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Abstract

This paper examines how restrictions on the tax-deductibility of interest cost affect location choices of multinational corporations (MNCs). Many countries have introduced so-called thin-capitalization rules (TCRs) to prevent MNCs from shifting tax base to countries with lower tax rates. As of 2012, in our sample of 172 countries, 61 countries have implemented a TCR. Using information on nearly all new foreign investments of German MNCs, we provide a number of new and interesting insights in how TCRs affect the decision of where to locate foreign entities. In particular, stricter TCRs are found to negatively affect location choices of MNCs. Our results include estimates of own- and cross-elasticities of location choice and also novel results on the relative importance of tax base vs. tax rate effects. We finally provide estimates for different uncoordinated as well as coordinated policy scenarios.

Keywords: Corporate Taxes, Location Choices, Multinational Corporations, Thin Capitalization Laws

JEL Classification: H2, H7

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1 Introduction

Policymakers all over the world increasingly respond to public outrage about how little taxes are payed by multinational corporations (MNCs) like Apple, Amazon, Google, Facebook, Microsoft or Starbucks. Recent reports about substantial tax avoidance by these firms as well as tight public budgets after the financial crisis have provoked governments to take drastic measures to prevent avoidance activities.[1] This government action is supported by the OECD report on base erosion and profit shifting (BEPS) published in 2013, in which the OECD raises concerns about corporate tax revenue losses, recognizing that profit shifting by MNCs is "a pressing and current issue for a number of jurisdictions" (OECD, 2013a, p.5).

The OECD identifies intra-group financial transactions as one of the main strategies used by MNCs to save taxes. In particular, there is a great deal of evidence that MNCs thinly capitalize foreign entities operating in high-tax countries by excessively using debt financing there. This debt is often provided through lending entities facing low or even zero taxes via an internal capital market (see Egger et al., 2014). The implication is that tax base (taxable profit) is shifted out of high-tax countries through interest payments across borders. The BEPS report recommends to "limit base erosion via interest deductions and other financial payments" (OECD, 2013b, Action 4, p.17).

As a matter of fact, measures to restrict interest deductions associated with excessive debt financing and profit shifting have been implemented for some time by many countries. For example, 61 out of 172 analyzed countries have been using so-called thin-

[1] For example, plans of the UK government of revising international tax law and to force companies to pay taxes in the UK try to put an end to all tax planning structures used by multinational firms. Politicians and the UK press have even been referring to the "Google tax" when reporting about government measures (Neate, 2014, The Guardian).

capitalization rules (TCRs) in 2012 (see Merlo and Wamser, 2014). From 1996 until 2012, 37 countries have introduced a TCR, only 4 countries abolished their TCRs.[2]

A small but growing literature in economics confirms the effectiveness of TCRs in removing tax-incentives related to debt financing. Buettner et al. (2012) as well as Blouin et al. (2014) find that affiliates of MNCs no longer respond to tax incentives if TCRs are introduced or made stricter. Weichenrieder and Windischbauer (2008), Overesch and Wamser (2010), as well as Wamser (2014) analyze a reform of the German TCR and find that foreign firms adjusted their capital structures after stricter rules have been introduced. Thus, this literature suggests that TCRs are effective and countries may use them as a policy instrument to restrict tax planning of MNCs.

Another way of interpreting the results of this literature is that new or stricter TCRs lead to a broader tax base. To the extent that a broader tax base leads to higher effective tax payments, a straightforward prediction is that stricter TCRs reduce real investment activity of firms, ceteris paribus. However, the question of how TCRs are related to real investment activities of MNCs has been widely neglected in the literature. One exemption is the paper by Buettner et al. (2014), in which the intensive margin of foreign activity (in terms of foreign affiliates investments in fixed assets) is analyzed. That paper confirms that TCRs exert negative effects on investments, particularly in countries with relatively high taxes.

Our paper contributes to this literature in several ways. First, we assess the impact of TCRs on the extensive margin of foreign activity (location choice). Second, we use new data on TCRs and all worldwide (first) location choices of German MNCs over a

[2]This does not take into account newly introduced earnings stripping rules (see Section 3).

time span of 11 years. Third, we calculate realistic own- and cross-tax as well as TCR elasticities by using a mixed logit (or random coefficient) model. The latter allows for heterogeneity in the responsiveness of firms to corporate tax incentives. Fourth, we provide numerous interesting policy results, including (i) an assessment of the relative importance of tax base vs. tax rate effects; (ii) estimates on real world policy options for unilateral measures against profit shifting; (iii) an assessment of the implications of a coordination in policies against profit shifting.

Our results can be summarized as follows. First, lower corporate taxes and laxer TCRs exert positive effects on the probability to choose a given location to set up the first foreign affiliate. For example, a 1% lower tax in the UK would lead to an increase of about 0.66% in the probability to choose the UK as a host country for the first foreign affiliate. The findings of tax and TCR effects are robust to a number of additional tests. These include variations in the estimation specification and also the analysis of subsequent (second) location decisions (following the first location choice). Second, we find that policies of one country exert significant externalities on other countries. For example, a 1% more lenient TCR in France would reduce the probability to locate in Argentina by -0.039%. Note that these externalities on other countries are heterogeneous across countries. This implies not only that own optimal policies differ, but also that coordinated action would produce winners and losers. Our estimations suggest that the main losers of a coordinated policy would be Austria, Belgium, Switzerland, and Ireland. The main winners of such a policy would be France, the UK, and the US.

Finally, we provide estimates on the relative importance of tax rate vs. tax base effects. We illustrate this using the example of the US and its policy options. Starting

from actual values of tax and TCR policy, we demonstrate that location choices are more sensitive to tax rate changes. For the US, our estimates imply that a 10 percentage point stricter TCR needs to be matched by a 2.3 percentage point lower corporate tax rate in order to keep the location attractiveness unchanged.

We believe that our paper not only contributes to the discussion about how to prevent profit shifting of MNCs but also to a general literature on the impact of tax and tax-base effects and their relative importance. We provide a number of new and instructive results supporting theoretical work. Given the externalities created by tax policy, our findings suggest that under strategic interaction, tax rates are set too low and TCRs are set too lenient. Coordinated measures against profit shifting by implementing a uniform TCR would therefore be clearly welfare increasing (see Haufler and Runkel, 2012).

The remainder of the paper is structured as follows. Section 2 briefly reviews related literature. Section 3 describes how TCRs work and and in Section 4 we discuss how TCRs affect location choices of MNCs. Sections 5 and 6 describe the estimation strategy and our dataset. The results and numerous policy experiments and quantifications are reported in Sections 7 and 8. Section 10 discusses policy implications and concludes.

2 Related literature

Our paper contributes to several strands of the literature. First, it relates to a growing number of empirical papers providing evidence on profit shifting by MNCs. For example, Swenson (2001), Clausing (2003), and Bartelsman and Beetsma (2003), and Cristea and Nguyen (2016) show that firms distort intra-firm transfer prices in a way that is

consistent with tax differentials. New evidence provided by Davies, Martin, Parenti and Toubal (2017) suggests that tax avoidance through transfer pricing, particularly of large firms, is economically sizable. Desai, Foley, and Hines (2004), Mintz and Weichrieder (2010), Huizinga et al. (2008), Møen et al. (2011), Buettner and Wamser (2013), Overesch and Wamser (2010, 2014), and Egger et al. (2014) present evidence that corporate taxes determine capital structure choices of affiliates of MNCs, which is in line with debt and profit shifting behavior (see also Heckemeyer et al., 2013, for a meta-study). Second, beside the contributions on the impact of TCRs (see above), recent papers confirm that legislations enacted by European countries to limit the abusive use of transfer pricing are effective (Lohse and Riedel, 2013; Beer and Loeprick, 2015). There is also evidence that controlled foreign company (CFC) legislation has an impact on how MNCs allocate passive assets across countries (Ruf and Weichenrieder, 2012). Our paper contributes to this literature by assessing the impact of TCRs on the location of real corporate activity of multinational firms. To the best of our knowledge, this link has so far largely been ignored.

Our paper is also related to prior work on the impact of corporate taxation on the location decision of MNCs. The large majority of papers on corporate taxation and firm activity analyse corporate tax rate effects on marginal investment decisions (see, e.g. de Mooji and Ederveen, 2003, and Heckemeyer and Feld, 2011). The impact of corporate taxes on location choice is, on the contrary, studied by a relatively small number of papers. The seminal paper by Devereux and Griffith (1998) provides evidence that corporate taxation deters the location of subsidiaries of MNCs. Barrios et al. (2012) confirm this finding using rich data on European MNCs. In line with this evidence, our estimates suggest a negative impact of corporate taxes on multinational location

decisions and, additionally indicate a negative impact of stricter anti-avoidance rules. Moreover, contrary to most prior work, our analysis accounts for the worldwide location decision of multinational firms and does not restrict the perspective to a limited set of countries in the OECD, Europe or North America. The paper by Gumpert, Hines, and Schnitzer (2016) uses data on German MNCs to analyze the extensive margin of tax haven activity of MNCs.

