting



Panel B: Mismatches between tax systems including preferential tax treatment



Note: Panel A shows that in 2000 a one percentage point higher statutory corporate tax rate than the average in the corporate group is associated with a reduction in reported profits of about 1.9%. Panel B shows that in 2000 the ETR of large MNE entities is on average close to 4 percentage points lower than that of comparable large domestic groups. The year estimates are obtained by interacting the tax planning sensitivities described in Box 3.A1.3 with a year dummy.

Identifying the main tax planning channels

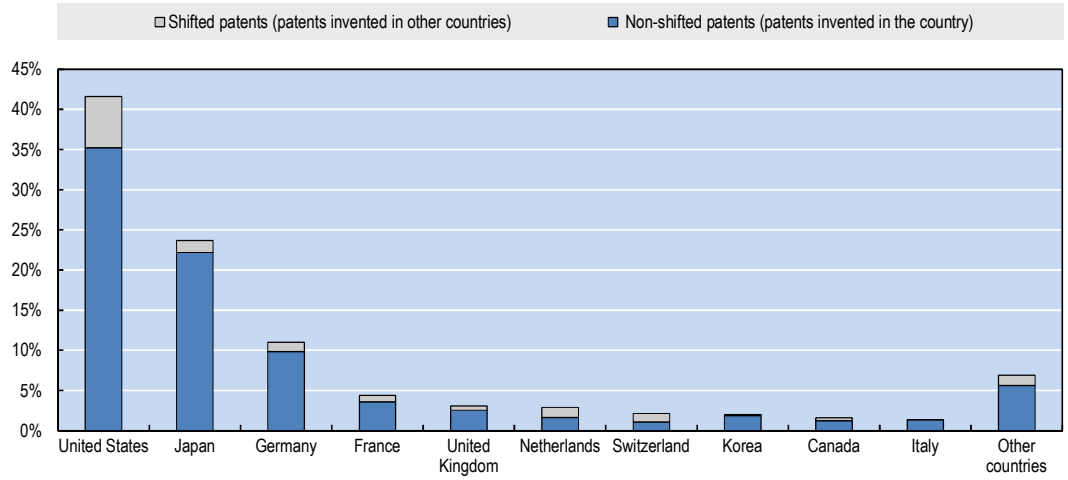
The empirical approach in this study estimates the overall magnitude of tax planning as it is difficult to separate and quantify each channel such as transfer price manipulation and strategic location of external and internal debt. Nevertheless, it is possible with the available data to identify certain channels and certain types of MNEs engaging more intensively in tax planning.

Intangible assets are an important tax planning channel

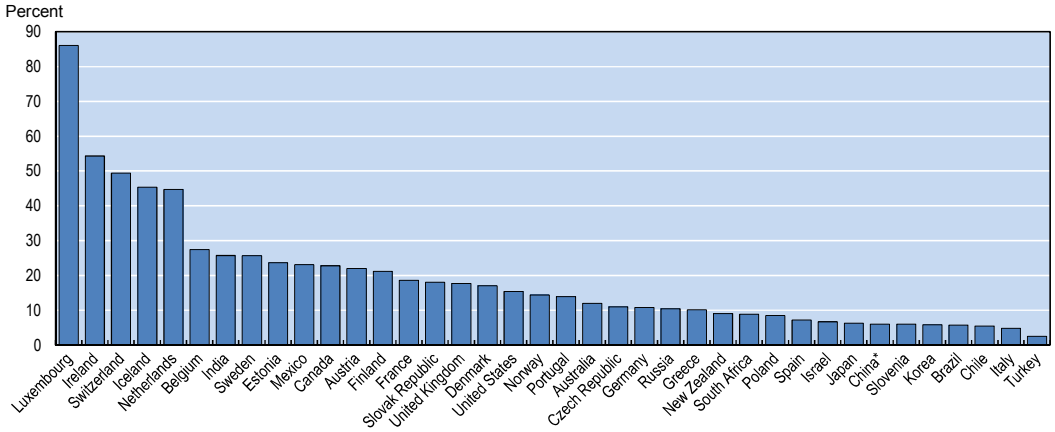
MNEs can shift profits by locating intangible assets (e.g. patents, property rights, brands, know-how, etc.) and their associated revenues in lower-tax countries. This is facilitated by intangible assets (and the associated revenues) being easier to shift and more difficult to price and thus more susceptible to transfer price manipulation than other assets. Indeed, the share of patents that have been shifted, i.e. patents where the inventor is located in a different country than the MNE entity applying for the patent protection, varies significantly across countries (Figure 3.A1.5). Still, this can reflect factors other than taxes, such as outsourcing of R&D activities. More generally, patent data do not capture all types of intangible assets.

Figure 3.A1.5 Distribution of patents across countries

Panel A: Shifted and non-shifted patents as % of worldwide patents, 1998-2011[21]



Panel B: Shifted patents as % of total patents in each country, 1998-2011[22]



Note: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

* People's Republic of China.

Source: PATSTAT Database.

An increasing number of countries have preferential tax treatment of the income from intellectual activities (so-called "patent boxes" or "IP-boxes") (see Table 3.A1.1). In some countries, but not all, the preferential tax treatment is conditional on activity requirements and does not apply to acquired intellectual property unless it is further developed in the buying country (Evers et al. 2013; PWC, 2013).[23]

Table 3.A1.1 Tax treatment of intellectual property in selected OECD and G20 countries, 2014[24]

Country	Corporate tax rate	Patent box rate	Qualifying intellectual property	Acquired intellectual property	Year of introduction
Belgium	34	6.8	Patents, Supplementary Protection Certificates	Yes, if further developed	2007
China[1]	33	0-12.5	Patents, process innovation	na	2008
France	34.4	15.5	Patents, extended patent certificats, patentable inventions, manufacturing processes associated with patents, improvements of patents	Yes, under certain conditions	2001
Hungary	19	9.5	Patents, industrial designs, trademarks, copyrights, know-how, business secrets	Yes	2003
Luxembourg	29.2	5.84	Patents, designs, trademarks, brands, domain names copyrights on software	Yes	2008
Netherlands	25	5	Patents, Intellectual propert from R&D projects	Yes, if further developed	2007
Portugal	31.5	50% of gross income exempted	Patents, industrial designs or other protected intellectual property rights	Yes, if transfer complies with transfer pricing rules and country not considered a tax haven	2014
Spain[2]	30	60% of patent income exempted	Patents, secret formulas and procedures, plans, models	Yes, under certain conditions	2008
Switzerland (Niedwalden)	21.1	8.8	Patents, secret formulas and processes, trademarks, copyrights, software, know-how	Yes	2011
Turkey (Technology development zones)	20	20	Patents, licences, Intellectual propert from R&D projects	No	2001
United Kingdom	21	10	Patents, Supplementary Protection Certificates, certain other rights similar to patents	Yes, if further developed	2013

Notes:

1. People's Republic of China.

2. The corporate rate is reduced to 28% in 2015 and 25% in 2016 and onwards.

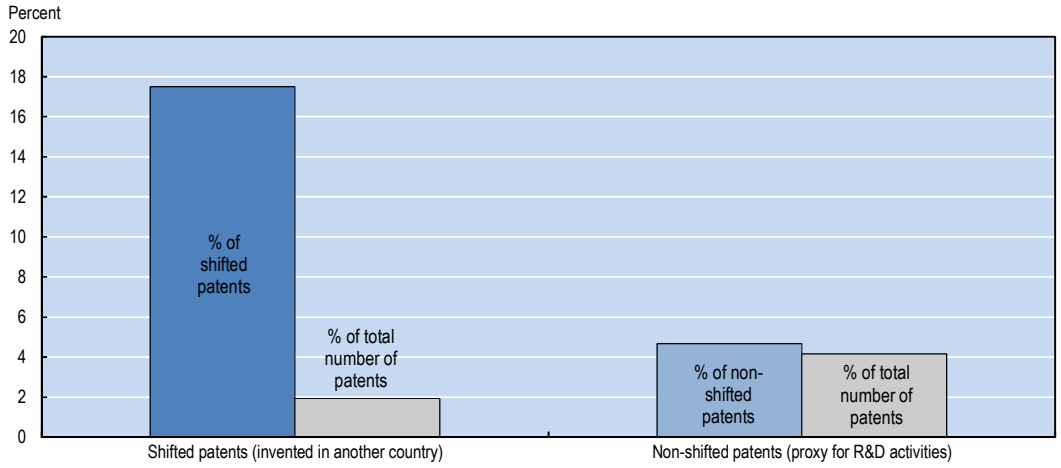
Source: Evers et al. (2013) and PWC (2013).

The empirical strategy to assess the tax sensitivity of the location of patents is to compare patent applications of MNE entities with similar characteristics except for their links to countries with different tax rates (Box 3.A1.4).[25] The hypothesis is that MNEs with links to countries with a lower effective tax rate on patent income (statutory rate or reduced rate for patents) would apply for fewer patents in entities located in higher-tax countries as compared to similar firms that have no such links. Similarly to the profit shifting analysis, taxes are measured by the difference between the corporate tax rate or the preferential tax rate on intellectual property income in the country of an entity and the average (unweighted) tax rate in the countries where the group operates. The analysis considers the impact of taxes on both shifted and non-shifted patents. Non-shifted patents are used as a proxy for R&D activities.

The empirical analysis suggests that preferential tax treatment attracts both patents invented in other countries and R&D activities. For instance, a 5 percentage point cut in the preferential tax rate on patent income is associated with an increase of 17% in the number of shifted patents, which represents a 2% increase in the total (shifted and non-shifted) number of patents. The same tax rate cut is also associated with an increase of 5% in the number of non-shifted patents, corresponding to a 4% increase in the total number of patents (Figure 3.A1.6). The relative importance of these two effects is likely to vary with the design of the preferential tax treatment, such as activity requirements.

Figure 3.A1.6 The effect of preferential tax treatment on the number of patent applications

Change in patent applications induced by a 5 percentage point cut in the preferential tax rate on patent income



1. Shifted (non-shifted) patents are patents where the inventor is located in a different (the same) country than the MNE entity applying for the patent protection. A 5 percentage point cut in the preferential tax rate on patent income is associated with an increase of 17% in the number of shifted patents, which corresponds to 2% of all (shifted and non-shifted) patents. The effect is evaluated for an average country where the share of shifted patents is 11% (weighted average of available countries).

Box 3.A1.4. Empirical approach: Location of patents

The empirical approach to assess tax sensitivity of patent location is to compare the patent applications of MNE entities with similar characteristics except for their link to countries with different tax rates. The hypothesis is that MNEs with links to lower-tax countries would apply for relative fewer patents in entities located in higher-tax countries compared with other similar firms that have no such links. In practice, the estimated equation is as follows:

$$\begin{aligned} &\boldsymbol{Patents}_{f,g,i,c,t} \\ &= \boldsymbol{f}\{(\boldsymbol{EffectiveTaxPatent}_{c,t} \\ &- \boldsymbol{EffectiveTaxPatent\_group\_avg}_{g,i,c,t}), \boldsymbol{X}_{f,g,i,c,t}, \boldsymbol{Y}_{g,i,c,t}, \boldsymbol{Z}_{c,t}, \boldsymbol{\delta}_i, \boldsymbol{\delta}_c, \boldsymbol{\delta}_t, \boldsymbol{\varepsilon}_{f,g,i,c,t}\} \end{aligned}$$

where $\boldsymbol{Patents}_{f,g,i,c,t}$ is the number of patent applications to the three main patent offices in the world of firm $\boldsymbol{f}$ (belonging to group g operating in country $\boldsymbol{c}$ and industry $\boldsymbol{i}$) in year $\boldsymbol{t}$. $(\boldsymbol{EffectiveTaxPatent}_{i,t} - \boldsymbol{EffectiveTaxPatent\_group\_avg}_{g,i,c,t})$ is the difference between the effective tax rate on patent income in the home country and the average effective tax rate on patent income in the group. The effective tax rate on patent income is the patent-box tax rate if a patent box exists; otherwise it is the statutory tax rate. $\boldsymbol{X}_{f,g,i,c,t}, \boldsymbol{Y}_{g,i,c,t}$ $\boldsymbol{and}$ $\boldsymbol{Z}_{c,t}$ are vectors of control variables, including: the entity's lagged depreciated stock of patent applications, the concentration of researchers and statutory corporate tax rates (both defined in differential terms relatively to the MNE group average, in the same way as the tax variable), entity size dummies, headquarter dummy, parent dummy, MNE group size, R&D subsidies at home and on average in the countries where the group operates. $\boldsymbol{\delta}_i$ $\boldsymbol{\delta}_c$ and $\boldsymbol{\delta}_t$ are industry, country and time fixed-effects. In a second step, the effect of preferential tax treatment is separated from the effect of statutory corporate tax rates by interacting the effective tax rate with a dummy variable identifying whether the country has a patent box or not. The model is estimated successively for all, shifted and non-shifted patents.

The patent data is sourced from the OECD PATSTAT data matched with ORBIS data for firm characteristics. The sample consists of entities in 25 countries covering the years 2004-10. The equation is estimated using a negative binomial model, which is a non-linear model suited for high-variance count data, such as patent numbers.

Consistent with this, the profit shifting analysis confirms that profit shifting is significantly stronger – the tax sensitivity is about twice as large – among MNE groups with patents than for non-patenting MNE groups. Moreover, all else equal, patenting firms are found to have a lower ETR than non-patenting firms, which reflects the existence of preferential treatment for intellectual property and R&D tax credits in some countries. This difference is larger for MNEs than for domestic firms, suggesting that MNEs benefit more from these tax incentives by shifting patents and R&D investments to countries with preferential treatment for patent income and R&D investments.

