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Does Exchange of Information Between Tax Authorities Influence Multinationals' Use of Tax Havens?

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Julia Braun† and Alfons Weichenrieder‡

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Abstract

Since the mid-1990s, countries offering tax systems that facilitate international tax avoidance and evasion have been facing growing political pressure to comply with the internationally agreed standards of exchange of tax information. Using data of German investments in tax havens, we find evidence that the conclusion of a bilateral tax information exchange agreement (TIEA) is associated with fewer operations in tax havens and the number of German affiliates has on average decreased by 46% compared to a control group. This suggests that firms invest in tax havens not only for their low tax rates but also for the secrecy they offer.

Keywords: Tax havens, tax information exchange agreements, location decisions, international taxation

JEL classification: F21, F23, H87

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1 Introduction

Since the mid-1990s, countries offering tax systems that facilitate international tax avoidance and evasion have been facing growing political pressure. In 1998, the OECD issued a report on harmful tax competition that names banks secrecy and the unwillingness to exchange information with other tax authorities as a defining characteristics of tax havens.[1] Two years later, the OECD published different lists of tax havens and the "Global Forum for Transparency and Exchange of Information for Tax Purposes" was launched. This forum, which includes both OECD and non-OECD countries, offers a multilateral framework to coordinate national efforts to enhance the flow of information among tax authorities. In 2002, the forum published a model agreement on exchange of information on tax purposes. Countries can implement this standard of information exchange in two ways. Either they incorporate a clause on the exchange of information into their double tax treaties (cf. Art. 26 OECD Model Tax Convention) or they sign bilateral tax information exchange agreements (TIEAs).

Since the outbreak of the financial and economic crisis in 2008, the fight against tax evasion and avoidance has gained new momentum and the political pressure on tax havens to comply with the internationally agreed standards of exchange of tax information is increasing. In order to be delisted from the black list of tax havens, countries are required to sign at least twelve TIEAs. This pressure shows results. Since 2009, the number of TIEAs has soared and already exceeds 800 (OECD, 2013b).

In this paper, we examine whether the international exchange of tax information affects the investment of German multinational enterprises (MNEs) in tax havens. For the purpose of this study, we focus on a list of small tax havens, some of which have signed TIEAs with Germany, some have not. The main research question is whether the conclusion of these agreements is associated with a lower activity of German MNEs compared to activities in tax

[1] The OECD (1998) enumerates four criteria for identifying tax havens: (i) no or low effective tax rates, (ii) lack of effective exchange of information, (iii) lack of transparency, and (iv) "the absence of a requirement that the activity be substantial" (p. 23).

haven countries and offshore centers that have not concluded such an agreement with Germany.

This research question is based on the hypothesis that firms invest in tax havens not only for their low tax rates but also for the secrecy that these countries offer. Several examples for the demand for secrecy by businesses have recently been given by Schjelderup (2011). Secrecy may allow businesses to avoid liability for misconduct in business affairs by obscuring ownership. It may prevent high-tax countries from detecting dubious but legal tax avoidance schemes of firms making it more difficult to react by adjusting tax legislation. Secrecy may also help to obscure where physical presence takes place. Sherman (2010) describes the prevalence of offshore shell companies to obscure the payment of bribes in the arms industry. Gordon (2009) lays out practices used by resource extracting firms to pay bribes to government officials via offshore companies. Many observers emphasize that chains of tax haven affiliates are used to obscure the intentions behind tax haven activities. Evidence provided in Hebous (2014) suggests that German-owned affiliates in tax haven countries compared to subsidiaries in other countries are relatively often held indirectly via other intermediate affiliates instead of being directly held by the German parent. The creation of such ownership chains may be explained by the desire additionally to obscure the activities in tax havens.

When it comes to banking, secrecy may indirectly attract MNEs in the banking sector as banks may be induced to follow some of their customers who, as tax dodgers, benefit from tax haven secrecy and cross-border bank deposits. There is a growing empirical literature that looks on the connection between taxation and cross-country banking deposits, providing interesting evidence. Huizinga and Nicodème (2004) consider bilateral bank deposits by non-banks and conclude that international exchange of information did not have a significant effect in a cross-section of countries in 1999, while, at the same time, they find limited evidence that taxes did influence the structure of cross-border deposits of non-banks.[2] Hemmelgarn and Nicodème (2009) use bilateral cross-

[2] Somewhat relatedly, Grilli (1989) finds that the inflow of foreign non-bank deposits is significantly and positively correlated with a country's banking secrecy.

border deposits to evaluate the impact of the EU savings directive, which introduced information exchange in Europe, and find no robust results. At the same time, Johannesen (2010) finds strong evidence that the introduction of the savings directive has led to a flight of European tax dodgers' deposits from Switzerland to other jurisdictions. Johannesen and Zucman (2014) look on the influence of TIEAs on bank deposits. Their analysis shows that recent agreements on the exchange of information led to a significant shift in non-bank deposits, suggesting that tax evaders moved their deposits to tax havens that have no treaty with their respective home country. Their paper does not, however, look at the effect on FDI. Significant results on the impact of tax information exchange for portfolio investment in tax haven countries is also provided by Hanlon et al. (2015), but again without reference to foreign direct investment.