Finally, a number of recent papers discuss to what extent the questions raised in the OECD BEPS report require action and how this action should look like. For example, Dharmapala (2014) argues that policy measures to prevent income shifting can not be implemented without having reliable estimates on the magnitude thereof. Hebous and Weichenrieder (2014) reason that measures to prevent profit shifting have been implemented successfully by many countries, but that it is less clear to what extent partial harmonization and coordination of these measures leads to beneficial results, given that tax rates are still set at the national level. Our paper contributes to the policy discussion by quantifying the externalities of uncoordinated anti-avoidance policies, in terms of the attractiveness of a location for real investment. We also quantify the trade-off between base-broadening and tax-cutting reforms.

3 Thin capitalization rules

As described in the introductory section, MNCs have an incentive to distort the financial structure of their operations in order to shift income from high-tax to low-tax entities. This is achieved by injecting equity capital in a low-tax affiliate which then lends to related entities located in high-tax countries. As interest payments for the

intra-firm borrowing are deductible from the corporate tax base, the associated income is stripped out of the high-tax country and taxed at a low or zero rate at the low-tax or tax-haven entity.

The purpose of thin capitalization rules is to limit the deductibility of interest payments on intra-firm loans from the corporate tax base, thereby reducing the described debt-shifting incentives. Most countries' tax legislations lay down specific safe haven or safe harbor debt-equity relations until which interest deduction is not restricted.[3] Once a firm's debt-to-equity ratio is in excess of such a safe haven ratio, interest is no longer tax-deductible and fully taxed. An example may help to see this. For instance, interest costs of a foreign affiliate located in Canada are fully deductible only if its debt is below 1.5 times its equity. However, suppose a foreign affiliate is financed by a loan of 10 million Canadian Dollar (CAD) and by 5 million equity. Then, only 75% of the interest expenses are deductible as the loan exceeds 1.5 $\times$ equity by 2.5 million CAD $(10 - 1.5 \times 5)$. Denoting ω as the amount of debt and ϑ as the amount of equity, we can define a safe haven threshold Θ as

$$\Theta \equiv \frac{\omega}{\omega + \vartheta}. \tag{1}$$

Using this definition, the Canadian *safe haven threshold* (SHT) amounts to $\Theta_{CAN} = \frac{1.5}{1.5+1} = 0.6$. Equation (1) implies that higher values of Θ are associated with less strict TCRs and lower values of Θ are associated with stricter ones. In the extremes, if interest

[3]Ruf and Schindler (2012) as well as Dourado and de la Feria (2008) provide surveys on TCRs. They distinguish between different types of TCRs: some countries have implemented specific, others have implemented non-specific TCRs. For reasons of data availability and measurability, we focus on specific TCRs and the so-called fixed debt-to-equity approach. More details on TCRs, their design and application, as well as a discussion of the recent trend of replacing the fixed debt-to-equity approach by using earnings stripping rules (ESRs) can be found in Merlo and Wamser (2014).

is non-deductible for all debt, $\Theta = 0$; if interest deduction is not restricted and there is no TCR in place, $\Theta = 1$.[4]

Our analysis is based on TCR information for a sample of 172 countries (see Merlo and Wamser, 2014). In our data, the average SHT conditional on $\Theta < 1$ equals 0.73. Hence, the Canadian SHT is stricter than the average SHT in our data (conditional on $\Theta < 1$). The prevalence of thin capitalization requirements has increased substantially over our sample period. By 2012, 61 countries had implemented a TCR (111 countries did not have one). From 1996 until 2012, 37 countries have introduced a TCR, 6 relaxed their rules (an increase in Θ), and 21 countries made their rules stricter (a reduction in Θ). Four countries abolished their TCR between 1996 and 2012.[5]

4 The effect of TCRs on location choices

As mentioned in Section 2, corporate taxation is an important determinant of MNCs location choices. Previous work focused on the effect of profit tax rates on the choice of location. As Devereux and Griffith (1998) show, a firm facing a given number of possible locations will base its location decision on the comparison of after-tax profits arising at each location. The effective average tax rate (total tax payments relative to gross profits) determines the location choice through its effect on average costs.[6]

Since TCRs directly determine the effective average tax rate, we expect them to have

[4]Note that in the following, we will use all three acronyms (TCR, SHT, or the letter Θ) to refer to a thin capitalization rule or the safe haven ratio.

[5]Note, however, that three countries (Germany, Italy and Spain) abolished their TCRs but replaced them with so-called earnings-stripping rules in 2008 (Germany and Italy) and 2012 (Spain).

[6]While the marginal tax rate determines the optimal level of production in a given location, through its effect on the user cost of capital, the location decision depends on average costs which determine the relative size of after-tax profits at each location.

an effect on location choices. Denoting gross profits by G, the volume of debt financing by D, the statutory tax by τ, and debt interest by ι we obtain a simple representation of an average effective tax as

$$\tau^e = \frac{\tau\left(G - \theta\iota D\right)}{G}.$$

τ^e measures the proportion of total profit taken in tax and, in line with the discussion above, a higher τ^e reduces ceteris paribus after-tax profits at a given location and thus makes that location less likely to be chosen over other locations. The relevant component for understanding the effect of a TCR on τ^e is the fraction of deductible interest expenses θ, $\theta \in [0, 1]$. This fraction is always 1 if Θ equals 1 and interest deduction is not restricted. If $\Theta < 1$, the parameter θ may take any value between 0 and 1. A stricter rule (a lower Θ) implies a lower fraction of deductible interest expenses θ. Since $\frac{\partial \tau^e}{\partial \theta} < 0$, a stricter TCR implies a higher effective tax rate. This leads us to the following prediction:

Hypothesis: A laxer TCR (a higher Θ) implemented by a given country reduces the average tax burden faced by MNCs at that country and increases the probability that firms choose that country as host location.

5 Econometric approach

We examine the impact of TCRs on MNCs' location decisions using a discrete location choice model, where each choice yields a potential (latent) payoff. Suppose a firm i is concerned with choosing one of J potential locations (countries) to set up its first foreign affiliate. Each of the $j = 1, ..., J$ locations is associated with a latent profit π^*_{ij} and the actual choice of a location $C_i \in \{1, 2, ..., J\}$ is based on the maximum

attainable profit, argmax$(\pi^*_{i1}, \pi^*_{i2}, ..., \pi^*_{iJ})$. We postulate potential profits to depend on observable and unobservable firm and country characteristics as follows:

$$\pi^*_{ij} = \gamma\Theta_j + \alpha_i\tau_j + \boldsymbol{x}'_{ij}\boldsymbol{\beta} + \epsilon_{ij}, \tag{2}$$

where Θ_j is the safe-haven threshold in country j as defined in Section 3, τ_j is the statutory corporate tax rate in country j, $\mathbf{x}_{ij}$ is a $1 \times K$ vector of country- and country-firm specific characteristics, and ϵ_{ij} is a disturbance term. Note that variables in (2) do not bear a time index t, although we measure all variables in the year of each firm's first location choice. The parameters γ and those in the vector $\boldsymbol{\beta}$ are fixed population parameters to be estimated. The parameter on the corporate tax rate α_i is indexed by i as it is defined as a firm-specific random coefficient and assumed to be normally distributed with parameters a and σ, which are to be estimated. Assuming $\alpha_i \sim N(a, \sigma^2)$ and $\epsilon_{ij} \sim$ iid extreme value yields the mixed (or random parameters) logit model.[7] Specifying the coefficient α_i on the corporate tax rate as random directly relates to the expectation of a large heterogeneity across firms in tax avoidance activities (depending on firm characteristics, products sold, access to finance, etc.), which suggests heterogeneity in tax elasticities.

Alternatively, it is useful to think of $\alpha_i\tau_j$ as error components which, together with ϵ_{ij}, represent the stochastic part of π^*_{ij}. This stochastic part $\eta_{ij} = \alpha_i\tau_j + \epsilon_{ij}$ is allowed to be correlated across alternatives. Under the assumption of a zero error component, the unobserved proportion of profits for one alternative is not correlated with the

[7]The mixed logit model is estimated by simulated maximum likelihood. For an extensive discussion of the mixed logit model, see Train (2009).

unobserved proportion of profits for another alternative.[8] By allowing for correlation in profits over alternatives m and n, we have $Cov(\eta_{in}, \eta_{im}) = E(\alpha_i \tau_{im} + \epsilon_{im})(\alpha_i \tau_{in} + \epsilon_{in}) = \tau_{im} W \tau_{in}$, with W being the covariance of α_i (see Train, 2009).

One of the central issues about (2) is specifying the variables that induce correlation among alternatives. One way to proceed is to think about the different determinants of location choice and why they might induce such correlation. It seems natural to consider the tax rate as a variable that causes such correlation as differences in taxes and tax policy across countries induce unobservable tax avoidance activities affecting π^*_{ij} through different forms of ij-specific tax planning or income shifting. Another interpretation in view of the theoretical tax competition literature is that tax policy is used by one country to attract mobile capital at the expense of other countries.[9]

6 Data

To test whether TCRs affect MNCs' location choices, we make use of the German firm-level census-type dataset *MiDi* (Microdataset Directinvestment) provided by Deutsche Bundesbank. This annual dataset comprises information on direct investment stocks of German enterprises held abroad. Data collection is enforced by German law, which determines reporting mandates for international transactions if investments exceed a balance-sheet threshold of 3 million Euros.[10] *MiDi* is particularly well suited to explore

[8] Such a model would exhibit the independence from irrelevant alternative assumption (IIA) property.