MNEs manipulate the location of debt

One profit shifting strategy of MNEs is to locate external and internal debt in higher-tax rate countries, which allows MNEs to reduce their tax burden by deducting interest payments from taxable profits at a higher rate.[26] A number of studies have analysed the sensitivity of MNEs' capital structure to corporate taxation and find that firms' leverage depends on domestic and international taxation (e.g. Huizinga et al., 2008; Dischinger et al., 2010; Buettner and Wamser, 2013). Using German firm-level data, Møen et al. (2011) find evidence of both internal and external debt shifting and estimate that they are of about equal relevance.

An in-depth analysis of MNEs' allocation of external debt (i.e. third-party debt to credit institutions), relying on a similar approach as the profit shifting analysis, confirms that MNEs tend to locate external debt in higher-tax rate countries (see Box 3.A1.5). Specifically, the estimated debt-manipulation elasticity implies that a one percentage point higher statutory corporate tax rate of an entity than the average in the MNE group is associated with a 1.3% higher external debt for this entity. For the average entity, this would translate into a reduction in profit by about 0.2% (as compared to an overall reduction of 1% for profit shifting as a whole), accounting for 20% of overall estimated profit shifting. This is a lower-bound estimate, as the analysis only focuses on third-party debt and does not include the location of intra-group debt, which has been shown to be a significant tax planning channel (Buettner et al., 2012). In the financial account data used in this study, intra-group debt cannot be isolated.

Box 3.A1.5. Empirical approach: Manipulation of the location of external debt

The strategy to assess manipulation of the location of debt draws on Huizinga et al. (2008) and is similar to the profit shifting analysis. The idea is that the observed debt of an entity is the sum of a "true" and a manipulated debt. Manipulated debt would generally be positive in higher-tax rate countries and negative in lower-tax rate countries. The strategy is to compare the leverage of MNE entities with different opportunities to manipulate (i.e. shift or receive) debt, controlling for other characteristics influencing "true" debt. Manipulation opportunities are assessed based on the location of the other firms in the group and the statutory tax rate in these locations. A lower tax rate than the group average is assumed to be associated with shifting of debt to higher-tax rate countries, while a higher tax rate would be associated with receiving debt. Reflecting this strategy, the baseline equation is:

$$\frac{Debt}{Equity}_{f,g,c,i,t} = \alpha X_{f,g,c,i,t} + \beta\left(STAT_{c,t} - STAT\_group\_avg_{g,c,i,t}\right) + \delta_t + \delta_i$$

where $\frac{\boldsymbol{Debt}}{\boldsymbol{Equity}}_{\boldsymbol{f,g,c,i,t}}$ is the leverage (i.e. external debt-to-equity) ratio of MNE entity f, which is part of MNE group g and operates in country c and industry i, in year t. Debt refers to debt owed to financial institutions, as reported in an entity's financial accounts sourced from the ORBIS database. Importantly, it does not include intra-group debt, reflecting data limitations. $\left(\boldsymbol{STAT_{c,t} - STAT\_group\_avg_{g,c,i,t}}\right)$ is the difference between the statutory tax rate in country c and the unweighted average of the statutory tax rates in the countries where the multinational group of f operates. A positive $\boldsymbol{\beta}$ would indicate that debt is located in higher-tax countries. $\boldsymbol{X_{f,g,c,i,t}}$ is a vector of determinants of "true" debt including firm-specific controls such as size, position in the group (headquarters, other parent entity or non-parent entity) and the number of countries where its MNE group operates. Country or industry-specific controls are: GDP growth, value-added growth in the industry, development level (GDP per capita) and size of the credit sector (measured by private credit as a share of GDP and the share of employment in the finance industry). $\boldsymbol{\delta_t}$ and $\boldsymbol{\delta_i}$ are respectively time and industry fixed-effects.

Another way to assess the relative importance of profit shifting channels is to compare the tax sensitivity of pre-tax profit with the sensitivity of operating profit (i.e. profit before interest expenses and financial income). The tax sensitivity of pre-tax profit captures all profit shifting channels (transfer pricing, location of intangibles, location of debt, interest rate manipulation, etc.), while the tax sensitivity of operating profit does not include the location of debt and interest rate manipulation. For example, if the tax sensitivity of pre-tax profit were twice as large as the one of operating profit, debt manipulation would represent half of overall profit shifting. The empirical analysis does

not find a statistically significant difference between the tax sensitivity of operating profit and that of total pre-tax profit. One caveat is that pre-tax profit includes financial income, i.e. interest income and dividends received. However, results are robust to dropping all entities with at least one identified subsidiary, which are the principal ones receiving dividends.

Summing up, the analysis suggests that transfer price manipulation, artificial allocation of legal ownership of intangible assets and manipulation of debt levels are important profit shifting channels. This is in line with recent literature findings (Heckemeyer and Overesch 2013; Buettner and Wamser, 2013).[27]

Treaty abuse is a way of implementing tax planning

MNE groups present in many countries have greater tax planning opportunities. Indeed, they have access to a broader range of (potentially mismatching) tax systems and pairs of bilateral tax treaties, creating scope for "treaty abuse". The empirical evidence suggests that both profit shifting and the exploitation of mismatches between tax systems are significantly more frequent among MNEs present in more than five countries. Their profit shifting propensity is more than twice as high as other MNEs and their propensity to exploit mismatches about 1.5 times higher

Overall effect of tax planning on the effective tax rate of MNEs

As a result of both profit shifting and mismatches between tax systems, the effective tax rate of large (more than 250 employees) MNE entities is on average 4-8½ percentage points lower than that of domestic group entities with similar characteristics along a number of dimensions (Table 3.A1.2). This differential is even higher among very large firms (more than 1 000 employees). The differential is also higher among patenting MNEs, which have a higher profit-shifting intensity than other MNEs and take greater advantage of tax incentives for R&D than domestic firms (by locating R&D and patents strategically). In contrast, the ETR differential is lower for smaller (non-patenting) MNE entities, as small MNEs appear to exploit profit shifting opportunities but not mismatches between tax systems.

Overall, the results suggest that there are two categories of tax planning MNEs. A first category is large MNE groups engaged in complex schemes often involving the exploitation of mismatches between tax systems, preferential tax treatment, abuse of bilateral tax treaties and profit shifting to low-or-no-tax countries. The empirical analysis suggests that tax planning can greatly reduce the effective corporate tax rates of these groups. The other category is smaller MNEs shifting profit via manipulation of the price of intra-group transactions and the location of debt, but not engaging in more complex tax schemes. This reduces their tax burden, but to a lesser extent than that of the first category.

Table 3.A1.2 Profit shifting and mismatches reduce the effective tax rate of MNEs[1]

Average differential in the effective tax rate between MNEs and domestic groups with similar characteristics
Percentage point

	Induced by:		
	Profit shifting	Mismatches between tax systems and preferential tax treatment	**Total**
Small MNE entity (<250 employees) as compared to a small non-MNE (domestic) entity	-2.0 [-1½ to -3½]	0.0	**-2.0 [-1½ to -3½]**
Large MNE entity (250+ employees) as compared to a large non-MNE (domestic) entity	-2.0 [-1½ to -3½]	-3.3 [-2½ to -5]	**-5.3 [-4 to -8½]**

1. The ranges around the average differential are computed using the sensitivity assumptions described in section 3.1.

Anti-avoidance rules can mitigate international tax planning

A variety of "anti-avoidance" rules exist in most countries to prevent tax planning strategies. Common ones include rules that hinder the manipulation of the price of transactions between related firms (transfer-pricing rules), rules that limit base erosion via interest deduction (e.g. thin-capitalisation and interest-to-earnings rules), specific rules applying to MNE income generated in foreign countries (controlled foreign company rules) and general and other specific anti-avoidance rules (GAAR and SAAR) (see Box 3.A1.6).

Withholding taxes on interest, royalties and dividends (i.e. taxes levied on these kinds of payments to non-resident entities) can influence cross-border tax planning opportunities even though they are not strictly speaking anti-avoidance rules. Withholding taxes influence firms' incentives to shift profit when they are levied at higher rates on payments made to residents of lower-tax rate countries. For instance, withholding taxes on interest income and royalties can discourage profit shifting via strategic allocation of debt and intangible assets, as they reduce the after-tax income of the firm in the receiving country.

Box 3.A1.6. Anti-avoidance rules

Some of the main anti-avoidance rules in domestic tax systems in OECD and G20 economies are (OECD, 2013):

- Transfer price rules require that cross-border transactions between related firms should be valued at market price (so-called "arm's length" principle). When no comparable transaction exists, different valuation methods can be used, for instance based on cost plus a fixed mark-up or using economic models to split the relevant profit among entities.
- Thin capitalisation rules and rules limiting interest deductibility disallow the deduction of certain interest expenses when the debt-to-equity or the interest-to-earnings ratio of the debtor is considered excessive. These rules apply either to total or related-party debt.
- Controlled foreign company (CFC) rules aim at eliminating the deferral of tax on certain income by using lower-tax foreign affiliates or the exemption on certain mobile foreign source income.
- General or other specific anti-avoidance rules prohibit "aggressive" tax avoidance, for instance, by denying tax benefits from a transaction that lacks economic substance.
- Anti-hybrid rules link the domestic tax treatment of instruments or entities with the tax treatment in the foreign country, thus eliminating the mismatch between tax systems. For instance, they may deny the deduction of interest if treated as non-taxable dividend in the recipient country.

A number of academic studies have classified countries according to the degree of strictness on specific anti-avoidance rules, such as transfer pricing regulations and rules against debt manipulation (e.g. Lohse et al., 2012; Lohse and Riedel, 2012; Blouin et al., 2014). However, there exists no classification of the overall strictness of the anti-avoidance stance.

Building upon these studies, a new, though limited, classification on the strictness of anti-avoidance and withholding taxes among OECD and G20 countries is developed in this study. Detailed tax rules vary significantly between countries and the classification aims at grouping countries along the key dimensions of anti-avoidance that are relatively easy to quantify and compare across countries, using simple and mechanical rules. The classification focuses on: (i) requirements regarding transfer pricing documentation; (ii) rules that limit interest deductions (i.e. thin capitalisation and interest-to-earnings rules); (iii) existence of a GAAR; and (iv) existence of a CFC rule. The classification also considers the level of withholding taxes on interests, dividends and royalties as they can influence MNEs' incentives to shift profit. Within the European Union, withholding taxes are set to zero by law.

On transfer pricing, interest deductibility and withholding taxes, the classification is based on a 0-1-2 scale, which captures the broad strictness of rules but may miss important country-specific details. On GAAR and CFC rules, a simpler 0-1 scale based on the existence of a rule is used, reflecting the difficulty to classify these country-specific rules in a harmonised way. The overall classification sums the 5 components. As a result, the classification runs from 0 to 8.

A caveat to this classification is that some aspects of anti-avoidance rules that are more difficult to compare across countries as well as country-specific details and enforcement practices (e.g. frequency of tax audits, penalties in case of non-compliance) are not captured. In addition, the classification does not distinguish between territorial and worldwide tax systems.

Information on some of the main anti-avoidance rules and withholding taxes among OECD and G20 countries is the basis for a new, though limited, composite anti-avoidance classification outlined in Box 3.A1.6 and presented in Figure 3.A1.7. This grouping

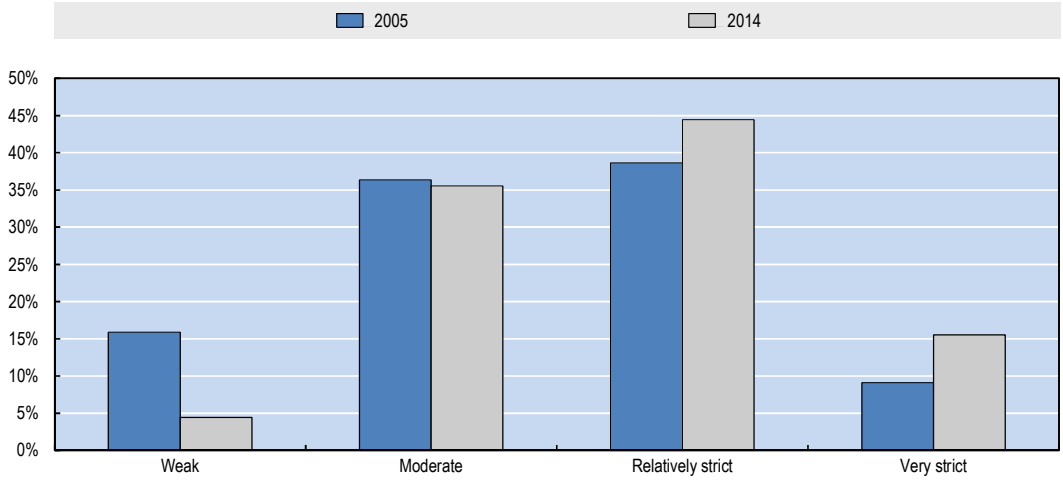
builds upon earlier classification efforts in the literature (Lohse et al., 2012; Lohse and Riedel, 2012; Blouin et al., 2014). According to this grouping of countries, anti-avoidance rules appear to be comparatively strict in countries with relatively high corporate tax rates. This may reflect that, in countries with relatively high tax rates, firms have stronger incentives to avoid taxes, prompting governments to introduce stricter regulations.