[9] We also consider a specification where the coefficients on both the corporate taxe rate τ_j and the safe-haven threshold Θ_j are random (see Section 7).

[10] All German firms and households which hold 10 percent or more of the shares or voting rights in a foreign enterprise with a balance-sheet total of more than 3 million euros are required by law to report balance-sheet information to Deutsche Bundesbank. Indirect participating interests had to be

the determinants of corporate location choices, as we observe all (directly and indirectly held) new entities established by German firms in foreign countries over a 11-year period between 2002 and 2012.

For the empirical analysis, we restrict our attention to the location choice of the *first* foreign affiliate. For each firm in the dataset, we observe the country of location of their first foreign affiliate and the year in which it is set up. In the location choice model the firm's choice set consists of all J countries in which we observe first locations. The dependent variable indicating each firm's choice is a binary variable c_{ij} defined for all firm-i and country-j combinations. c_{ij} equals one if firm i locates its first foreign affiliate in country j, i.e. $c_{ij} = 1$, and zero otherwise (i.e. for all other possible $J - 1$ locations). Since firms establish their first foreign affiliate in different years, the choice set of each firm corresponds to the given set of countries, and the respective characteristics of those countries in the year of the choice. The country- and firm-specific characteristics that determine the choice are correspondingly dated. In our data, 3,574 German MNCs locate their first foreign entity in one of 80 countries in the period between 2002 and 2012.[11] Many of the foreign entities are established in neighboring countries to Germany like France (283 entities), Austria (263 entities), Poland (248 entities) or Switzerland (196 entities). Other European countries like the UK are important as well (216 entities). However, the most important host country

reported whenever foreign affiliates held 10 percent or more of the shares or voting rights in other foreign enterprises until the end of year 2006. Thereafter, indirect participating interests had and have to be reported whenever foreign affiliates held more than 50 percent or more of the shares or voting rights in other foreign enterprises with a balance-sheet total of more than 3 million euros. The reporting requirements are set by the Foreign Trade and Payments Regulation. For details and a documentation of *MiDi*, see Lipponer (2009).

[11] In the location choice model, each of the 3,574 firms faces 80 potential locations, which gives a total number of observations of $3,574 \times 80 = 285,920$. Due to missing values in some country-level explanatory variables for some country-year combinations, our estimation sample has 264,959 observations.

in terms of number of new establishments is the US, where 458 new entities have been established between 2002 and 2012. We also count a substantial number of new investments in emerging markets like China and Russia (177 and 108, respectively).

As outlined above, location choice is determined by all variables that determine π_{ij}^*. Beside tax determinants, our empirical analysis uses a very rich set of control variables which have been identified in previous studies as determinants of corporate location decisions.[12]

Our explanatory variables of interest are a country's safe-haven threshold, SHT (Θ in Eq. 2), and statutory corporate tax rate, TAX (τ). Additionally, we include the following variables. The log of a country's GDP, $log(GDP)$, is included to capture local market size and demand conditions. Ceteris paribus, we expect that the location choice probability is positively related to this variable. Moreover, we include the log of GDP per capita, $log(GDPPC)$, as a proxy for a country's labor productivity. As far as $log(GDPPC)$ is positively related to purchasing power and the foreign entity is part of a horizontal FDI strategy, we would expect a positive impact of this variable. If, on the other hand, the foreign entity is part of a vertically integrated firm and the MNC produces intermediate goods in low wage countries, a higher GDP per capita may be associated with higher average wages, which may lead to a lower probability to choose a location. Gross domestic product growth in country j, $GDP\ growth$, may be considered as a general measure for the economic attractiveness of a location. We furthermore include the variable $DCPS$ to measure domestic credits provided to the private sector in a country relative to a country's GDP. We expect that $DCPS$ is

[12]Note that most of the following variables are country-j-specific and are allowed to vary in time t. However, as mentioned above, we model location choice as a choice from alternatives at a given t and suppress t and j indices for the sake of simplicity.

positively correlated with the quality of a country's financial market. Thus, higher values of $DCPS$ are expected to make host countries more attractive. In addition, we include the log capital-labor ratio of host country j, $KLRATIO$. This variable should reflect relative factor endowments of countries. To capture fixed investment cost we include $COSTBS$, which measures costs of business start-up procedures (in % of GNI per capita) in a potential host country. The cost of starting a business is clearly an entry cost factor for MNCs (irrespective of whether FDI is vertical or horizontal), so its impact is expected to be negative.

Another relevant country characteristic is market j's inflation rate, $INFLR$. The variables $CORRUPTION$ (freedom from corruption) and $PRIGHTS$ (property rights) measure institutional quality. They can take values between 0 and 100, higher values referring to less corruption and better property rights in a host country. As foreign locations are more attractive for MNCs if they are more integrated in terms of bilateral investment treaties (BITs) and double taxation treaties (DTTs), we condition on the existing treaty network of host countries by including BIT and DTT. BIT refers to the aggregate number of BITs, and DTT refers to the aggregate number of DTTs concluded by host country j with all other countries.

Using information from *MiDi*, we calculate the variable $log(TASSETS)$ as the sum of total assets of German MNCs in country j in the year before a new investment is established. The idea is to include a variable that measures the general attractiveness of foreign markets for German investors. Note that this variable refers to the aggregate of German FDI in the period before firm i enters a market, but all other explanatory variables are measured in the years a new foreign entity is set up.

Our analysis also accounts for control variables that reflect distance between host locations and the parent country Germany. On the one hand, these measures relate to geographical distance: $log(DISTANCE)$ is the log of the distance (in kilometers) between the most populated cities between Germany and a host country; $CONTIG$ is an indicator variables which equals one if Germany and a potential host country share a common border, and zero else. On the other hand, we include measures that relate to cultural closeness: $COLONY$ is equal to one if the potential host country is a former colony of Germany, and zero otherwise; $COMLANG$ is equal to one if Germany and the foreign country j share a common language. Mean values, standard deviations, definitions and data sources are summarized in Table 1.

7 Results

7.1 Estimation results

Table 2 presents our preferred specification of the location choice model.[13] In addition to the variables listed in the previous section, the specification shown in Table 2 additionally includes interactions of the non-tax (fixed) determinants with the sales-to-total-asset ratio ($SATA$) of the parent.[14] The estimated mean of TAX is significant at 1% and negative. The estimated standard deviation is significant and suggests that

[13]We have tested a number of different specifications, including ones that define SHR (Θ) as a random variable. Some of the additional robustness estimates are presented below. We have also estimated conditional logit models (under the unfavorable IIA assumption). The results are very robust to this. However, a conditional logit does not allow for calculating meaningful substitution elasticities.

[14]Note that the explanatory variables in a mixed logit model need to exhibit variation across alternatives. The way to introduce firm-specific variation is to interact firm-level variables with the alternative-specific (i.e. country-level) variables.

Table 1: *VARIABLE DESCRIPTIONS AND DESCRIPTIVE STATISTICS*

VARIABLE	*MEAN*	*STD.DEV.*	*DESCRIPTION*	*DATA SOURCE*
TAX (τ)	.257	.087	Statutory corporate tax rate in country j	International Bureau of Fiscal Documentation, IBFD; tax surveys provided by Ernst&Young, PwC, and KPMG
SHT (Θ)	.894	.136	Safe haven debt-to-equity ratio of country j	International Bureau of Fiscal Documentation, IBFD; tax surveys provided by Ernst&Young, PwC, and KPMG
$log(GDP)$	25.902	1.685	(log of) Gross domestic product (GDP) in country j	World Bank, World Development Indicators (WDI) database
$log(GDPPC)$	9.469	.930	(log of) Gross domestic product per capita ($GDPPC$) in country j	World Bank, World Development Indicators (WDI) database
$GDP\ growth$	.039	.042	Gross domestic product growth ($GDP\ growth$) in country j	World Bank, World Development Indicators (WDI) database
$DCPS$	83.664	56.441	Domestic credit to private sector (% of GDP) in country j	World Bank, World Development Indicators (WDI) database
$log(KLRATIO)$	10.054	1.276	(log of) Capital-labor ratio of country j	World Bank, World Development Indicators (WDI) database
$COSTBS$	17.763	27.116	Cost of business start-up procedures (% of GNI per capita) in country j	World Bank, World Development Indicators (WDI) database
$INFLR$	4.818	5.120	Average consumer prices percent change (inflation) in country j	IMF, World Economic Outlook (WEO) database
$CORRUPTION$	51.469	22.954	Freedom from corruption of country j (scale ranges from 0-100; higher values indicate less corruption)	Heritage Foundation, Heritage Indicators database
$PRIGHTS$	57.665	23.908	Property rights in country j (scale ranges from 0-100; higher values indicate less corruption)	Heritage Foundation, Heritage Indicators database
BIT	.364	.481	Total number of bilateral investment treaties concluded by country j	United Nations Conference on Trade and Development (UNCTAD) database
DTT	50.142	30.326	Total number of double taxation treaties country j has concluded	United Nations Conference on Trade and Development (UNCTAD) database
$log(TASSETS)$	14.493	2.539	(log of) Sum of total assets of German MNCs in country j (variable is measured in the period before market entry)	Own calculations using $MiDi$ data
$log(DISTANCE)$	7.974	1.155	(log of) Distance is the distance (in kilometer) between the most populated cities between Germany and country j	CEPII (Centre d'études prospectives et d'informations internationales)
$CONTIG$	.121	.327	Binary variable indicating whether Germany and country j share a common border	CEPII (Centre d'études prospectives et d'informations internationales)
$COLONY$	.027	.162	Binary variable indicating whether Germany and country j ever had a colonial relationship	CEPII (Centre d'études prospectives et d'informations internationales)
$COMLANG$	.040	.197	Binary variable indicating whether Germany and country j share a common language	CEPII (Centre d'études prospectives et d'informations internationales)
$SATA$	.746	1.277	Sales-to-total-asset ratio of the parent company (variable enters through interaction terms)	Own calculations using $MiDi$ data

there is quite some heterogeneity in how tax rates affect location choices of MNCs.