A few existing studies have assessed the role of specific anti-avoidance rules for firms' behaviour, such as the impact of transfer pricing regulations on profit shifting (e.g. Lohse and Riedel, 2012) and the effect of thin capitalisation rules on firms' capital structure (e.g. Blouin et al., 2014). Generally, these studies find that individual anti-avoidance measures can reduce tax planning. However, there is no evidence of the overall impact of anti-avoidance rules and their implementation on tax planning.

Based on the slightly broader, but still limited, anti-avoidance classification presented in Figure 3.A1.7, the estimates in this study suggest that relatively stricter anti-avoidance rules are associated with lower profit shifting across OECD and G20 economies.[28] For instance, an increase in the strictness of anti-avoidance rules from moderate to relatively strict is associated with a reduction in profit shifting from that country by about one half. The empirical analysis also provides evidence that rules that limit base erosion via interest deductions are associated with reduced debt manipulation.

Figure 3.A1.7 Illustrative classification of anti-avoidance rules

Distribution of countries by degree of strictness of anti-avoidance rules and withholding taxes



Note: 15% of countries in the sample (which includes all OECD and G20 countries) had "very strict" anti-avoidance rules in 2014. A "very strict" anti-avoidance rule corresponds to a score of 7-8 on the 0-8 indicator of anti-avoidance and withholding taxes described in Box 3.A1.6. A score of 8 is defined as the combination of strict documentation requirements on transfer pricing, a strict rule against debt manipulation, existence of a GAAR and a CFC rule as well as relatively high withholding taxes on interest, dividends and royalties. A "relatively strict" rule corresponds to a score of 5-6, a "moderate" to 3-4 and "weak" to 0-2. The indicator does not reflect the enforcement of existing rules.

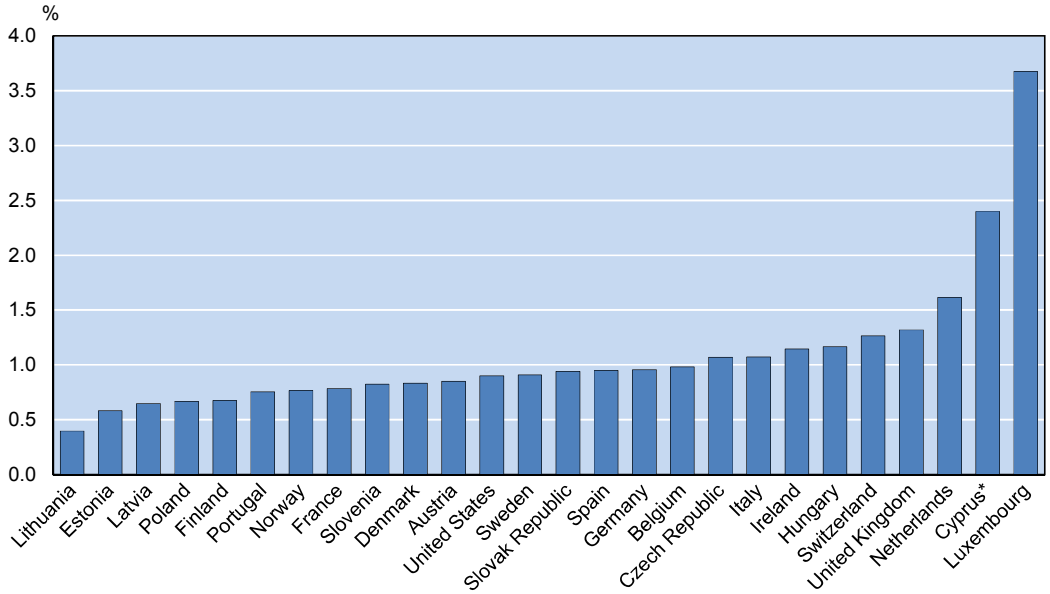
Both tax planning and anti-avoidance entail compliance costs, reducing firms' profitability

Complex tax codes result in wasted resources for firms and tax administrations and can contribute to deter foreign investment. International tax planning also involves a collective waste of resources due to the costs associated with setting up complex tax schemes (e.g. tax and legal advice). One indication of resources spent on tax planning is the share of production of the "tax consultancy" industry in overall output (Figure 3.A1.8). Still, this indication is rough as this production category also includes non-tax-related activities, such as regular accounting and bookkeeping activities, the size of which varies across countries, depending among other things on industry structure.

One reason for the complexity of the tax system is that governments react to tax planning by some firms with anti-avoidance legislation that increases the administrative cost of all firms. For instance, Slemrod et al. (2007) suggests that tax complexity in the United Kingdom has increased mainly because of a significant volume of anti-avoidance legislation was added to the tax code. Consistent with this, the empirical analysis shows that anti-avoidance rules mitigate profit shifting, but are also associated with significantly lower average (pre-tax) profitability. The lower profitability may reflect resources spent on tax compliance. This adverse effect on average profitability is robust to controlling for the income level of a country, burdensome regulations in other areas and the statutory corporate tax rate. Compliance costs for firms as well as administration and enforcement costs for tax authorities are important to the assessment of the overall cost-benefit of anti-avoidance rules. Co-ordinating anti-avoidance rules across countries could reduce compliance costs for MNEs.

Figure 3.A1.8 Production of the accounting, bookkeeping, auditing and tax consultancy industry[29]

% of GDP, 2011



Note by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is

found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Source: Eurostat, BEA, OECD calculations.

Fiscal and economic implications of international tax planning

International tax planning affects both the size of the global corporate tax revenues and the distribution of tax bases and revenues across countries.[30] As the lost revenues would have been used to finance welfare or efficiency-enhancing public expenditures or to reduce other distortive taxes, such redistribution has real effects. Tax planning can also affect real activity in several other ways. As compared to a situation where tax planning would not be possible, tax planning MNEs have a lower tax burden, which may give them a competitive advantage over other firms. Also, the possibility to manipulate the location of internal and external debt reduces the effective cost of debt for MNEs, which can lead them to take on higher overall leverage. In addition, tax planning opportunities lessen the importance of corporate tax rates in shaping the allocation of MNEs' investment (both tangible and intangible) across countries.

Fiscal implications

Profit shifting redistributes corporate tax bases across countries and results in global tax revenue losses as shifted profits are taxed at a lower average rate than they would have been in the absence of profit shifting. While profit shifting entails gains or losses at the country level depending on the characteristics of tax systems, in the case of mismatches between tax systems (including preferential tax treatment) there are generally no gains in terms of tax revenues, but there can be ambiguity as to who has lost revenue. For example, both parties concerned by a scheme involving a hybrid security may (or may not) claim that they lost revenues. Another difficulty is to identify the most frequent schemes and countries involved in these mismatches.

The revenue effects are presented for hypothetical combinations of tax bases and tax rate differentials between tax rates faced by the average MNE entity in the home country and the tax rate faced by this hypothetical MNE on average in the other countries where it operates. They should be seen as illustrative and ranges reflecting the many uncertainties of the analysis are provided. The revenue estimates are based on the average tax planning propensity (both for profit shifting and mismatches) estimated over the full sample of countries, in combination with different hypothetical tax rate differentials and tax bases (i.e. the share of MNE profits in total corporate profits). It is important to note that the average propensity leaves aside certain country-specific differences in tax planning intensity, for example resulting from the strictness and enforcement of rules against tax planning.

Illustrative results for hypothetical cases

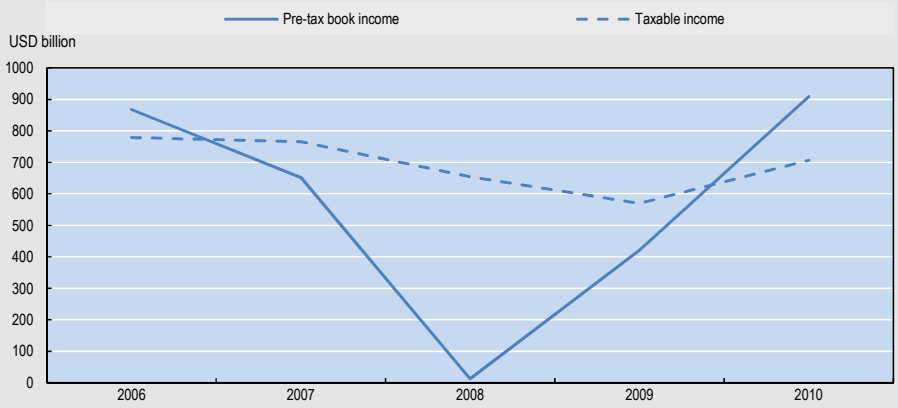
A number of assumptions are required to translate the estimated tax planning propensity into estimated effects on corporate tax revenues. One assumption is the share of MNEs in taxable profits, which in many countries is not readily available from tax statistics. Based on the sample of firm-level financial account data used in this study, this share ranges

between 40% and 80% in most OECD and G20 countries. The revenue effects of tax planning are also based on the assumption that corporate tax revenues change in proportion with reported financial profits. This is an approximation because of potential differences between reported and taxable profits due to, inter alia, book/tax differences and tax credits. The effect of book/tax differences on the estimated revenue effects is ambiguous (Box 3.A1.7). By contrast, taking into account tax credits would increase the revenue effects where such tax credits are significant. Information on tax credits is limited and the available data suggest that they can vary substantially across countries and over time. The assumption in this hypothetical example is that tax credits represent 15% of CIT revenues before tax credits. Another key assumption is that firms outside the sample have similar structures and behave in a similar way as firms in the sample. Sensitivity analysis to this assumption is presented below.

Box 3.A1.7. The impact of book/tax differences and tax credits on tax revenue estimates

There exist few estimates of the difference between book and taxable profits. In the United States, the difference was volatile over 2006-10. Excluding the crisis-year 2008, the difference was relatively small on average over the period (Boynton et al., 2014; see Figure below). This pattern would suggest that differences in the timing of recognition of income and expenses are an important driver of book/tax differences (see Section 2.2 above on the sources of book/tax differences). In Germany, financial profits were 10% lower than taxable profits in 2009, with the difference being largest among firms engaged in corporate restructuring, but the corresponding information is not available for other years (Zinn and Spengel, 2012).

Book/tax differences in the United States[1]



Source: Boynton et al. (2014). Data is for SEC 10-K corporations.

Book/tax differences can affect the estimation of the average tax planning propensity, which is based on financial account rather than tax data. Book/tax differences that are independent of tax planning (e.g. timing differences) likely create noise in the estimation, but are unlikely to bias the estimated tax sensitivity in any direction. In contrast, certain book/tax differences result from tax planning schemes (e.g. a dual residence scheme leading to the same interest expense being deducted in more than one country). These schemes would reduce taxable income relatively to book income (Lisowsky, 2010). Such schemes are not identified in the profit shifting analysis, but they are captured in the empirical analysis of mismatches between tax systems, which focuses on how reported profits are taxed.

Box 3.A1.7. The impact of book/tax differences and tax credits on tax revenue estimates *(continued)*

Book/tax differences can also affect tax revenue estimates for a given tax-sensitivity of reported profits. Indeed, these differences imply that corporate tax revenues may not change proportionately with profits reported in financial accounts. For example, if taxable profit is systematically lower (respectively higher) than book profit, shifting 5% of book profit would amount to shifting more (respectively less) than 5% of taxable profit and thus lead to a revenue loss greater (respectively smaller) than 5% of revenues.

Similarly, the existence of tax credits, if they are unaffected by profit shifting, can influence revenue estimates. Taking tax credits into account would increase estimated revenue effects (see Table below).

Illustrative example of the effect of book/tax differences and tax credits

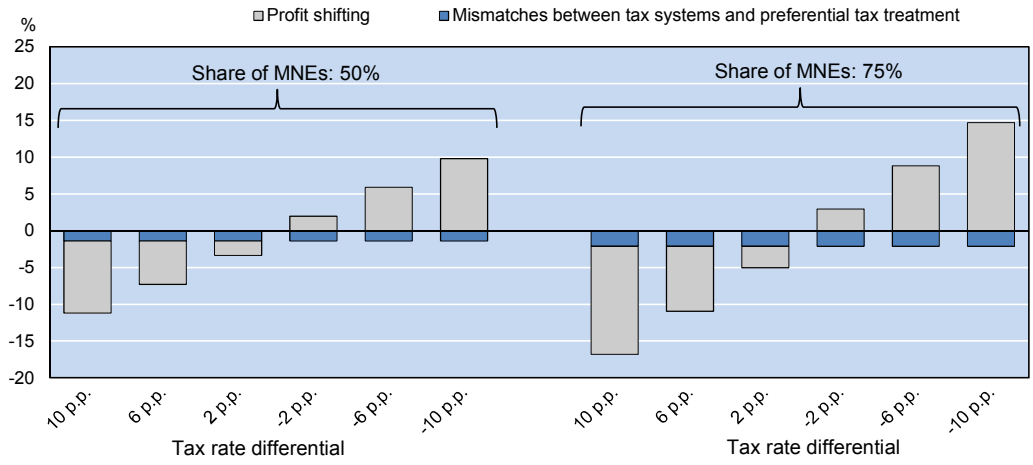
	No tax planning	Tax planning	Share of tax planning
(1) Financial account profit	105.0	100.0	5.0%
(2) Taxable profit (assuming 10% lower tax than book profits)	94.5	89.5	5.6%
Tax rate	*30%*	*30%*	
(3) Tax before credits	28.4	26.9	5.6%
(4) Tax credits (assuming 15% of tax before credit)	4.0	4.0	
(5) Tax after credits	24.3	22.8	6.6%

Note: Profit shifting is assumed to reduce financial account (i.e. reported) profit by 5% (line 1). Assuming that taxable profits are 10% lower than financial profits, then profit shifting represents 5.6% of taxable profit (line 2). Assuming that tax credits represent 15% of tax before credits and are unaffected by profit shifting, revenue losses from profit shifting, revenue losses would represent 6.2% of tax revenues rather than 5% (line 5).