Our central result is the finding of a positive and significant coefficient for SHR. Hence, a laxer TCR (an increase in the safe haven ratio) leads to a higher probability that a country is chosen as first location. We will provide a quantification and interpretation of this result in the next sections.

The estimated coefficients on the other controls are usually in line with what we expect and can be summarized as follows. First, closer countries (in terms of distance, direct neighborhood, but also in terms of historic ties and language) are chosen with a higher probability than ones farther away. Second, higher FDI by German firms in the period before market entry is positively related to location probabilities. Third, the positive coefficient on $DCPS$ and the negative estimate on $SATA \times DSPS$ suggests that, while an underdeveloped financial market deters foreign affiliate location, the effect is less severe for larger MNCs which can arguably rely on an internal capital market. Fourth, we cannot find a statistically significant effect for BIT, DTT, $INFLR$, and $COSTBS$.

Tables 3 and 4 present alternative specifications of our location choice model. In Table 3 we test whether the omission of the firm-country interactions makes a big difference for the estimated coefficients of TAX and SHT. The results show that the estimates are very similar compared to the specifications using the additional interactions. In Table 4 we also define the safe haven ratio as random. However, the estimates suggest that there is no additional heterogeneity in the responses of firms as the standard deviation of SHT is insignificant. Conditional on TAX, this seems very plausible as the differences in taxes across countries, rather than cross-country variation in SHT

Table 2: *BASIC ESTIMATION RESULTS*

VARIABLES DEFINED AS RANDOM			
TAX (τ) *(Mean)*	-2.367***		
	(.455)		
TAX (τ) *(Std.Dev.)*	2.471**		
	(1.127)		
VARIABLES DEFINED AS FIXED			
$SHT(\Theta)$	.437**	$SATA \times SHT$	-.007
	(.214)		(.146)
$log(GDP)$	.130***	$SATA \times log(GDP)$	-.055*
	(.048)		(.030)
$log(GDPPC)$	.323*	$SATA \times log(GDPPC)$	-.177
	(.177)		(.123)
$GDP\ growth$	2.933***	$SATA \times GDP\ growth$	.599
	(1.046)		(.716)
$DCPS$	.003***	$SATA \times DCPS$	-.001***
	(.001)		(.001)
$log(KLRATIO)$	-.118	$SATA \times log(KLRATIO)$	.055
	(.121)		(.086)
$COSTBS$	-.001	$SATA \times COSTBS$	-.002
	(.003)		(.002)
$INFLR$	-.0003	$SATA \times INFLR$	.002
	(.009)		(.006)
$CORRUPTION$	-.017***	$SATA \times CORRUPTION$	.005**
	(.003)		(.002)
$PRIGHTS$	.004	$SATA \times PRIGHTS$	-.003*
	(.003)		(.002)
BIT	-.044	$SATA \times BIT$	.066
	(.068)		(.047)
DTT	.002	$SATA \times DTT$	-.001
	(.002)		(.001)
$log(TASSETS)$	.731***	$SATA \times log(TASSETS)$	.094***
	(.041)		(.030)
$log(DISTANCE)$	-.112***	$SATA \times log(DISTANCE)$	.024
	(.042)		(.031)
$CONTIG$	.506***	$SATA \times CONTIG$	.012
	(.075)		(.051)
$COLONY$	.217**	$SATA \times COLONY$	.080
	(.108)		(.063)
$COMLANG$	.153*	$SATA \times COMLANG$	.022
	(.094)		(.065)

Notes: Mixed logit estimates; 264,959 observations; 3,574 new location choices; ***, **, * indicate significance at the 1, 5, and 10 percent level; standard errors in parentheses; TAX (τ) defined as random; all other variables defined as fixed.

per se, induce firms to optimize over intra-firm trade or financing. Taken all results together, it appears that the coefficients on SHT are precisely estimated as comparing it across different specifications shows that it hardly differs: .437 in Table 2, .433 in Table 3, and .430 in Table 4.

7.2 Estimated location probabilities

Given the estimated coefficients of our preferred specification (Table 2) we calculate the probability of a firm choosing a given country to locate its first foreign affiliate. The mixed logit model probability of firm i choosing location j is

$$P_{ij} = \int L_{ij}(\alpha_i)\phi(\alpha)d\alpha, \quad \text{for all } i, j, \tag{3}$$

where $L_{ij}(\alpha_i) = exp(V_{ij}(\alpha_i))/\sum_j exp(V_{ij}(\alpha_i))$ with $V_{ij}(\alpha_i) = \gamma\Theta_j + \alpha_i\tau_j + \boldsymbol{x}'_{ij}\boldsymbol{\beta}$. $L_{ij}(\alpha_i)$ is the probability conditional on the unobserved firm-specific parameter α_i. The unconditional probability P_{ij} is obtained integrating $L_{ij}(\alpha_i)$ over all possible values of α_i.[15]

Table 5 reports the estimated base location probabilities for the 80 countries included in our sample. These estimates vary from 0.126 for the US to values close to zero for Guyana, Jordan, Nicaragua, or Qatar. Note that these base probabilities are important not only when calculating elasticities but also when expressing our findings in terms of number of new affiliates below.

[15]The integral in Eq. (3) does not have a closed form and has to be approximated through simulation by drawing values of α_i from a normal distribution with mean and standard deviation as estimated in Table 2 (See Train, 2009).

Table 3: *ALTERNATIVE SPECIFICATION I*

VARIABLES DEFINED AS RANDOM	
TAX (τ) *(Mean)*	-2.358***
	(.456)
TAX (τ) *(Std.Dev.)*	2.677**
	(1.052)
VARIABLES DEFINED AS FIXED	
SHT (Θ)	.433**
	(.184)
$log(GDP)$	.089**
	(.043)
$log(GDPPC)$	.194
	(.154)
GDP $growth$	3.405***
	(.899)
$DCPS$	.002***
	(.001)
$log(KLRATIO)$	-.079
	(.105)
$COSTBS$	-.002
	(.002)
$INFLR$	.001
	(.008)
$CORRUPTION$	-.014***
	(.003)
$PRIGHTS$	.001
	(.002)
BIT	.009
	(.058)
DTT	.001
	(.002)
$log(TASSETS)$	.798***
	(.036)
$log(DISTANCE)$	-.091***
	(.036)
$CONTIG$	.517***
	(.065)
$COLONY$	.286***
	(.093)
$COMLANG$	.169**
	(.080)

Notes: Mixed logit estimates; 264,959 observations; 3,574 new location choices; ***, **, * indicate significance at the 1, 5, and 10 percent level; standard errors in parentheses; TAX (τ) defined as random; all other variables defined as fixed.

Table 4: *ALTERNATIVE SPECIFICATION II*

VARIABLES DEFINED AS RANDOM			
TAX (τ) *(Mean)*	-2.371***		
	(.455)		
TAX (τ) *(Std.Dev.)*	2.461**		
	(1.132)		
SHT (Θ) *(Mean)*	.430**		
	(.184)		
SHT (Θ) *(Std.Dev.)*	.242		
	(.756)		
VARIABLES DEFINED AS FIXED			
$log(GDP)$	.130***	$SATA \times log(GDP)$	-.055*
	(.048)		(.030)
$log(GDPPC)$	.322*	$SATA \times log(GDPPC)$	-.176
	(.177)		(.122)
$GDP\ growth$	2.935***	$SATA \times GDP\ growth$	.596
	(1.045)		(.713)
$DCPS$	.003***	$SATA \times DCPS$	-.001***
	(.001)		(.001)
$log(KLRATIO)$	-.117	$SATA \times log(KLRATIO)$	.055
	(.121)		(.085)
$COSTBS$	-.001	$SATA \times COSTBS$	-.002
	(.003)		(.002)
$INFLR$	-.0003	$SATA \times INFLR$	.002
	(.009)		(.006)
$CORRUPTION$	-.017***	$SATA \times FFC$	.005**
	(.003)		(.002)
$PRIGHTS$	.004	$SATA \times PRIGHTS$	-.003*
	(.003)		(.002)
BIT	-.045	$SATA \times BIT$	.066
	(.068)		(.045)
DTT	.002	$SATA \times DTT$	-.001
	(.002)		(.001)
$log(TASSETS)$	.730***	$SATA \times log(TASSETS)$	.094***
	(.041)		(.029)
$log(DIST)$	-.112***	$SATA \times log(Distance)$	.023
	(.042)		(.031)
$CONTIG$	.506***	$SATA \times CONTIG$	.013
	(.076)		(.050)
$COLONY$	.217**	$SATA \times COLONY$	.080
	(.108)		(.063)
$COMLANG$	.154*	$SATA \times COMLANG$	.020
	(.090)		(.054)

Notes: Mixed logit estimates; 264,959 observations; 3,574 new location choices; ***, **, * indicate significance at the 1, 5, and 10 percent level; standard errors in parentheses; TAX (τ) and SHT (Θ) defined as random; all other variables defined as fixed.