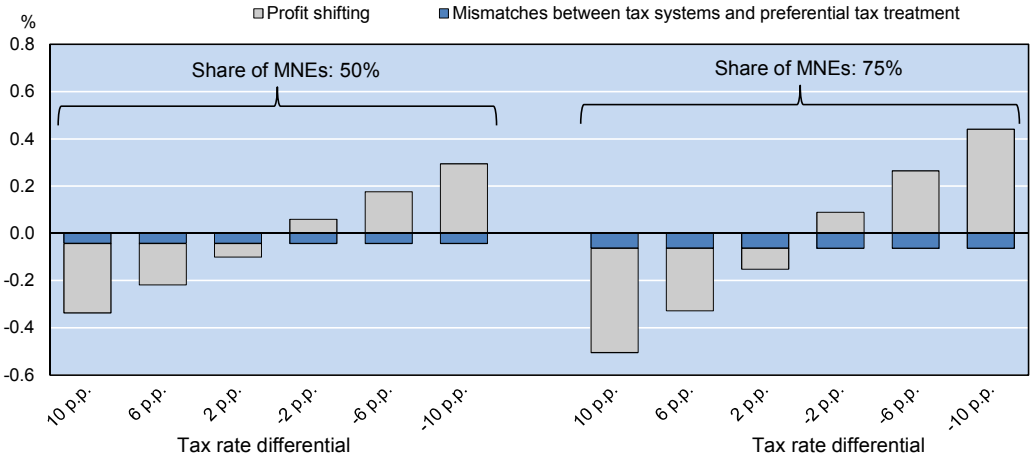
Based on these assumptions, illustrative tax revenue effects of tax planning in hypothetical cases are presented in Figure 3.A1.9. These estimates represent average effects for different combinations of statutory tax rate differentials and tax bases (i.e. shares of MNEs profits in total corporate profits). Clearly, actual tax revenue effects in a given country can deviate substantially from these hypothetical estimates. Indeed, the estimates rely on the observation that MNE entities that face higher-tax rate differentials tend to have more links to lower-tax rate countries and thus more profit-shifting opportunities than entities that face lower-tax rate differentials. However, profit shifting opportunities may differ from these averages, for instance because of differences in the strictness and enforcement of anti-avoidance rules. The extent of losses from mismatches between tax systems and preferential tax treatment can also differ from the cross-country average because of differences in tax rules as well as specific anti-avoidance rules (Figure 3.A1.10.). Thus, countries with higher statutory tax rates do not necessarily have higher revenue losses from multinational tax planning. In order to estimate the scale of profit shifting, it is necessary to consider real economic activity by companies in each country, such as FDI. Estimates are shown in Figures 3.A1.9 and 3.A1.11, but it should be noted that the scale of revenue loss cannot be explained only by corporation tax rate differentials. Especially when countries have effectively implemented substantive anti-avoidance tax rules, as shown in Figure 3.A1.10, the relationship between corporation tax rates and the scale of revenue loss by multinational tax planning could be significantly different from the results shown in Figures 3.A1.9 and 3.A1.11.

Figure 3.A1.9 Illustrative tax revenue effects of international tax planning in hypothetical cases

Panel A: As a share of corporate income tax revenues



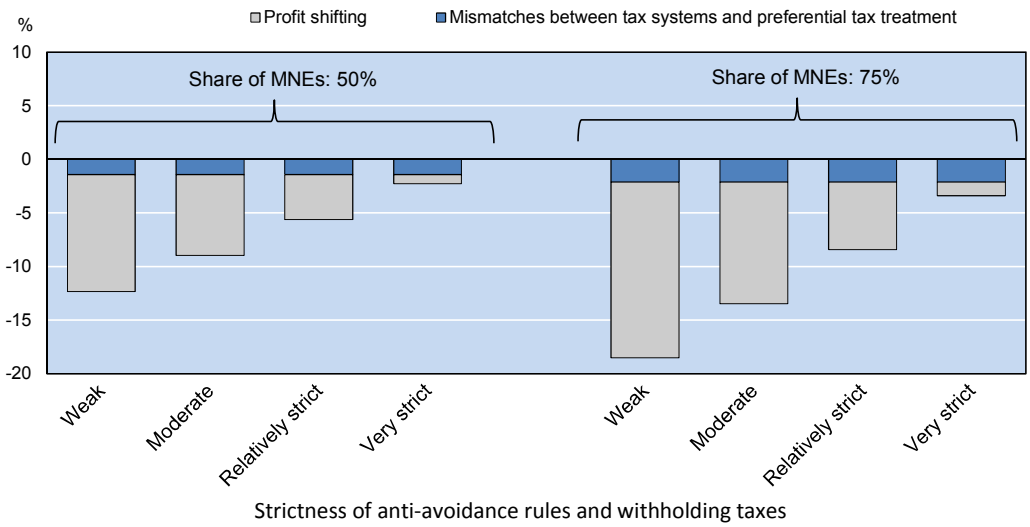
Panel B: As a share of GDP[31]



Note: For a country in which the average resident MNE would face a 10 percentage point higher tax rate than the average tax rate in the other countries where this MNE group operates and with a 50% share of MNEs in total corporate profits, the tax revenue loss from tax planning would represent on average about 11% of CIT revenues (or about 0.3% of GDP), most of which from profit shifting. These averages are presented as an illustration of the magnitude of tax planning. However, actual country-specific tax revenue effects can vary widely around these averages for many reasons, including cross-country differences in the strictness of anti-avoidance rules against tax planning and other country-specific tax rules.

Figure 3.A1.10 Illustrative tax revenue effects depending on the strictness of anti-avoidance rules

Example assuming a 6 percentage point tax rate differential between the resident rate and the average rate in the countries where the MNE groups operate



Note: For an average country with a 6 percentage point tax rate differential, a 50% share of MNEs in total corporate profits and weak anti-avoidance rules, the tax revenue loss from tax planning would represent on average about 12% of CIT revenues. The effect of anti-avoidance rules on the profit shifting intensity is estimated by refining the equation presented in Box 3.A1.3. The refinement consists of interacting the tax rate differential with the classification of anti-avoidance strictness. The resulting effect is positive, suggesting that profit shifting is reduced when anti-avoidance rules are relatively strict. The potential effect of anti-avoidance rules on mismatches between tax systems is not included since it could not be established empirically with the available data.

The revenue effects are surrounded by a number of uncertainties (Box 3.A1.8). Some factors may lead to an underestimation of revenue effects, such as the potential lack of financial or ownership information on certain entities involved in the most complex tax schemes. More generally, "unknown" tax planning schemes of MNEs may not be captured, although the empirical approach (based on the location of activity, profits and tax expenses) does not require knowing the details of schemes to estimate tax planning. On the other hand, certain assumptions may lead to an overestimation, such as not controlling for country fixed-effects in the estimation of the profit shifting sensitivity.

Box 3.A1.8. Main uncertainties surrounding the tax revenue estimates

Factors potentially leading to underestimating the revenue effects:

- Lack of financial or ownership information on some firms involved in complex tax schemes (e.g. specific case of "stateless" entities for tax purposes, which may be less likely to report financial accounts than "normal" entities), thereby leading to their under-representation in the sample.
- The cleaning of the data (e.g. dropping outliers) may have led to certain observations of extreme tax planning behaviour being excluded.

Factors potentially leading to overestimating the revenue effects:

- The empirical specification does not include country-specific fixed-effects and some not-controlled-for country-specific factors may be captured by the tax sensitivity. With country fixed-effects, the estimated profit shifting elasticity is about 30% lower.
- Inclusion of legislated tax incentives such as R&D tax credits or negotiated tax preferences, if MNEs exploit these incentives to a greater extent than similar domestic firms. These are not considered as BEPS behaviours.

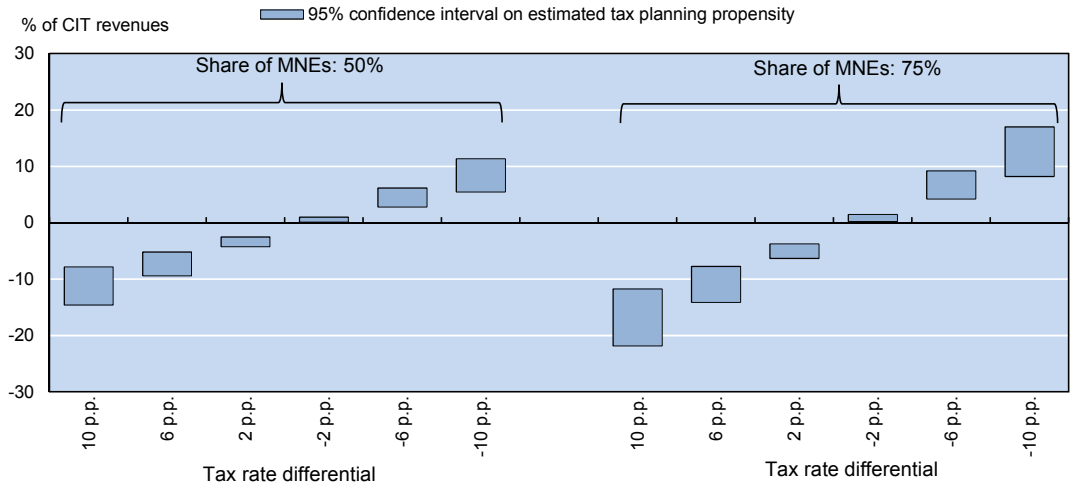
Factors with ambiguous impact on the revenue effects:

- Corporate group structure is not exogenous to profitability. High-profitability MNE groups are more likely to set up affiliates in lower-tax countries, so as to shift profits there. Despite shifting part of their profits, these groups still report relatively high profits in higher-tax rate countries because of high "true" profitability. Based on the comparison with an average (less profitable) firm, the profits shifted by these groups may be underestimated. However, a symmetric effect exists in lower-tax rate countries, where these high-profitability groups may report relatively high profits not only because of profit shifting, but also because of higher "true" profitability. Thus, the overall effect on the tax sensitivity is ambiguous.
- Corporate tax revenues are assumed to change proportionately with financial reported profits. This may not always be the case because of differences between financial and taxable profits as well as tax credits (see Box 3.A1.7).
- Corporate tax rates have recently been cut in some countries. This may lead to smaller losses (or larger gains) in these countries. It also leads to larger losses (or smaller gains) in other countries which have not cut tax rates.

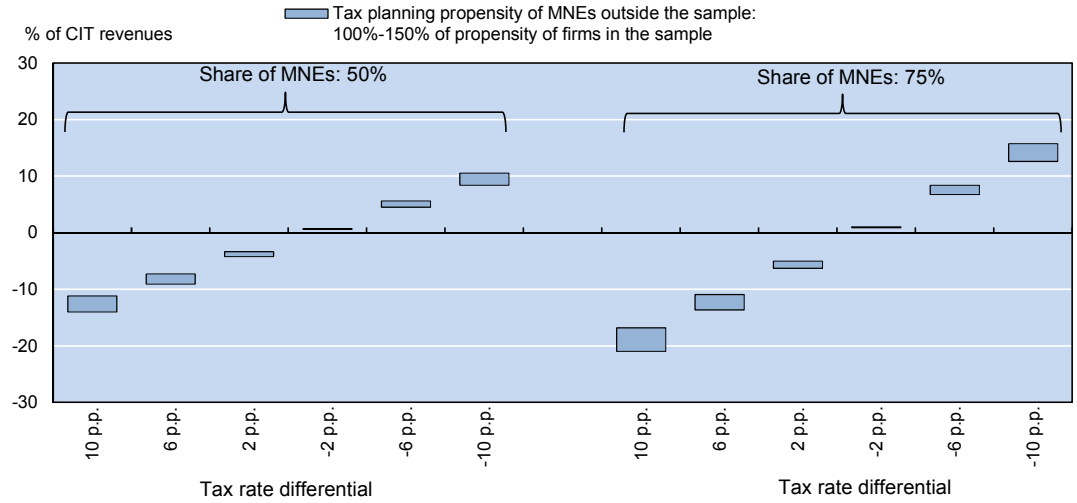
Reflecting these uncertainties, the revenue effects incorporate sensitivity to the following two sources of variation (Figure 3.A1.11): (i) taking a 95% confidence interval around the tax sensitivity estimate; and (ii) assuming that firms outside the sample have a 50% higher tax sensitivity than firms in the sample, where the sample coverage is assessed against the population of firms from the OECD Business Demography Statistics database (the weighted average of coverage is about 40%).[32]

Figure 3.A1.11 Revenue effects of tax planning: accounting for uncertainties

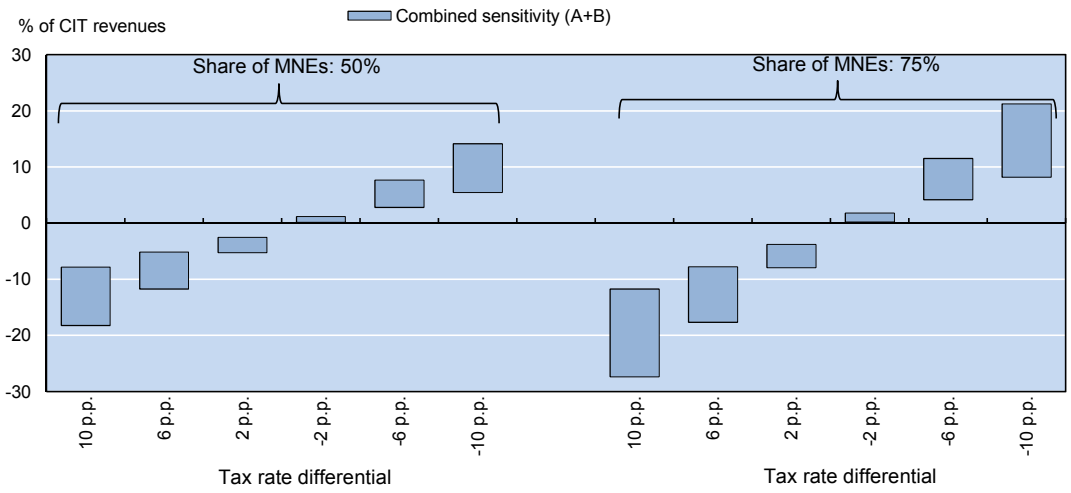
Panel A: Sensitivity to the estimated tax planning intensity[33]



Panel B: Sensitivity to the tax planning intensity of firms outside the sample[34]



Panel C: Combined sensitivity



1. The revenue effect is based on the assumption that firms outside the sample have the same tax elasticity (i.e. profit shifting elasticity and average tax differential) as firms in the sample. The sensitivity analysis assumes a 50% higher tax elasticity of firms outside the sample relative to firms in the sample. The assumption is that 50% of firms are covered in the hypothetical country.

Global tax revenue loss

An estimate of the global revenue loss from tax planning is calculated based on the weighted average of the relevant parameters for the countries covered in this study. The weights are based on corporate tax revenues. Since only MNEs can shift profits internationally, tax revenue losses are proportional to the share of MNEs in corporate profits times the average extent of profit shifting by MNEs (i.e. the estimated tax sensitivity applied to the average tax rate differential). More precisely, the parameters underlying the global revenue loss are based on: (i) the share of MNEs in profits in financial account data complemented with tax data collected as part of the work on Action 11 (the weighted average is 59%); (ii) the average tax rate differential based on the actual links of MNE entities to other countries with different tax rates (the weighted average differential is 3.6 percentage points[35]); and (iii) tax credits as a share of pre-tax profits (the weighted average is 17%).[36]

Factoring in the uncertainties described above, the estimated total net revenue loss for the countries included in this study is in the interval of 4% to 10% of corporate tax revenues (Figure 3.A1.11). Globally, this corresponds to an accumulated revenue loss of about USD 0.9-2.1 trillion over the last ten years (2005-14) or about USD 100-240 billion in 2014.[37] Of these, about two-thirds are due to profit shifting and one-third to mismatches between tax systems and preferential tax treatment. A recent report by the IMF gives an estimate that falls in this range for the overall revenue loss, with an analysis based on macroeconomic data and comparing gross operating surplus with actual corporate income tax revenues (IMF, 2014). Based on FDI data, a preliminary report by UNCTAD estimates to around USD 100 billion the annual tax revenue loss from international tax planning through offshore investment for developing countries, a number of which are part of OECD or G20 (UNCTAD, 2015).

Competition implications

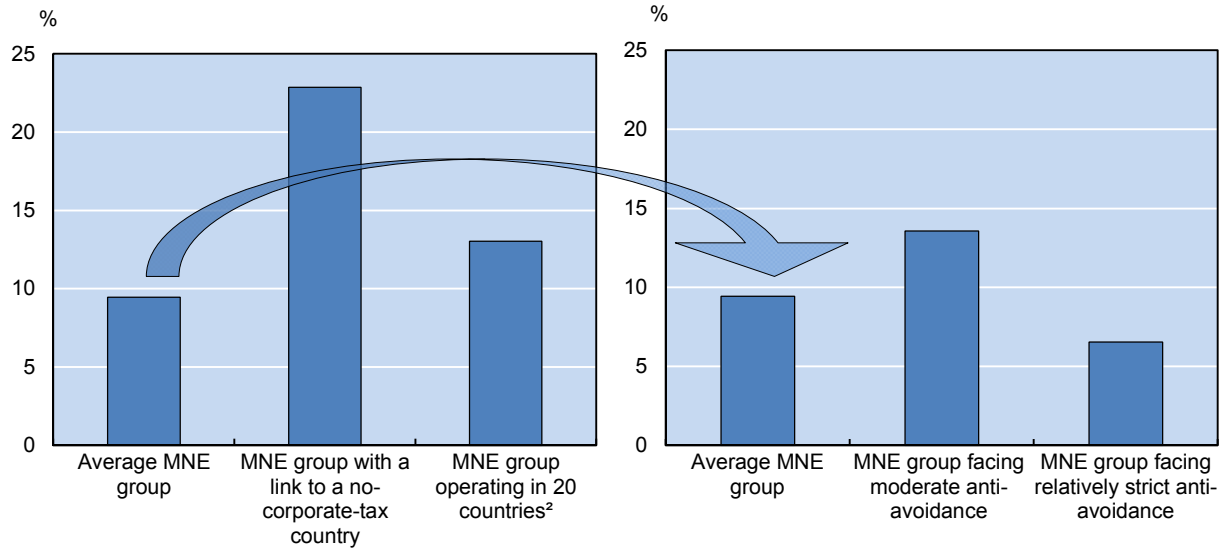
Tax planning can distort competition among firms and entail efficiency losses. Indeed, as shown above, the effective corporate tax rate of large tax planning MNEs can be sizeably lower than the rate of some other firms. This lower effective tax rate can give rise to an unintended competitive advantage of MNEs compared to other firms as it reduces the firms' tax costs (Overesch, 2009; OECD, 2013). This cost advantage can allow the MNE to gain market shares by reducing its price in line with its costs at least in the short term. In the longer term, once the MNE has gained a dominant market position, it may ultimately increase prices to raise profits. Alternatively, if the MNE is pursuing a strategy of competing on attributes other than the price (e.g. quality, service and branding), it may use the cost savings to further differentiate its products to achieve a larger market share and eventually a higher price and profit than its competitors (Porter, 1980). Finally, as tax planning reduces the cost of MNEs relative to other firms (entrants), MNEs can raise entry barriers by, for example, using the tax savings on spending on advertising and R&D (Sutton, 1991). Overall, the expected effect of tax planning is to increase the market share and after-tax profitability of tax planning MNEs at the expense of other firms.

Assessing the potential distortion to competition is difficult and little empirical evidence exists. This study uses a combination of firm and industry-level data to investigate if industries with a large share of MNEs with tax planning opportunities are more concentrated than other industries (see Box 3.A1.9). One way to assess the impact of tax planning on industry concentration is to compare it across countries having different anti-avoidance rules. The idea is that tax planning is more frequent when anti-avoidance is less strict, resulting in more concentrated industries than elsewhere. Controlling for other country and industry characteristics, this analysis suggests that industries with a strong presence of MNEs are less concentrated when anti-avoidance rules are stricter. Industry concentration is measured as the market share of the 10 largest entities divided by the market share of the 100 largest entities in an industry and country. For example, in an industry with a high share of MNEs among top-10 firms (the 75th percentile of the distribution), increasing anti-avoidance strictness by two notches (see Figure 3.A1.7) would reduce the combined market share of the ten largest firms in the industry by about 6 percentage points.

The study also investigates the implications of tax planning for price mark-ups of MNE groups using firm-level data (see Box 3.A1.9). Mark-ups are proxied by pre-tax operating profit divided by turnover, in line with Aghion et al. (2005). Along with the increased market concentration, estimates show that engaging in tax planning is associated with higher price mark-ups controlling for other factors affecting mark-ups such as size, productivity, leverage, presence of patents and exposure to foreign competition. For example, the mark-up of a MNE group is about 10% higher than that of a domestic firm, while the mark-up of a tax-planning MNE is up to 23% higher (Figure 3.A1.12, left panel). The effect is reduced in countries with stricter anti-avoidance rules against tax planning (Figure 3.A1.12, right panel). One caveat to these analyses is that the causality is unclear as more profitable firms may choose to set up affiliates in lower-tax countries (leading them to be identified as tax planners), suggesting that the results should be interpreted with caution.

Figure 3.A1.12 Mark-up rate and international tax planning

Mark-up rate premium over a non-multinational corporate group with similar characteristics1



Notes:

1. The differences in mark-up between different types of firms are statistically significant at a 5% level.

2. The average MNE group operates in five countries. MNE groups operating in many countries have been shown to engage more intensively in international tax planning.

Distortions of competition lead to welfare losses as consumers face higher prices in some markets than otherwise. It can also, under certain circumstances, reduce innovation (Aghion et al., 2005; Gilbert, 2006). Reduced competitive pressures can also curb innovation incentives for MNEs themselves as it reduces the incentives to innovate to stay ahead of competitors (Aghion et al., 2005). Differences in the effective tax rate between MNEs and other firms may also contribute to a suboptimal allocation of capital in the economy as, by providing rates of return artificially altered by tax distortions, MNEs may crowd out investment by other (potentially more productive) MNEs and domestic firms.

Yet, MNEs are in general more productive and exposed to competition than other firms (e.g. Helpman et al., 2004; Bloom et al., 2012) and they can generate positive technological and productivity spillovers to other firms. If tax planning MNEs are more productive than the firms they crowd out, the overall effect on efficiency is unclear.

Box 3.A1.9. Empirical approach: Tax planning and competition

The empirical approach to investigate if tax planning affects competition explores two avenues: (i) assessing if industries with a strong presence of tax-planning MNEs are more concentrated; and (ii) assessing if MNE groups engaged in tax planning obtain different price mark-ups as compared to other firms with similar characteristics. The analysis draws on firm-level data from the ORBIS database to measure market concentration, mark-ups and the propensity of MNE groups to engage in international tax planning.

The estimated market concentration equation is:

$$Concentration_{i,c} = \gamma TaxPlanningIntensity_{i,c} + \delta_i + \delta_c$$

where $Concentration_{i,c}$ is the market concentration of industry *i* in country *c*, measured as the combined market share (based on turnover) of the 10 largest entities (based on unconsolidated accounts) in industry *i* and country *c,* divided by the combined market share of the 100 largest entities in the same industry and country. The analysis is based on 28 industries in 28 OECD and G20 countries. Tax planning intensity ($TaxPlanningIntensity_{i,c}$) is measured by the market share of MNE entities among top-10 firms in the industry multiplied by the strictness of anti-avoidance rules in country *c*. The idea is that tax planning is more intense in industries with a large share of MNEs, but less so in countries with relatively strict anti-avoidance rules. δ_i and δ_c are dummies for industry and country, which capture common characteristics of certain industries and countries.

The estimated mark-up equation is:

$$Markup_{g,i,c,t} = \alpha TaxPlanning_{g,i,c,t} + \beta X_{g,i,c,t} + \delta_i + \delta_t + \delta_c$$

where $\boldsymbol{Markup_{g,i,c,t}}$ is the mark-up rate of the MNE group g (consolidated accounts), which operates in industry i, in year t with headquarters in country c. The mark-up rate is proxied by the Lerner index or price-cost margin, measured as operating profit divided by turnover, in line with Aghion et al. (2005). The tax planning propensity ($\boldsymbol{TaxPlanning_{g,i,c,t}}$) is measured by four proxy variables: (i) a dummy variable for multinational (as opposed to domestic) groups; (ii) a dummy variable for MNE groups with links to no-corporate-tax countries; (iii) the number of countries where a MNE group operates; (iv) the average anti-avoidance strictness (as measured by the indicator defined in Box 3.A1.6) in the countries where the group operates. The control vector $\boldsymbol{X_{g,i,c,t}}$ is a set of group-specific variables potentially influencing the mark-up rate, including size, productivity, leverage, presence of patents (as a measure of innovative activities) and exposure to foreign competition (proxied by the average import penetration in markets where the group is active). $\boldsymbol{\delta_i}$, $\boldsymbol{\delta_t}$ and $\boldsymbol{\delta_c}$ are industry, year and country of headquarters fixed-effects.

All four measures of tax planning intensity have advantages and disadvantages. Comparing MNEs and domestic firms (option i) poses the issue of potential unobserved differences between them, although the extensive set of control variables included should minimise this issue. Comparing tax-planning MNEs (e.g. with links to no-tax countries, option ii) to other MNEs can pose reverse causality issues since ex ante more profitable MNEs have more incentives then other MNEs to set up affiliate in low-tax countries. The number of countries where a MNE operates (option iii) is also subject to reverse causality, since profitable firms are more likely to expand to other countries than other firms. Finally, MNE groups facing relatively strict anti-avoidance rules against tax planning (option iv) may have lower mark-up than other groups because of the compliance costs implied by these rules. Despite these limitations, the results are consistent across the various specifications, which supports the initial hypothesis that tax planning distorts competition.

Manipulation of the location of related and third-party debt: Implications for group leverage

In most OECD countries, the corporate tax system influences corporate financing decisions by favouring debt over equity, since interest payments on debt are generally deductible from taxable profits while dividends payments are not (de Mooij, 2012).[38] This can affect productivity if it distorts the allocation of investment towards firms that can raise debt easily over those that have to rely on equity finance, such as knowledge-based innovative firms investing in intangible assets (Arnold et al., 2011). This is an argument for advocating that corporate tax systems should aim at treating debt and equity-financed investment equally.[39]

International tax planning may compound this "debt bias" (e.g. de Mooij 2011).[40] The possibility to locate external and internal debt in entities in higher-tax rate countries lowers the marginal cost of debt at the MNE group level, which could lead MNE groups to increase their overall leverage.[41] Indeed, relying on group-level information on MNEs' overall external debt (consolidated debt at the corporate group level), the empirical analysis provides evidence that this overall leverage is sensitive to the possibility to locate external and internal debt in higher-tax rate countries – an area that has not yet been explored in the literature (see Box 3.A1.10). Group external leverage is found to be sensitive to the tax rates in the highest tax rate countries in the MNE group (e.g. the average of the two highest tax rates) and thus to the effective cost of debt in these countries. This suggests that MNE groups with the possibility to manipulate the location of debt have higher overall leverage as compared to other MNE groups.