Table 5: *ESTIMATED BASE PROBABILITIES FOR ALL COUNTRIES*

ARE	0.004700	DZA	0.000540	KGZ	0.000132	PAN	0.000448
ARG	0.003309	EGY	0.001278	KOR	0.009086	PHL	0.001337
AUS	0.007061	ESP	0.029750	LBN	0.000184	POL	0.069798
AUT	0.055393	EST	0.000782	LBR	0.000383	PRT	0.006768
AZE	0.000424	FIN	0.004952	LKA	0.000158	PRY	0.000122
BEL	0.043140	FRA	0.077659	LTU	0.002576	QAT	0.000000
BGD	0.000253	GBR	0.066381	LUX	0.011572	RUS	0.026170
BGR	0.003898	GRC	0.008135	LVA	0.001613	SAU	0.001034
BHS	0.000384	GUY	0.000000	MAR	0.000972	SGP	0.007953
BLR	0.000281	HKG	0.005982	MDA	0.000388	SVK	0.014703
BRA	0.018812	HRV	0.006161	MEX	0.012044	SVN	0.001774
CAN	0.011485	HUN	0.022291	MKD	0.001262	SWE	0.016528
CHE	0.055046	IDN	0.004618	MLT	0.000563	THA	0.004018
CHL	0.001901	IND	0.007874	MUS	0.000159	TUN	0.000552
CHN	0.043588	IRL	0.008027	MYS	0.005154	TUR	0.011568
COL	0.001660	ISR	0.001174	NAM	0.000134	UKR	0.005913
CRI	0.000250	ITA	0.035830	NIC	0.000024	URY	0.000180
CYP	0.001168	JOR	0.000038	NLD	0.042545	USA	0.125987
CZE	0.054565	JPN	0.018977	NOR	0.004181	VNM	0.000613
DNK	0.009111	KAZ	0.000792	NZL	0.000426	ZAF	0.007874

7.3 Own- and cross- $SHT-$ and $TAX-$elasticities

The mixed logit model allows the calculation of interesting substitution patterns, i.e the own- and cross-country effect of a change in the safe-haven threshold of any given country on the location probabilities. The percentage change in the probability for alternative ℓ given the percentage change in Θ of jurisdiction j is given by

$$\begin{aligned} E_{i\ell\Theta_{ij}} &= -\frac{\Theta_{ij}}{P_{ij}} \int \gamma L_{i\ell}(\alpha) L_{ij}(\alpha) f(\alpha) d\alpha \\ &= -\Theta_{ij} \int \gamma L_{ij}(\alpha) \left[\frac{L_{i\ell}}{P_{i\ell}}\right] f(\alpha) d\alpha, \quad \forall \ell \neq j, \end{aligned} \tag{4}$$

where the change in the probability depends on the correlation between $L_{i\ell}(\alpha)$ and $L_{ij}(\alpha)$ over different values of α.

Tables 6 and 7 present own- and cross-elasticities for a selected number of countries. In these tables, the entries on the main diagonal refer to the estimated own-elasticities. For example, a 1-percent higher SHT (a 1-percent laxer safe haven threshold Θ) in

Brazil increases the probability to choose Brazil as a location to set up the first affiliate by 0.4238%. A 1-percent more lenient SHT in Ireland is associated with a somewhat lower elasticity of 0.2142. The entries off the main diagonal refer to cross-elasticities of a 1-percent change in the SHT of a country in a column on a country in a row.

Table 6 shows that these cross-elasticities are not only estimated to be heterogeneous across countries changing their $SHTs$ (across columns) but also across countries facing externalities exerted by other countries (in rows). For example, a 1-percent more lenient SHT in the US leads to large negative responses in Argentina, Canada, Japan, and Norway. On the other hand, we estimate the smallest (the least negative) elasticity for Russia. The differences in estimated cross-elasticities may reflect differences or similarities in factor endowments or closeness in terms of language, culture, or distance (for Canada). It is also interesting to notice that there is no clear regularity with respect to how countries are recipients of shocks. For example, for a given country (in a given row), whether or not the impact on this country is big or not (compare columns for a given line), is highly dependent on which country is changing its policy.

Table 7 presents own- and cross-elasticities for changes in the tax variable.[16] On average, we find larger elasticities compared to changes in the SHT. For example, a 1-percent lower tax in Canada would lead to a 0.7448% higher probability to locate a new entity there. The cross-tax-elasticities are also larger and highly heterogeneous. It is interesting to interpret these estimates in the light of the SHT elasticities. For example, we find that a change in the tax in the US leads to a huge impact on the probability

[16]We are only aware of one previous paper that reports cross-tax elasticities. In a recent contribution, Griffith et al. (2014) calculate own- and cross-elasticities with respect to variations in corporate tax rates for a sample of 14 countries. Our estimates seem to be on average a little larger, but often relatively similar (for example, for Norway we find an elasticity of 0.7369; the elasticity estimated by Griffith et al., 2014, equals 0.783).

to locate in Ireland (a cross-elasticity of -0.1317), while the estimated SHT-cross-elasticity was rather modest. The reason for this finding may be that the tax burden of foreign affiliates in Ireland is not very high, so restrictions on debt financing do not bite. On the other hand, when other countries benefit from cutting taxes, this comes at the expense of Ireland whose attractiveness as a low-tax country is relatively reduced. This is confirmed when focusing on the row IRL and comparing cross-responses across columns: the negative effect on Ireland is usually one of the largest.

We can finally interpret Tables 6 and 7 in light of the theoretical literature. Tax competition models with strategic interaction usually predict that increasing its own tax rate leads to an outflow of capital. A higher safe haven ratio (a more lenient TCR) would imply an inflow of capital. In this sense, higher taxes exert positive externalities on other countries, while a higher safe haven ratio exerts a negative externality on other countries. Hence, on average, taxes are too low and TCRs are too lax as countries do not consider these externalities.

8 Policy implications

8.1 Policy options for the US

In this section we take a closer look at the policy options of a single country. In particular, we will focus on the US as it is the most important country in terms of number of new entities in our data. Figure 1 presents estimated probabilities (the vertical axis) and how these depend on the two policy variables we are interested in. Although we know from Tables 6 and 7 that tax elasticities are somewhat larger compared to safe haven elasticities, it is not clear what this means for a given parameter

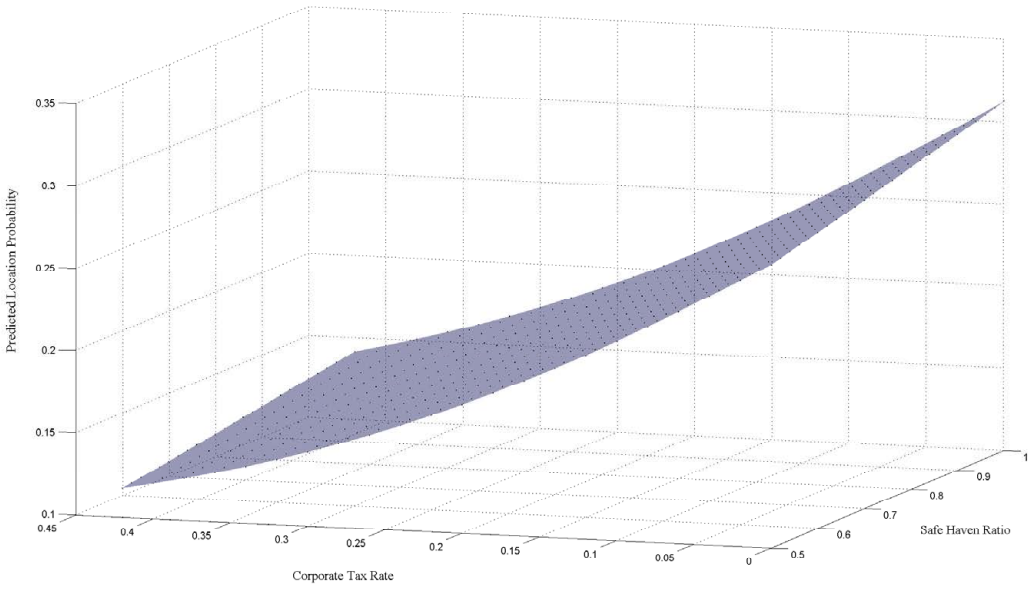
Table 6: *SHT OWN- AND CROSS-ELASTICITIES*