Box 3.A1.10. Empirical approach: Tax planning and group external leverage

The idea is to assess the sensitivity of MNE groups' overall external leverage to changes in tax rates in the different countries where they operate. These changes can affect the location of group debt, but also its overall level by altering the effective cost of debt for the group. Overall group leverage is expected to be sensitive to the tax rate in the country of headquarters, where an important share of group debts is generally located, and in the higher-tax rate countries in the group, where MNE groups have been shown to shift debts.

The estimated equation is as follows:

$$\left(\frac{Debt}{Equity}\right)_{g,c,t} = \beta_1 STAT_{c,t} + \beta_2 STAT\_max_{g,c,t} + \alpha X_{c,t} + \delta_t + \delta_g,$$

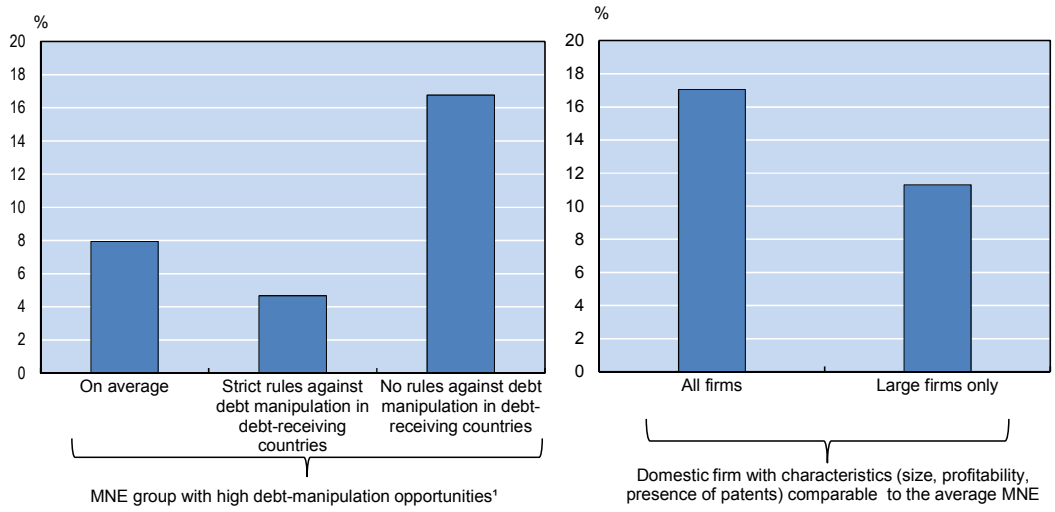
where $\frac{Debt}{Equity}_{g,c,t}$ is the external (i.e. consolidated) debt-to-equity ratio of the MNE group *g*, with headquarters in country *c,* in year *t*. β_1 is the sensitivity of leverage to the statutory tax rate in the headquarters country ($STAT_{c,t}$) and β_2 the sensitivity to the average of the two highest tax rates among the countries where the group operates ($STAT\_max_{g,c,t}$). In alternative specifications, the average tax rate among all countries where the group operates and the average of the two lowest tax rates are also considered. $X_{c,t}$ is a set of firm-specific and macroeconomic control variables (e.g. profitability, GDP growth, interest rates). δ_t and δ_g are respectively time and group fixed-effects.

The source of data is consolidated financial accounts of MNE groups from the ORBIS database, over 2000-2010. The number of observations is about 15 000 group-year pairs, covering most OECD and G20 countries. Results are robust to: (i) replacing the average of the two highest tax rates in the group by the highest tax rate, or the average of the three highest; (ii) restricting the sample to EU countries; (iii) excluding financial firms.

For example, a MNE group with relatively high debt manipulation opportunities (e.g. the average of the two highest tax rates in the group is 40%, as compared to 35% for the average MNE) has 8% higher external leverage (Figure 3.A1.13, left panel). This finding is robust to a number of variants, such as adding control variables for macroeconomic developments or restricting the sample to only EU countries or non-financial firms. In addition, relatively strict thin capitalisation and interest-to-earnings rules against debt manipulation are found to lower the propensity of MNE groups to increase their external leverage through debt manipulation.

Figure 3.A1.13 MNE group external leverage and international tax planning

Leverage (external consolidated debt-to-equity) as compared to an average MNE group1



1. All differences are significant at a 5% level.
2. MNE groups with high debt-manipulation opportunities are groups facing a 5 percentage point higher statutory tax rate on average in the two highest-rate countries where they operate as compared to the average MNE group. For the average MNE group, this average is 35%, while for high debt-manipulation opportunities groups it is 40% (which corresponds to the 90th percentile of the distribution of this variable).

The empirical evidence suggests that strategic location of debt (internal and external) can increase the total debt of MNE groups. Yet, the external leverage of the average MNE group is found to be lower than that of the average domestic firm with comparable characteristics (Figure 3.A1.13, right panel), in line with most of the empirical literature (e.g. Burgman, 1996). This suggests that manipulation of the location of debt is not among the main determinants of MNE groups' external debt level, as it does not increase the average external leverage of MNEs above the average of domestic firms. Moreover, MNEs tend to have more diversified income streams as compared to domestic firms, making them less vulnerable to adverse income shocks (e.g. Baker and Riddick, 2013). Despite the additional external leverage induced by debt manipulation, the average MNE is therefore less likely than a domestic firm to have external debt levels that make it vulnerable to income shocks.

International tax differences, tax planning and the location of investments

Without differences in corporate tax rates and tax systems across countries, investment would be determined and located purely according to economic rates of return (assuming perfect mobility of capital and no other policy differences between countries). However, tax rates and systems differ and this creates distortions. Corporate income taxes affect firms' investment by reducing the after-tax return on investment. Indeed, recent OECD work found that corporate taxes reduce firms' investment, except for small and young firms (OECD, 2009; Arnold et al., 2011). Taxes can also affect firms' investment choices by favouring projects with a high after-tax rather than pre-tax return on capital (e.g. projects that can be more highly financed by debt). This may result in resources not being allocated to the most efficient projects or countries. In situations with tax distortions, tax

planning may affect the impact of these distortions on investment and its location by reducing the effective cost of investing in high-tax countries.

International tax differences affect the location of foreign investment

Cross-country differences in corporate taxation influence the location of foreign investments and MNEs' foreign subsidiaries. Foreign investment, particularly investment in innovative activities, can generate knowledge spillovers with implications for human capital and productivity. Foreign investment can also increase competition from foreign firms in the domestic market, with positive productivity effects. There is a vast literature, including past OECD work, suggesting an adverse effect of host country corporate tax rate on foreign investment (Hajkova et al., 2006; OECD, 2007a; Feld and Heckemeyer, 2011). But corporate taxes are only one among many factors affecting firms' location choice (e.g. labour and product market regulation, size of the market, labour taxes, infrastructure, etc.). Its influence appears relatively small, for instance in comparison with labour taxes (Hajkova et al., 2006).

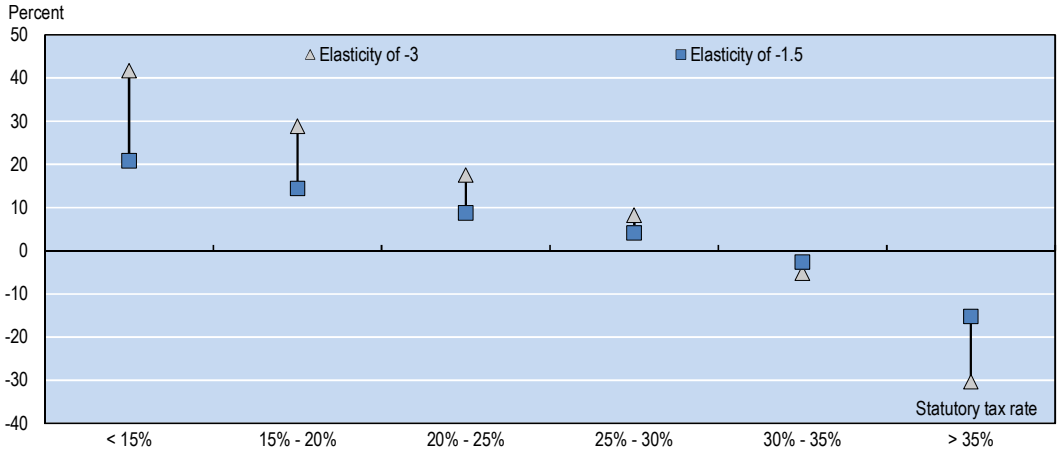
An example illustrates the effect of cross-country differences in corporate taxes for foreign investment, based on a tax sensitivity estimated on bilateral data on foreign direct investment (FDI) stocks (see Box 3.A1.11). More specifically, the sensitivity of FDI to corporate taxes is taken from past empirical OECD work, which controls for other determinants of FDI (e.g. income level, GDP, market size, distance between countries, product market regulation, employment protection legislation, labour taxes etc.). This estimate implies that a one percentage point increase in the corporate tax rate differential between two countries results in a 1.5% decrease in the gross bilateral FDI stock in the higher-tax rate country (Hajkova et al., 2006). Alternatively, an estimate based on a meta-analysis by Feld and Heckemeyer (2011) is used, with a tax sensitivity of 3 instead of 1.5. This higher sensitivity is because the meta-analysis does not control for the effect of policy determinants (other than corporate taxes) on FDI.

One caveat is that the available FDI statistics and the estimated tax sensitivity of FDI are distorted by international tax planning, for instance by large flows of interest income between countries. This is because the bilateral FDI statistics cannot separate investment income reflecting real activity from financial flows stemming from profit shifting.[42] Even so, the illustration gives an indication of the importance of taxes for foreign investment.

Based on these data and sensitivity, a tax-adjusted FDI stock is computed assuming that the statutory corporate tax rate at home is equal to the one in the host country for all pair of countries. For many pairs of countries this would involve a large tax change. In most countries, FDI positions explained by existing differences in corporate taxes account for less than 15% of inward FDI (based on the conservative OECD estimate of the sensitivity) (Figure 3.A1.14).[43]

Figure 3.A1.14 Share of inward FDI stock explained by tax rate differences between countries[1,2]

Average 2006-2011



1. A positive figure indicates that the existing tax differences contribute positively to FDI. For example, without tax differences with other countries the FDI stock in a country with a tax rate below 15% would be about 20-40 percent lower (depending on the elasticity) than the actual stock.
2. The estimates are based on differences in statutory tax rates (the most widely available across countries). The estimates are similar when based on forward-looking effective tax rates instead of statutory tax rates.

In addition to differences in statutory corporate tax rates, preferential tax regimes (e.g. for intangible assets) and other characteristics of tax systems may influence the location of FDI. A potentially important factor is whether the home country of a MNE exempts foreign-source dividends from tax (i.e. territorial/source tax system) or subjects them to domestic tax while giving a credit for taxes paid in the host country (i.e. worldwide/residence taxation). Existing studies do not find a significant difference in the tax sensitivity of FDI under alternative tax systems (e.g. Hajkova et al., 2006). This may reflect tax deferrals and other tax planning strategies of MNEs as well as in practice that most countries do not have a "pure" territorial or worldwide system. A pure territorial system would tax all investments into a specific country in the same way regardless of home country, but would tax investment of the same MNE differently across countries. A pure worldwide system would do the opposite: it would tax investment of a MNE at home or abroad similarly, while treating investment of different MNEs into one country dissimilarly. Recently, there has been a trend towards territorial systems among OECD and G20 countries.

Box 3.A1.11. Cross-country differences in taxes and location of investment

The illustration relies on existing estimates of the sensitivity of FDI stocks to corporate taxation. Based on these tax sensitivities, a hypothetical bilateral FDI position in absence of differences between home and host statutory tax rates is computed for all pair of countries (estimates are similar when using forward-looking effective tax rates for a subsample of countries). The difference between actual and hypothetical inward FDI in a country reflects bilateral FDI positions, the assumed tax sensitivity and bilateral tax differences:

$$\Delta FDI_{IN,host} = \sum_{p} FDI_{home \rightarrow host} \times Tax\ sensitivity \times (STAT_{host} - STAT_{home})$$

Bilateral gross FDI stocks are drawn from the OECD International Direct Investment database, covering 34 reporting countries and more than 200 partner countries over the period 2006-2011. In the statistics, foreign direct investment consists of capital shares and reserves, including retained profits, as well as net positions of loans, trade credits and securities.

The location of R&D activity and intangible assets are also influenced by taxation. As discussed, MNEs may locate income associated with patents and other intellectual property to countries with lower tax rate or preferential tax treatment on such income. However, MNEs do not locate the ownership of intellectual property only based on taxes. They often co-locate the ownership of intellectual property with the associated R&D activity (Griffith et al., 2014). Indeed, the empirical analysis suggests that R&D activities (proxied by patents where the inventor is located in the same country as the firm applying for the patent protection) are sensitive to tax rate differentials (see Box 3.A1.4).

Tax planning reduces the effect of tax rate differences on the location of investment by tax planning MNEs

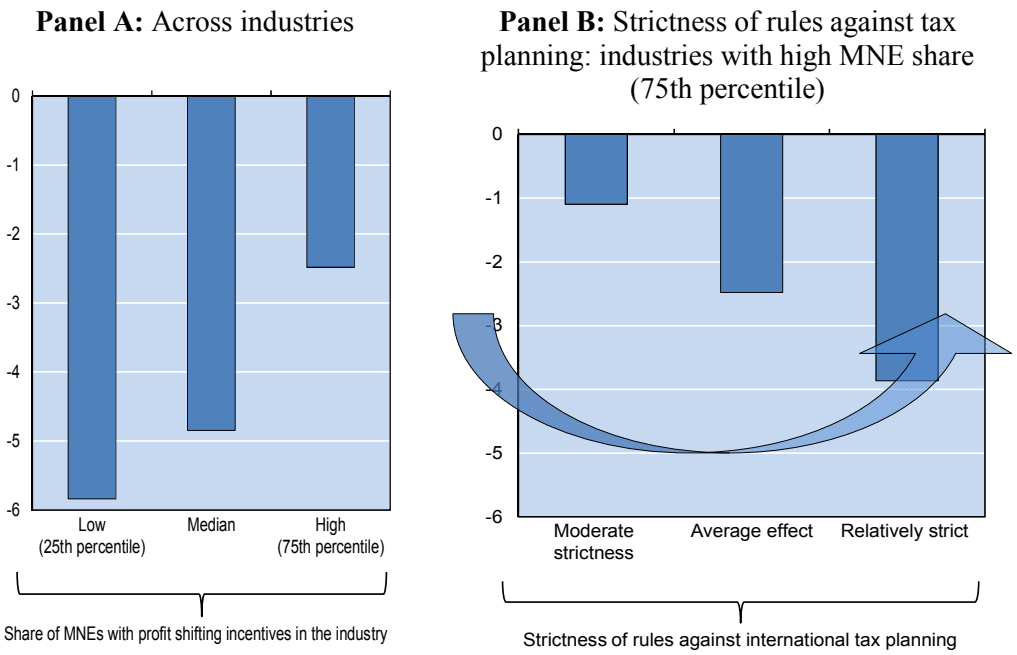
Existing evidence, including recent OECD work, shows that a higher effective corporate tax rate in a country reduces firms' investment in that country (e.g. OECD, 2009; Djankov et al., 2010; Arnold et al., 2011). However, the possibility for MNEs with links to low-tax countries to reduce their effective tax rates by tax planning may make the location of their investment less sensitive to cross-country differences in tax rates. Thus, testing if (controlling for other factors affecting investment) the effects of high corporate tax rates on investment are weaker for such MNEs than for other similar firms without links to low-tax countries is an indirect way to verify the existence of tax planning.[44,45] International tax planning may reduce the effect of relatively high corporate taxation on tangible and intangible investment of tax planning MNEs, but at the cost of introducing distortions that are related to both the implied tax revenue losses and to the uneven playing field generated by differential effective taxation of different types of firms. Thus, across-the-board corporate rate reductions and base broadening would have more beneficial effects on the economy than "self-helped" reductions in effective tax rates by selected MNEs via tax planning behaviour.

Industry and firm-level evidence across a large set of OECD and G20 countries confirms that, while increases in corporate taxes tend to reduce firms' investment in a typical industry, the reduction in investment is lower in industries with a large share of tax planning MNEs (see Box 3.A1.12). For instance, a 5 percentage point increase in the effective (forward-looking) marginal corporate tax rate[46] would reduce investment on average across industries by about 5% in the long term (Figure 3.A1.15, Panel A). However, in industries with a high concentration of MNEs with profit shifting incentives,

this effect would be nearly halved. This supports the hypothesis that tax-planning MNEs' investment is less sensitive to tax rates than other firms' investment. This is because tax-planning MNEs can achieve lower taxes through artificial arrangements without changing the location of the value-creating real economic activity. Moreover, stricter anti-avoidance rules against tax planning are found to raise the sensitivity of investment to tax rate changes (Figure 3.A1.15, Panel B).

Figure 3.A1.15 Tax planning reduces the effect of corporate taxes on tax planning MNEs' investment

Estimated long-term change in investment after a 5 percentage point increase in the corporate tax rate[47]



Box 3.A1.12. Empirical approach: Investment and tax planning

The effect of corporate taxes on investment is estimated with a similar strategy as in OECD (2009) (for details, see Schwellnus and Arnold, 2008; Vartia, 2008). The idea is to estimate an investment equation based on a neo-classical investment model (Hall and Jorgenson, 1967) to assess the impact of a tax rate change on firms having different tax planning incentives and opportunities. The analysis is conducted both at the industry and the firm-level. The industry level offers a better measure of investment, while the firm level offers a better measure of tax planning incentives. The two approaches give consistent results.

At the industry-level, the estimated equation is as follows:

$$Ivt\ rate_{c,i,t} = \alpha Ivt\ rate_{c,i,t-1} + \beta ETR_{c,t-1} + \gamma ETR_{c,t-1} \times Profit\_shifting\_MNEs_{c,i} + \theta VAgrowth_{c,i,t-1} + \delta_{c,i} + \delta_t$$

where $\boldsymbol{Ivt\ rate_{c,i,t}}$ is the investment rate (investment divided by lagged capital stock) in country c, industry i and year t, sourced from the World Input-Output Database (WIOD). $\boldsymbol{ETR_{c,t}}$ is the forward-looking effective marginal tax rate from the Oxford Centre for Business Taxation (results with the average effective rate are consistent but less statistically significant). $\boldsymbol{Profit\_shifting\_MNEs_{c,i}}$ is the number of MNE entities with profit shifting incentives among the 100 largest firms in country c and in industry i sourced from the firm-level database (ORBIS). An entity is considered as having profit shifting incentives if it faces a higher tax rate in its home country than the average (unweighted) in its corporate group, in line with the profit shifting analysis (Box 3.A1.3). The coefficient $\boldsymbol{\beta}$ reflects the tax sensitivity of the average firm, while $\boldsymbol{\gamma}$ reflects whether industries with a high concentration of profit-shifting MNEs are more sensitive than other industries. $\boldsymbol{VAgrowth_{c,i,t}}$ is the value-added growth of the industry – a high-growth industry is expected to have a higher investment rate. $\boldsymbol{\delta_{c,i}}$ and $\boldsymbol{\delta_t}$ are respectively fixed-effects for country-interacted-with-industry and time.

The sample consists of 30 industries in 29 countries over 1997-2009. The equation is estimated either with ordinary least squares or a generalised method of moments estimator that avoids the potential bias induced by the simultaneous use of the lagged dependent variable and fixed-effects. Results are consistent between the two estimation methods.

At the firm-level, the estimated equation is as follows:

$$\boldsymbol{Ivt\ rate_{f,c,i,t} = \beta ETR_{c,t-1} + \gamma ETR_{c,t-1} \times Profit\_shifting\_incentives_{f,c,i,t} + \theta VAgrowth_{c,i,t-1} + \delta_f + \delta_t}$$

where $\boldsymbol{Ivt\ rate_{f,c,i,t}}$ is the investment rate of firm f operating in country c, industry i and year t. The investment rate is measured as the change in fixed assets (at book value), net of depreciation (also at book value) and divided by lagged fixed assets, sourced from the ORBIS database. This measure is similar to Gal (2013). The effective tax rate and value-added growth variables are identical to the industry level analysis. $\boldsymbol{Profit\_shifting\_incentives_{f,c,i,t}}$ is the difference between the statutory tax rate in country i and year t and the average (unweighted) among the countries where the MNE group of f operates. $\boldsymbol{\delta_f}$ and $\boldsymbol{\delta_t}$ are firm and time fixed-effects. The sample consists of about 50 000 observations of MNE entity accounts in 18 OECD countries over ten years (2001-2010).

International tax competition

In an integrated global economy, countries may compete over mobile capital (tangible and intangible) by lowering effective and statutory corporate tax rates. One rationale for lowering tax rates is that it can attract foreign investment and increase domestic investments, with positive effects on growth. These investments can, in turn, create

additional activity (e.g. employment opportunities, investment by intermediate suppliers, etc.), which further adds to growth and tax revenues.

One clear prediction from the tax competition literature is a reduction in tax rates, with a "race to the bottom" in the extreme case of a small open economy with perfect capital mobility (Devereux and Lorentz, 2012; Keen and Konrad, 2012). To the extent that the corporate tax is considered as more distortive than other taxes, a certain degree of tax competition may enhance economic efficiency. However, tax competition may also lower public spending and taxes below their efficient level and cause welfare losses, although this depends on what is considered the optimal level of public service provision (e.g. Wilson, 1999). Overall, in practice it is difficult to determine at what point tax competition produces negative effects for growth and welfare.

The empirical literature confirms that tax competition took place in past decades, as countries have responded to lower corporate tax rates elsewhere by reducing their own rates (Devereux and Sorensen, 2006; IMF, 2014). Furthermore, tax competition over corporate tax bases may have induced indirect spillovers on other tax bases. Pressures to reduce the corporate rate may have created pressures to reduce the top personal income tax rate because of the possibility to incorporate to reduce tax payments (OECD, 2009; Arnold et al., 2011; IMF, 2014). One marked change in taxation over the past decades is a reduction in top personal income tax rates and in progressivity in income taxes in OECD countries (OECD, 2009).

Tax planning provides incentives for tax competition as countries compete to attract profits generated by MNEs' activities elsewhere. This form of tax competition is not always transparent as it can occur through preferential regimes rather than on statutory rates. However, in the absence of tax planning, tax competition may not necessarily be less intensive. This is because the sensitivity of "real" investment to taxes may increase, as shown earlier. For instance, the estimates obtained with the methodology presented in Box 3.A1.12 suggest that the sensitivity of industry-level investment to the effective corporate tax rate would increase by about 30% if tax planning would be halved. In the absence of tax planning, higher-tax rate countries could become less attractive investment destinations for certain MNEs and may ultimately compete more fiercely to attract investment. At the same time, the additional tax revenues obtained in the short run by tackling tax planning could be used to reduce tax rates across the board or finance public spending, which could support private investment over the longer term.

Overall effect on efficiency and growth

International tax planning affects economic efficiency in several ways (Table 3.A1.3). Assessing the overall economic efficiency effect of tax planning is not easy as opposing factors are at play. One way to investigate this effect is to empirically examine if industries with a larger share of tax planning MNEs grow differently from other industries. Empirical analysis investigating if value-added growth differs across industries depending on the presence of tax planning MNEs, controlling for other factors affecting industry growth, yielded no clear evidence of a (positive or negative) impact of the presence of tax planning MNEs on industry growth.

Table 3.A1.3 Economic implications of international tax planning: summary of main findings

	Negative welfare effect	Positive welfare effect
Fiscal implications	Tax planning leads to tax revenue losses. The lost tax revenues could have been used to finance welfare or efficiency-enhancing public expenditures or to reduce other distortive taxes. Tax planning may also undermine the legitimacy of the tax system and reduce tax compliance among a wider set of taxpayers.	-
Competition between firms	Tax planning allows certain MNEs to increase their market power, resulting in more concentrated markets and higher price mark-ups. The reduced competitive pressure may hamper innovation and result in consumer welfare losses.	Welfare losses may be partially offset by the associated reallocation of resources to high-productivity MNEs.
Debt	The possibility to manipulate internal and external debt location reduces the effective cost of debt for MNEs and can lead them to take on higher overall external leverage.	-
Investment	Tax planning reduces effective tax rates at the cost of additional distortions (e.g. unlevel playing field between tax-planning MNEs and other firms) as compared with a situation in which corporate tax rates were cut across the board.	Tax planning reduces effective tax rates – and the associated drag on investment – for tax planning MNEs. Tax planning also reduces the effect of cross-country corporate tax differences on the location of investment by tax planning MNEs.
Tax competition	Tax planning provides incentives for tax competition as countries compete to attract profits generated by MNEs' activities elsewhere.	In the absence of tax planning, tax competition may not necessarily be less intensive, because the sensitivity of "real" investment to taxes may increase.

In any case, the welfare implications of tax planning go beyond economic efficiency. Tax planning redistributes corporate tax bases across countries, leading to revenue losses in higher-tax rate countries. These losses will either lead to lower government expenditures (which may reduce welfare) or may need to be offset by raising other distortive taxes on less mobile tax bases, which may entail a welfare loss. More broadly, tax planning may undermine the legitimacy of the tax system and reduce tax compliance among a wider set of taxpayers. This may hamper governments' ability to mobilise fiscal revenues due to lack of trust and perception of unfairness of the tax system. In turn, this can generate large compliance and administrative costs.

Discussion and concluding remarks

Corporate income taxes entail distortions and have been found to be more harmful for economic growth compared to other taxes at least at their observed level (OECD, 2007b; OECD, 2009; Arnold et al. 2011). Nevertheless, most countries levy corporate taxes. One reason is that the corporate tax plays a role as a "backstop" to the personal income tax. In the absence of a corporate tax, business income would not be taxed until it is realised as dividends or capital gains, which are often not subject to tax. By levying corporate income tax, governments reduce the opportunities for shareholders, especially non-resident, to shelter their income from taxation. In this area, new standards for automatic exchange of financial account information between countries (OECD, 2014d) may increase the possibility of taxing part of the corporate income at the personal level. Another argument for levying corporate income tax is that it could be designed to tax only economic rents (i.e. profits above a "normal" rate of return), in which case the economic distortions induced by the tax would be small (OECD, 2008).[48,49]

Globalisation creates additional challenges for corporate tax systems. Most corporate income tax systems were designed during a time when cross-border transactions, international trade and MNEs were less important than today. The issue is how to allocate the worldwide income of firms across the countries in which they are active. Provisions to deal with international trade and avoid double taxation or non-taxation of income have gradually been added to domestic tax systems. Nonetheless, as discussed, MNEs can often exploit the differences between tax systems to reduce their tax burden, with significant revenue losses for governments and globally.