	ARG	**AUS**	**AUT**	**BRA**	**CAN**	**CHE**	**CHN**	**DNK**	**ESP**	**FRA**	**GBR**	**IRL**	**JPN**	**MEX**	**NOR**	**RUS**	**SGP**	**USA**
ARG	**0.2846**	-0.0020	-0.0241	-0.0069	-0.0048	-0.0141	-0.0123	-0.0029	-0.0102	-0.0390	-0.0168	-0.0016	-0.0112	-0.0047	-0.0014	-0.0067	-0.0024	-0.0652
AUS	-0.0004	**0.3221**	-0.0238	-0.0084	-0.0027	-0.0159	-0.0168	-0.0034	-0.0104	-0.0313	-0.0174	-0.0017	-0.0080	-0.0038	-0.0006	-0.0120	-0.0026	-0.0535
AUT	-0.0004	-0.0023	**0.4080**	-0.0083	-0.0029	-0.0157	-0.0164	-0.0033	-0.0102	-0.0318	-0.0170	-0.0017	-0.0079	-0.0040	-0.0006	-0.0113	-0.0026	-0.0528
BRA	-0.0004	-0.0024	-0.0243	**0.4238**	-0.0026	-0.0155	-0.0171	-0.0033	-0.0105	-0.0316	-0.0170	-0.0016	-0.0079	-0.0039	-0.0005	-0.0118	-0.0025	-0.0535
CAN	-0.0007	-0.0021	-0.0235	-0.0071	**0.3904**	-0.0145	-0.0127	-0.0032	-0.0102	-0.0357	-0.0172	-0.0017	-0.0100	-0.0043	-0.0011	-0.0080	-0.0023	-0.0638
CHE	-0.0004	-0.0023	-0.0240	-0.0080	-0.0027	**0.2691**	-0.0164	-0.0034	-0.0100	-0.0308	-0.0173	-0.0019	-0.0077	-0.0038	-0.0006	-0.0120	-0.0027	-0.0517
CHN	-0.0003	-0.0024	-0.0242	-0.0086	-0.0023	-0.0159	**0.3528**	-0.0034	-0.0104	-0.0303	-0.0172	-0.0017	-0.0076	-0.0038	-0.0005	-0.0127	-0.0026	-0.0512
DNK	-0.0004	-0.0023	-0.0237	-0.0081	-0.0028	-0.0161	-0.0164	**0.3647**	-0.0103	-0.0309	-0.0174	-0.0018	-0.0079	-0.0038	-0.0006	-0.0119	-0.0026	-0.0535
ESP	-0.0004	-0.0023	-0.0237	-0.0083	-0.0030	-0.0153	-0.0163	-0.0034	**0.3353**	-0.0326	-0.0174	-0.0016	-0.0085	-0.0039	-0.0006	-0.0112	-0.0025	-0.0566
FRA	-0.0005	-0.0022	-0.0238	-0.0080	-0.0033	-0.0151	-0.0153	-0.0032	-0.0105	**0.3774**	-0.0172	-0.0016	-0.0091	-0.0041	-0.0008	-0.0103	-0.0025	-0.0581
GBR	-0.0004	-0.0023	-0.0236	-0.0080	-0.0030	-0.0157	-0.0161	-0.0034	-0.0104	-0.0319	**0.2419**	-0.0018	-0.0082	-0.0039	-0.0007	-0.0114	-0.0026	-0.0545
IRL	-0.0004	-0.0023	-0.0239	-0.0076	-0.0028	-0.0170	-0.0160	-0.0035	-0.0096	-0.0301	-0.0174	**0.2142**	-0.0074	-0.0038	-0.0007	-0.0121	-0.0028	-0.0504
JPN	-0.0006	-0.0022	-0.0232	-0.0079	-0.0036	-0.0147	-0.0149	-0.0032	-0.0107	-0.0353	-0.0172	-0.0016	**0.4225**	-0.0041	-0.0009	-0.0097	-0.0024	-0.0631
MEX	-0.0005	-0.0022	-0.0243	-0.0081	-0.0033	-0.0153	-0.0156	-0.0033	-0.0102	-0.0333	-0.0171	-0.0017	-0.0087	**0.3204**	-0.0008	-0.0105	-0.0025	-0.0562
NOR	-0.0009	-0.0020	-0.0232	-0.0066	-0.0049	-0.0149	-0.0117	-0.0030	-0.0096	-0.0381	-0.0171	-0.0018	-0.0111	-0.0045	**0.3517**	-0.0071	-0.0025	-0.0652
RUS	-0.0003	-0.0024	-0.0239	-0.0085	-0.0021	-0.0166	-0.0181	-0.0035	-0.0102	-0.0289	-0.0174	-0.0018	-0.0070	-0.0036	-0.0004	**0.4190**	-0.0028	-0.0488
SGP	-0.0004	-0.0023	-0.0241	-0.0080	-0.0027	-0.0164	-0.0166	-0.0034	-0.0099	-0.0308	-0.0174	-0.0019	-0.0076	-0.0038	-0.0007	-0.0121	**0.3217**	-0.0508
USA	-0.0005	-0.0022	-0.0232	-0.0080	-0.0035	-0.0149	-0.0152	-0.0033	-0.0107	-0.0341	-0.0172	-0.0016	-0.0095	-0.0040	-0.0008	-0.0101	-0.0024	**0.3709**

Table 7: *TAX OWN- AND CROSS-ELASTICITIES*

	ARG	**AUS**	**AUT**	**BRA**	**CAN**	**CHE**	**CHN**	**DNK**	**ESP**	**FRA**	**GBR**	**IRL**	**JPN**	**MEX**	**NOR**	**RUS**	**SGP**	**USA**
ARG	**0.7719**	-0.0041	-0.0348	-0.0113	-0.0084	-0.0295	-0.0207	-0.0050	-0.0184	-0.0665	-0.0431	-0.0031	-0.0176	-0.0095	-0.0028	-0.0093	-0.0041	-0.1000
AUS	-0.0010	**0.7053**	-0.0366	-0.0130	-0.0051	-0.0331	-0.0310	-0.0061	-0.0210	-0.0537	-0.0453	-0.0032	-0.0128	-0.0081	-0.0012	-0.0166	-0.0045	-0.0853
AUT	-0.0012	-0.0052	**0.6511**	-0.0144	-0.0059	-0.0354	-0.0328	-0.0065	-0.0224	-0.0591	-0.0480	-0.0035	-0.0140	-0.0091	-0.0014	-0.0171	-0.0048	-0.0925
BRA	-0.0009	-0.0044	-0.0340	**0.7041**	-0.0044	-0.0298	-0.0285	-0.0054	-0.0186	-0.0484	-0.0400	-0.0028	-0.0113	-0.0075	-0.0011	-0.0150	-0.0041	-0.0753
CAN	-0.0016	-0.0040	-0.0326	-0.0104	**0.7448**	-0.0285	-0.0200	-0.0052	-0.0172	-0.0560	-0.0409	-0.0030	-0.0143	-0.0083	-0.0020	-0.0102	-0.0037	-0.0882
CHE	-0.0013	-0.0059	-0.0447	-0.0159	-0.0065	**0.5824**	-0.0368	-0.0075	-0.0255	-0.0662	-0.0548	-0.0041	-0.0161	-0.0099	-0.0016	-0.0199	-0.0056	-0.1069
CHN	-0.0008	-0.0052	-0.0386	-0.0142	-0.0042	-0.0344	**0.6783**	-0.0064	-0.0221	-0.0529	-0.0461	-0.0033	-0.0125	-0.0082	-0.0010	-0.0187	-0.0048	-0.0841
DNK	-0.0011	-0.0054	-0.0400	-0.0142	-0.0057	-0.0365	-0.0333	**0.6822**	-0.0231	-0.0585	-0.0496	-0.0036	-0.0142	-0.0089	-0.0013	-0.0181	-0.0050	-0.0955
ESP	-0.0009	-0.0041	-0.0308	-0.0108	-0.0042	-0.0277	-0.0257	-0.0051	**0.7040**	-0.0450	-0.0381	-0.0027	-0.0105	-0.0069	-0.0010	-0.0138	-0.0038	-0.0696
FRA	-0.0013	-0.0043	-0.0332	-0.0115	-0.0057	-0.0294	-0.0252	-0.0053	-0.0184	**0.6784**	-0.0410	-0.0029	-0.0131	-0.0079	-0.0015	-0.0131	-0.0040	-0.0826
GBR	-0.0012	-0.0051	-0.0378	-0.0133	-0.0058	-0.0342	-0.0308	-0.0063	-0.0219	-0.0576	**0.6555**	-0.0034	-0.0140	-0.0086	-0.0014	-0.0166	-0.0047	-0.0920
IRL	-0.0016	-0.0070	-0.0533	-0.0185	-0.0083	-0.0500	-0.0429	-0.0091	-0.0302	-0.0802	-0.0666	**0.4174**	-0.0200	-0.0121	-0.0021	-0.0236	-0.0068	-0.1317
JPN	-0.0012	-0.0035	-0.0271	-0.0092	-0.0050	-0.0248	-0.0205	-0.0045	-0.0149	-0.0454	-0.0346	-0.0025	**0.7073**	-0.0067	-0.0015	-0.0108	-0.0034	-0.0704
MEX	-0.0014	-0.0048	-0.0375	-0.0131	-0.0062	-0.0326	-0.0288	-0.0059	-0.0207	-0.0582	-0.0452	-0.0032	-0.0142	**0.7064**	-0.0016	-0.0149	-0.0045	-0.0910
NOR	-0.0028	-0.0050	-0.0397	-0.0130	-0.0105	-0.0360	-0.0237	-0.0061	-0.0217	-0.0787	-0.0519	-0.0039	-0.0219	-0.0110	**0.7369**	-0.0114	-0.0049	-0.1253
RUS	-0.0008	-0.0061	-0.0438	-0.0163	-0.0047	-0.0404	-0.0406	-0.0075	-0.0258	-0.0598	-0.0539	-0.0039	-0.0142	-0.0092	-0.0010	**0.6118**	-0.0056	-0.0975
SGP	-0.0014	-0.0062	-0.0469	-0.0167	-0.0065	-0.0426	-0.0393	-0.0078	-0.0269	-0.0694	-0.0579	-0.0043	-0.0169	-0.0105	-0.0017	-0.0213	**0.5847**	-0.1106
USA	-0.0011	-0.0037	-0.0281	-0.0096	-0.0048	-0.0257	-0.0216	-0.0047	-0.0154	-0.0446	-0.0354	-0.0026	-0.0110	-0.0067	-0.0013	-0.0115	-0.0035	**0.6424**