This study provides robust evidence of such tax planning by MNEs. It highlights that international tax planning significantly reduces corporate tax revenues globally, though there is large uncertainty around the magnitude of the overall loss due to limitations in the currently available data. MNEs shift profit from higher to lower-tax rate countries. Large MNEs also exploit mismatches between tax systems and preferential tax treatment to reduce their tax burden. Transfer price manipulation, strategic allocation of intangible assets and manipulation of internal and external debt levels are found to be important profit shifting channels. Aside from its fiscal implications, tax planning is found to have effects on economic efficiency through various channels, including by affecting the sensitivity of the location of tax-planning MNEs tangible and intangible investments. Stricter anti-avoidance rules such as comprehensive documentation requirements on transfer pricing, rules against debt manipulation, GAARs and CFC rules as well as higher withholding taxes are associated with reduced tax planning, but also with higher compliance costs for firms. Co-ordinating anti-avoidance rules across countries could reduce these costs.

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Notes

1. This annex was prepared by the OECD Economics Department in co-operation with the Centre for Tax Policy and Administration and has been approved by the OECD's Economic Policy Committee and the Committee on Fiscal Affairs.
2. More information about the ORBIS database is included in Box 3.A1.2.
3. The tax rate is the sum of the national and sub-national tax rate. For non-OECD countries, data are sourced from KPMG and refer to 2000 (Russian Federation refers to 2001 instead of 2000) and 2013.
4. The weighted average excludes Mexico due to missing data.
5. In the case of e-commerce or the sale of online services, there can be an ambiguity over where the profit of a firm is generated. For example, a firm may conduct substantial sales of goods and services in a market from a remote location and with minimal use of personnel (OECD, 2014a). As it is not possible to ring-fence the digital economy from the rest of the economy, no separate analysis was conducted of profit shifting associated with the digital economy. The assumption underlying the empirical analysis is that the location of assets (including purchased intangible assets reported in financial accounts) or employees represents a relevant proxy for the "true" activity of a firm.
6. MNEs may also shift certain activities (e.g. R&D activities) to benefit from preferential tax treatment on the related income. This is not considered as BEPS, but is included in the empirical analysis as it cannot be disentangled from BEPS channels with the available data. It was agreed in the BEPS Project that the preferential treatment of intellectual property should be coupled with "substantial activity" requirements to prevent harmful tax competition (OECD, 2014c).
7. In worldwide taxation systems, the location of headquarters determines the tax rate applying to worldwide profits. Thus, MNEs have an incentive to locate their headquarters in lower-tax countries (so-called tax inversion). However, the empirical analysis found no conclusive evidence that MNE headquarters are predominantly located in high or low-tax countries.
8. In some cases, reported and taxable profits differ because a firm exploits mismatches between tax systems to reduce its taxable profit (e.g. by deducting the same expense in more than one country) and thus its tax burden (Lisowsky, 2010). Such tax planning situations cannot be identified by analysing the location of profits using financial account data, but they are captured in the empirical analysis of mismatches between tax systems, which focuses on how reported profits are taxed.
9. "MNEs" are firms belonging to corporate groups present in at least two countries. "Domestic groups" are firms in corporate groups present in only one country. "Standalone firms" are firms belonging to no group (i.e. with no affiliate and no parent company). "Not identified" firms are assigned in different categories by the identification algorithm depending on the ownership threshold (i.e. 50% or 90%) chosen to link companies. All business forms (corporations, limited liability partnerships, etc.) are included in ORBIS data.

10. The share of domestic groups and MNEs appears implausibly low in the Netherlands, which probably reflects missing ownership links in the ORBIS database for this country. This may also be the case for other countries.

11. The data are based on the ORBIS sample used in the analysis and may not be representative of the underlying population, particularly for specific countries.

12. Only countries covered in the OECD STAN business demography statistics database are presented. Large firms are firms with more than 250 employees. When the number of employees is not available in ORBIS, turnover or total assets are used as alternative size measures (with respective thresholds of EUR 50 million and EUR 43 million, in line with the EU definition). Brazil and Iceland refers to manufacturing, Japan is 2012 in STAN as compared to 2009 in ORBIS (large firms is 50+ employees), Iceland 2005, Brazil 2008 and Switzerland 2009.

13. A MNE entity is considered as having a link to a given country if at least one entity in its corporate group is present in this country. A MNE entity is considered as large if it has more than 250 employees. The figures presented are computed based on all observations in the ORBIS sample used in this study over the period 2000-2010. Countries with less than 1200 observations of large MNE entities are not presented.

14. The data are based on the ORBIS sample used in the analysis and may not be representative of the underlying population, particularly for specific countries.

15. The statutory corporate tax is usually considered as the relevant tax rate on shifted profits (Gravelle, 2014). Lower effective tax rates (for example because of preferential tax treatment) are captured in the second part of the empirical analysis (mismatches between tax systems).

16. Using a weighted average is not straightforward. Weights based on activity levels may not reflect profit shifting possibilities as profits can be shifted to entities where the group has little activity. Weights based on profits or sales can pose endogeneity problems even in the case of lagging the relevant variable as there is a high correlation between past and current profits and sales.

17. In an alternative specification, the tax variable is split to assess separately profit shifting to no-tax countries and shifting between countries with positive (but different) tax rates. The result suggests that both types of profit shifting occur, with the profit shifting propensity (relative to tax rate differentials) being stronger between countries with positive tax rates.

18. A 50% threshold is commonly used in the tax literature for defining corporate groups (e.g. Huizinga and Laeven, 2008; Maffini and Mokkas, 2011). The rationale is that profit shifting would generally not take place between two companies that are not under the same control. By contrast, foreign direct investment statistics use a 10% ownership threshold.

19. The empirical approach is to compare in a regression analysis the profitability of MNE entities with different opportunities to shift profits, such as entities 1A and 2A. The entity 1A is expected to receive profits from other group members since it has a lower tax rate than them. In contrast, the entity 2A is expected to shift profits to other group members. The estimated tax sensitivity implies that a 1 percentage point statutory tax rate differential is associated with 1% higher (or lower) profit. This means that entity 1A is assumed to receive profits representing about 5% of its total profit, while entity 2A is assumed to shift about 10% of its profit. Details of the methodology are presented in Box 3.A1.3.

20. A few papers (e.g. Markle and Shackelford, 2011) include the effect of mismatches in their estimates, but without disentangling them from profit shifting.

21. Shifted (non-shifted) patents are patents where the inventor is located in a different (the same) country than the MNE entity applying for the patent protection. For example, the United States accounts for 42% of global patent applications, out of which 35% are invented in the country and 7% are invented in another country. Worldwide patent applications refer to the sum of patent applications (shifted and non-shifted) made by the 38 countries included in the analysis (see Panel B). Patent applications refer to applications to two major patent offices (i.e. the United States Patent and Trademark Office (USTPO) and the European Patent Office (EPO)) and patents filed under the Patent Co-Operation Treaty (PCT).

22. For example, in about 85% of patent applications in Luxembourg, the inventor is located outside Luxembourg.

23. It was agreed in the BEPS Project that the preferential treatment of intellectual property should be coupled with "substantial activity" requirements to prevent harmful tax competition (OECD, 2014c).

24. Existing intellectual property regimes in the OECD and G20 that do not meet the agreed standard for substantial activity should close to new entrants in June 2016 and stop operating in June 2021 (G20 communiqué, February 2015).

25. The patent protection may cover different countries than the one where the applying firm is located depending on the patent office where the patent is registered.

26. MNEs also have incentives to deviate from market interest rates on internal debt in order to shift profit. However, interest payments between related entities are generally regulated by the "arm's length" principle as other internal transactions.

27. Heckemeyer and Overesch (2013), based on a meta-analysis of 25 studies, estimate that debt manipulation accounts for about 30% of total profit shifting.

28. The indicator is compiled for 2005 and 2014. In the empirical analysis, the value for 2005 is used, which corresponds to the middle of the sample period.

29. The figure shows the percentage of GDP devoted to accounting, tax preparation, bookkeeping and payroll services, as a proxy for tax consultancy industry. It includes services unrelated to tax, but also excludes economic resources devoted to tax including tax legal services and corporations' in-house tax staffs.

30. The effect of international tax planning on other taxes and social contributions goes beyond the scope of this study. If international tax planning results from artificial financial flows and does not affect the location of "real" economic activity, the impact on other taxes and social contributions should be limited.

31. Figures as a share of GDP assume that CIT revenues represent 3% of GDP, which is close to the OECD average.

32. For Russian Federation, where no data is available in the OECD Business Demography Statistics database, a coverage rate of 70% is assumed. This corresponds to the average across European countries where comparison is possible. For non-European countries where no data is available in the OECD Business Demography Statistics database, a coverage rate of 5% is assumed.

33. The range is based on sensitivity around the point estimate of the tax planning sensitivity. The sensitivity analysis assumes a 95% confidence interval (i.e. about two standard errors on each side) around the point estimate of the profit shifting and mismatch estimates.

34. The revenue effect is based on the assumption that firms outside the sample have the same tax elasticity (i.e. profit shifting elasticity and average tax differential) as firms in the sample. The sensitivity analysis assumes a 50% higher tax elasticity of firms outside the sample relative to firms in the sample. The assumption is that 50% of firms are covered in the hypothetical country.

35. In the hypothetical example, the average tax rate differential corresponds to a statutory tax rate of 33%, which broadly corresponds to the weighted average of statutory tax rates over 2005-09 in OECD and G20 countries.

36. Data on tax credits is limited and the data used in this study were provided to the OECD as part of the work on Action 11 and most often refer to the year 2011. A caveat is that tax credits are volatile and that relying on data for only one year may not to be representative of the general size of tax credits.

37. The underlying assumption is that non-OECD and non-G20 countries lose on average 4-10% of corporate tax revenues, which is the same as the countries in the sample. On average in non-OECD non-G20 countries, corporate tax revenues as a share of GDP is about 50% higher than in countries in the sample (data on corporate tax revenues for these countries is sourced from available national sources and the IMF).

38. Other factors including the taxation of capital at the personal level can also affect financing decisions.

39. One option is to allow tax deductibility for the opportunity cost of equity finance (so-called allowance for corporate equity, ACE) as introduced in Belgium and Italy over the past decade. Another option is to remove interest deductibility altogether (so-called comprehensive business income tax, CBIT). These options are discussed extensively in the literature (e.g. OECD, 2007; de Mooij, 2012).

40. With complete markets and perfect information, there is no optimal debt-to-equity choice of firms (Modigliani and Miller, 1958). In reality, capital markets suffer from informational imperfections and non-neutral taxation. In a second-best world, changes in leverage due to taxation can either mitigate or exacerbate pre-existing distortions (de Mooij, 2011).

41. Manipulating the location of group debt may increase bankruptcy risks of the entities where debt is located if there is no perfect risk sharing within the group. However, MNE entities are generally thought to benefit from explicit or implicit guarantee from their parents (see Huizinga et al., 2008, footnote 9).

42. New international guidelines for compiling FDI statistics are currently being implemented. These guidelines recommend, among other things, to identify capital being channelled through special purpose entities, which are known to be used for tax planning. Once these data are available, the effect of tax differentials on FDI can be refined by excluding activities of special entities (see www.oecd.org/daf/inv/oecdimplementsnewinternationalstandardsforcompilingfdistatistics.htm).

43. In the case of location of investment, the relevant tax rate is the effective tax rate, as it takes into account the generosity of tax depreciation allowance of the investment and other tax provisions. The results presented in this study rely on statutory rates since effective tax rates are only available for a limited set of countries. However, the findings are robust to using effective rates for a smaller set of countries.

44. Few studies exist on the role of international tax planning for investment and most of the existing ones focus on one specific country, such as the United States or Germany (Grubert 2003; Overesch, 2009).

45. Using tax data for the United States, Grubert (2003) shows that R&D-intensive MNEs are more likely than other MNEs to invest in countries with either very high or very low tax rates. Investments in very-low-tax countries may serve in the setting up of tax-planning schemes. Investment in very-high-tax countries are attractive for tax-planning MNEs, since tax-planning allows them to avoid most of the high tax burden that non-tax-planning firms have to face in these countries.

46. Forward looking marginal tax rates are sourced from the Centre for the Oxford Centre for Business Taxation. They derive from modelling a hypothetical investment project taking into account all relevant tax provisions. By construction, they do not include the effect of international tax planning.

47. The corporate tax rate considered is the marginal forward-looking effective tax rate. All differences in the reaction of investment to tax rate changes are significant at a 5% level.

48. Dynamic inconsistency and lack of commitment in government policy may be another possible explanation for positive capital taxation as the policy maker has an incentive to tax capital once the investments is done to raise revenue (e.g. Kydland and Prescott, 1977; Piketty and Saez, 2012).

49. Another justification for capital income taxes is that they can provide insurance against future poor labour market outcomes (see Golosov et al., 2006). In a setting when there is uncertainty about individuals' future skills (productivity) and leisure is a normal good, more savings today, all else equal, will reduce work incentives later on. Thus, discouraging savings through capital income taxation increase the governments' ability to provide insurance against future labour market risks.