Figure 1: *US POLICY OPTIONS AND LOCATION CHOICE PROBABILITY*



Notes: Variation in the predicted probability to choose the US as first location (vertical axis) in the dimensions corporate tax (τ) and safe haven ratio (Θ).

space and actual policy options. However, it becomes clear in Figure 1. A tax cut would have a massive impact on the location choice probability. The difference in location probabilities between a tax of 40% and a zero tax for a given SHT of 0.5 is more than 0.15.[17] Compared to this, given a tax of 42%, abolishing the TCR would increase the probability to choose the US only by -0.024. To see that the impact in terms of real number of foreign affiliates is not that small, suppose the US abolished its TCR (a discrete jump in Θ from 0.5 to 1). Using the average number of first location decisions per year observed in our data (about 320) and the US-specific impact of its TCR, this would imply that the US attracted about 8 additional affiliates of German multinationals, ceteris paribus.

Another interesting experiment examines how the US would affect other countries

[17]Of course, a tax rate of zero is a relatively unrealistic scenario.

Table 8: *US ABOLISHES ITS TCR*

ARE	-0.000086	DZA	-0.000012	KGZ	-0.000003	PAN	-0.000010
ARG	-0.000091	EGY	-0.000029	KOR	-0.000214	PHL	-0.000032
AUS	-0.000160	ESP	-0.000714	LBN	-0.000004	POL	-0.001452
AUT	-0.001243	EST	-0.000017	LBR	-0.000006	PRT	-0.000158
AZE	-0.000009	FIN	-0.000107	LKA	-0.000004	PRY	-0.000002
BEL	-0.001033	FRA	-0.001913	LTU	-0.000051	QAT	0.000000
BGD	-0.000006	GBR	-0.001537	LUX	-0.000274	RUS	-0.000543
BGR	-0.000074	GRC	-0.000183	LVA	-0.000035	SAU	-0.000027
BHS	-0.000008	GUY	0.000000	MAR	-0.000022	SGP	-0.000172
BLR	-0.000006	HKG	-0.000132	MDA	-0.000007	SVK	-0.000328
BRA	-0.000428	HRV	-0.000137	MEX	-0.000287	SVN	-0.000039
CAN	-0.000310	HUN	-0.000482	MKD	-0.000026	SWE	-0.000364
CHE	-0.001211	IDN	-0.000109	MLT	-0.000014	THA	-0.000096
CHL	-0.000040	IND	-0.000179	MUS	-0.000003	TUN	-0.000012
CHN	-0.000949	IRL	-0.000172	MYS	-0.000119	TUR	-0.000246
COL	-0.000039	ISR	-0.000027	NAM	-0.000003	UKR	-0.000122
CRI	-0.000006	ITA	-0.000856	NIC	-0.000001	URY	-0.000004
CYP	-0.000026	JOR	-0.000001	NLD	-0.000979	USA	0.019848
CZE	-0.001175	JPN	-0.000507	NOR	-0.000115	VNM	-0.000013
DNK	-0.000207	KAZ	-0.000018	NZL	-0.000011	ZAF	-0.000179

Notes: Changes in probabilities per country (in alphabetical order) if the US abolished its TCR ($\Theta_{US} = 1$).

by abolishing its TCR completely. For this, we set Θ equal to 1 for the US. The implications for the 79 other countries included in our dataset are presented in Table 8. Note that countries are sorted in alphabetical order according to their country codes. The estimates suggest that this policy comes mainly at the cost of France, the UK, and Poland.

8.2 Uncoordinated tax rate and tax base policy

Over the last 30 years, corporate tax laws in many countries have seen tax-cutting and base-broadening reforms. Devereux, Griffith, and Klemm (2002) show that these reforms had the effect that, on average, effective tax rates remained relatively stable. Concluding from this that the reforms did not change the attractiveness of a location for real investment assumes that the marginal impact of tax and tax-base effects are of similar magnitude. In Table 9 we demonstrate that this is not necessarily the case. The table presents some calculations on the tax rate cut that would be necessary in order to

Table 9: *TAX-CUT-CUM-BASE-BROADENING POLICY*

ARG	1.96	BRA	2.05	CHN	1.79	FRA	2.04	JPN	2.45	RUS	1.55
AUS	1.85	CAN	2.08	DNK	1.69	GBR	1.78	MEX	1.84	SGP	1.44
AUT	1.72	CHE	1.53	ESP	2.21	IRL	1.25	NOR	1.64	USA	2.30

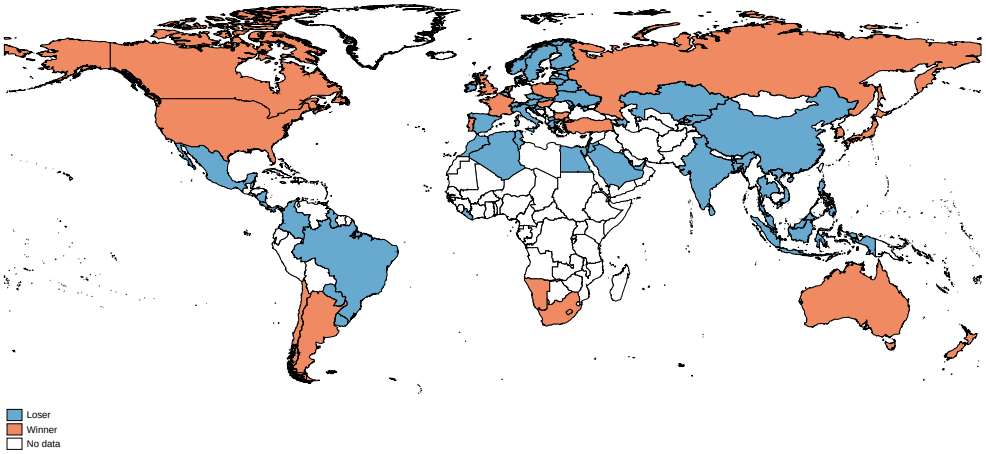
keep the location probability constant if the tax base was broadened by implementing a 10 percentage point stricter SHT. For the selection of countries from above, the numbers in Table 9 represent percentage point reductions in the tax rate. For example, Singapore would need to cut its tax by 1.44 percentage points if it reduced its SHT by 10 percentage points in order to hold the number of new entities constant. Hence, the table provides information about the relative importance of tax base vs. tax rate effects. It demonstrates that Ireland could easily make its TCR stricter without a large need to cut its tax rate. On the other hand, countries like Japan, Spain, or the US would need cut taxes by more than 2 percentage point in order to keep the number of new foreign affiliates (additional inward FDI at the extensive margin) constant.

8.3 Coordinated policy action

Our empirical approach also allows us to determine winners and losers of a coordinated policy experiment. Suppose all countries took a coordinated action and set Θ equal to 0.5. This would imply that interest deduction for any amount of debt exceeding equity financing would be denied. A value of $\Theta = 0.5$ refers to the strictest rules we have in our data, but a number of countries use ones that are nearly as strict.

The results of this experiment are summarized in Figure 2. Blue color in this figure denotes losers, orange color denotes winners of the coordinated policy. Among the

Figure 2: *WINNERS AND LOSERS OF A COORDINATED POLICY ACTION*



Notes: Countries in blue color depict the losers of a coordinated policy; the red colored countries are the winners.

biggest losers are countries like Austria, Belgium, Switzerland or Ireland. The loss in probability mass is, however, rather modest. For example, the probability that Austria attracts a new affiliate is reduced from 0.0554 to 0.0503. The impact on the other countries is even smaller. Belgium faces a reduction of -0.0040, Switzerland a reduction of -0.0019, and Irland a reduction equal to -0.0007 in their estimated probabilities to attract a new affiliate. Among the winners are the Netherlands (+0.0005), Canada (+0.0006), Poland (+0.0009), France (+0.0061), and the UK (+0.0084). The biggest winner is the US, where we find a substantial increase equal to 0.0097. Given a base probability of about 0.1260, this corresponds to an increase in the probability of about 7.7%.

9 Additional results

9.1 Industry-specific growth effects

We may be concerned about industry-specific growth effects, which may lead to biased estimates on SHT. Table 10, where we add such effects to the estimated model, shows that our results remain fully robust as the estimated TCR effect is hardly affected. In particular, to account for industry-specific growth effects, we build the variable GTH as average growth of foreign affiliates' total assets per industry and year. Table 10 includes 16 additional interaction terms between the country-specific variables and the variable GTH.[18] For the latter variable, we first calculate total asset growth at the level of foreign affiliates. We then take the average of this growth variable per industry and year. GTA is finally defined as the one-period lagged value of this industry-year specific growth variable.[19]

9.2 Subsequent investments

So far, our empirical analysis has focused on first investments of MNCs observed in our data. We believe that this produces the most reliable results as we avoid measurement problems related to more complex sequential investment patterns. A concern with this approach might be, however, that the relevance of TCRs could increase in the extent of foreign activity (in the number of foreign investments). TCRs are, of course, relevant for all entities as these rules apply to all subsidiaries of MNCs if internal or total debt

[18] Again, since GTH does not vary over alternatives it enters the model interacted with the country-specific variables.

[19] Information on industries in which foreign affiliates are operating in is used from *MiDi*.

Table 10: *INDUSTRY GROWTH EFFECTS*

VARIABLES DEFINED AS RANDOM					
$TAX(\tau)$ $(Mean)$	-2.340***				
	(0.456)				
$TAX(\tau)$ $(Std.Dev)$	2.439**				
	(1.143)				
VARIABLES DEFINED AS FIXED					
$SHT(\Theta)$	0.448**				
	(0.184)				
$log(GDP)$	0.151***	$SATA \times log(GDP)$	-0.058**	$GTH \times log(GDP)$	-1.891*
	(0.050)		(0.030)		(1.065)
$log(GDPPC)$	0.367**	$SATA \times log(GDPPC)$	-0.185	$GTH \times log(GDPPC)$	-4.253
	(0.183)		(0.123)		(4.458)
$GDP\ growth$	3.329***	$SATA \times GDP\ growth$	0.552	$GTH \times GDPgrowth$	-36.351
	(1.097)		(0.715)		(28.921)
$DCPS$	0.003***	$SATA \times DCPS$	-0.001***	$GTH \times DCPS$	-0.005
	(0.001)		(0.001)		(0.017)
$COSTBS$	-0.001	$SATA \times log(KLRATIO)$	0.058	$GTH \times log(KLRATIO)$	1.130
	(0.003)		(0.086)		(3.045)
$log(KLRATIO)$	-0.126	$SATA \times COSTBS$	-0.002	$GTH \times COSTBS$	-0.029
	(0.125)		(0.002)		(0.067)
$INFLR$	-0.005	$SATA \times INFLR$	0.003	$GTH \times INFLR$	0.368
	(0.010)		(0.006)		(0.238)
$CORRUPTION$	-0.017***	$SATA \times CORRUPTION$	0.005**	$GTH \times CORRUPTION$	-0.008
	(0.003)		(0.002)		(0.080)
$PRIGHTS$	0.002	$SATA \times PRIGHTS$	-0.003	$GTH \times PRIGHTS$	0.087
	(0.003)		(0.002)		(0.073)
BIT	-0.058	$SATA \times BIT$	0.066	$GTH \times BIT$	0.550
	(0.070)		(0.045)		(1.676)
DTT	0.002	$SATA \times DTT$	-0.001	$GTH \times DTT$	0.021
	(0.002)		(0.001)		(0.044)
$log(TASSETS)$	0.706***	$SATA \times log(TASSETS)$	0.098***	$GTH \times log(TASSETS)$	2.054**
	(0.043)		(0.029)		(1.042)
$log(DISTANCE)$	-0.133***	$SATA \times log(DISTANCE)$	0.026	$GTH \times log(DISTANCE)$	1.521
	(0.044)		(0.031)		(1.038)
$CONTIG$	0.471***	$SATA \times CONTIG$	0.017	$GTH \times CONTIG$	2.628
	(0.079)		(0.050)		(1.841)
$COLONY$	0.229**	$SATA \times COLONY$	0.081	$GTH \times COLONY$	-0.222
	(0.113)		(0.063)		(2.704)
$COMLANG$	0.164*	$SATA \times COMLANG$	0.018	$GTH \times COMLANG$	-1.380
	(0.094)		(0.053)		(1.974)

Notes: Mixed logit estimates; 264,959 observations; 3,574 new location choices; ***, **, * indicate significance at the 1, 5, and 10 percent level; standard errors in parentheses; TAX (τ) defined as random; all other variables defined as fixed.

exceed certain threshold levels (so they should be relevant for first investments as well). Table 11 presents results on second investment decisions. It additionally includes the growth variables from above as well as the binary indicator $LCHOICE$. The latter is an alternative-specific variable equal to one if a country has been chosen as first location by the MNC. If a country has not been the actual choice in the previous decision, $LCHOICE$ equals zero. The results on the second location choice are very convincing as (i) we estimate a positive and significant impact of $SHT(\Theta)$ (with a larger coefficient), (ii) $LCHOICE = 1$ makes it more likely that the same country is chosen , (iii) the effect of the tax rate is negative, but the heterogeneity of this effect seems to have vanished.

10 Conclusions

The purpose of this paper is to assess the impact of TCRs on the location of multinational firms' foreign affiliates. Using unique data on the worldwide activities and particularly on the first new foreign affiliates of German MNCs, we find that TCRs have a significant impact on location decisions of MNCs.[20] Although the impact of TCRs is statistically as well as economically relevant, we can show that location choices are more sensitive to tax rate changes. To the best of our knowledge, our paper is not only the first one to examine the impact of TCRs on the extensive margin of foreign investment activity, it is also the first to provide actual estimates for the relative importance of tax rate and tax-base effects in this context. We believe that this is a central contribution to the corporate tax literature, as finding out about the quantitative (and

[20]We find very conclusive evidence that subsequent location decisions (following the first one observed in our data) are affected in the same way.

Table 11: *SUBSEQUENT LOCATION CHOICE*

VARIABLES DEFINED AS RANDOM					
$TAX(\tau)$ $(Mean)$	-3.838***				
	(0.560)				
	0.056				
	(1.110)				
VARIABLES DEFINED AS FIXED					
$LCHOICE$	1.939***				
	(0.060)				
$SHT(\Theta)$	1.212***				
	(0.234)				
$log(GDP)$	0.146**	$SATA \times log(GDP)$	0.037	$GTH \times log(GDP)$	-3.672
	(0.063)		(0.039)		(3.141)
$log(GDPPC)$	-0.328	$SATA \times log(GDPPC)$	-0.133	$GTH \times log(GDPPC)$	-7.649
	(0.233)		(0.152)		(10.983)
$GDP\ growth$	4.203***	$SATA \times GDP\ growth$	0.834	$GTH \times GDPgrowth$	7.806
	(1.353)		(0.808)		(66.983)
$DCPS$	-0.0003	$SATA \times DCPS$	-0.001	$GTH \times DCPS$	0.0002
	(0.001)		(0.001)		(0.051)
$COSTBS$	-0.005	$SATA \times log(KLRATIO)$	0.135	$GTH \times log(KLRATIO)$	8.798
	(0.003)		(0.106)		(7.624)
$log(KLRATIO)$	-0.011	$SATA \times COSTBS$	-0.002	$GTH \times COSTBS$	-0.200
	(0.164)		(0.003)		(0.200)
$INFLR$	-0.002	$SATA \times INFLR$	0.003	$GTH \times INFLR$	0.643**
	(0.012)		(0.007)		(0.323)
$CORRUPTION$	0.004	$SATA \times CORRUPTION$	0.0004	$GTH \times CORRUPTION$	-0.255
	(0.004)		(0.003)		(0.244)
$PRIGHTS$	-0.001	$SATA \times PRIGHTS$	-0.002	$GTH \times PRIGHTS$	-0.030
	(0.004)		(0.003)		(0.201)
BIT	-0.097	$SATA \times BIT$	0.064	$GTH \times BIT$	-5.293
	(0.095)		(0.063)		(5.436)
DTT	0.004	$SATA \times DTT$	-0.002	$GTH \times DTT$	0.102
	(0.003)		(0.002)		(0.143)
$log(TASSETS)$	0.683***	$SATA \times log(TASSETS)$	-0.023	$GTH \times log(TASSETS)$	1.625
	(0.055)		(0.035)		(2.888)
$log(DISTANCE)$	-0.061	$SATA \times log(DISTANCE)$	-0.061	$GTH \times log(DISTANCE)$	1.878
	(0.058)		(0.040)		(3.274)
$CONTIG$	0.307***	$SATA \times CONTIG$	0.031	$GTH \times CONTIG$	1.514
	(0.112)		(0.072)		(5.990)
$COLONY$	0.075	$SATA \times COLONY$	0.009	$GTH \times COLONY$	5.534
	(0.169)		(0.105)		(8.359)
$COMLANG$	-0.121	$SATA \times COMLANG$	-0.056	$GTH \times COMLANG$	-5.146
	(0.137)		(0.082)		(7.599)

Notes: Mixed logit estimates; 143,357 observations; 1,981 second location choices; ***, **, * indicate significance at the 1, 5, and 10 percent level; standard errors in parentheses; TAX (τ) defined as random; all other variables defined as fixed.

relative) effectiveness of policy instruments is crucial for the design of tax policy.

Our results imply that policymakers should be aware of two things. First, imposing restrictions on profit shifting has implications for real investment activity: unilateral measures to "limit base erosion via interest deductions and other financial payments" (OECD, 2013b, Action 4, p.17) certainly come at the cost of losing real investments. Second, policymakers should focus on organizing coordinated policy action when imposing TCRs. Our analysis suggests that this is welfare improving.

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