The question whether information exchange in tax matters influences FDI has been discussed also in the economic literature on international double tax treaties. Somewhat surprisingly, initial studies that looked at the effect of bilateral tax treaties on FDI flows led to inconclusive results or even came up with a negative correlation between existence of a bilateral treaty and the amount of bilateral FDI. As a first study on this, Blonigen and Davies (2004) test linear and log-linear models of FDI flows and find significantly negative effects in the linear and insignificant effects in the log-linear model. They conclude that these surprising results may be due to countervailing effects. While double tax treaties reduce double taxation and investment uncertainty and may thereby promote FDI, they may, at the same time, provide for more intensive information exchange between authorities and for less tax evasion and avoidance opportunities, which in turn may dampen FDI flows. The work by Blonigen and Davies triggered several follow-up studies, including Barthel et al. (2010), Davies et al. (2009), Egger et al. (2006), Baker (2014), and Coupé et al. (2009). Very recently, Blonigen et al. (2014) have provided more concrete evidence that indeed the information exchange agreed in double tax treaties may reduce investment levels. Their study allows the treaty effects to differ between firms with high and low opportunities for transfer pricing strategies. The present

paper adds evidence on the effect of information exchange by looking at tax haven countries that normally do not have tax treaties with OECD countries.

Somewhat related to the present study, there is also a recent discussion of the factors that influence the decisions to engage in information exchange. Bilicka and Fuest (2014) find that economic links between a tax haven and potential treaty partners (alternatively measured by the amount of pre-existing bilateral portfolio investment, bilateral FDI or bilateral trade) increase the likelihood of a TIEA. Ligthart and Voget (2008) look at actual 'cases' of information sharing between the Netherlands and 81 partner countries. They find that high tax rates and a high stock of capital abroad increase the willingness of countries to exchange information with the Netherlands. Ligthart, Vlachaki and Voget (2012) study double tax treaties more generally and find that country pairs' personal tax rates, withholding rates and the stock of direct investment positively affect the conclusion of tax treaties.

The further structure of the present paper is as follows. Section 2 describes the institutional details and gives an account of the German TIEAs. Section 3 presents a descriptive analysis of the investments of German MNEs in tax haven jurisdictions. Section 4 looks at data at the country level and uses a difference-in-difference estimator to identify a significantly negative effect of TIEAs on German foreign investment in tax haven jurisdictions. Section 5 evaluates the effects of TIEAs by looking at micro data and employing binary choice models. Again, we find robust evidence that conclusion of TIEAs has a negative effect on German FDI. Also an instrumental variable estimation approach presented in Section 6 confirms these findings. Section 7 concludes.

2 Tax Haven Countries and German TIEAs

There exist several lists of tax havens that give an account of countries and other jurisdictions, which are offering offshore services and are deemed to facilitate tax avoidance and evasion (Hebous, 2014). One list of countries that in 2009 were either classified as jurisdictions that had not committed to the internationally agreed tax standard or were classified as jurisdictions that had not yet substantially implemented this standard comes from OECD (2009). Hines

and Rice (1994) provide a yet older list of tax havens. Another classification of offshore centers is provided by the Bank for International Settlements in its BIS statistics.[3] From the various tax haven lists collected by Hebous (2014), we distilled the set of countries included in Table 1 by omitting OECD countries, countries with more than seven million inhabitants and three jurisdictions (Monaco, Niue, and the Cook Islands) that are not listed (or not separately listed) as host countries in the German FDI database described below. These lists then result in a total of 39 jurisdictions in Table 1.

[3] E.g. cf. Table 6B: External positions of reporting banks vis-à-vis the non-bank sector.

Table 1: Usual Suspects - Tax Haven Countries and Offshore Centers

Jurisdiction	**Originating from list**
Andorra	OECD nyi
Anguilla	OECD nyi
Antigua and Barbuda	OECD nyi
Aruba	OECD nyi, BIS
Bahamas	OECD nyi, BIS
Bahrain	OECD nyi, BIS
Barbados	BIS
Belize	OECD nyi
Bermuda	OECD nyi
British Virgin Islands	OECD nyi
Brunei	OECD: Other Financial Centers
Cayman Islands	OECD nyi, BIS
Costa Rica	OECD nc
Dominica	OECD nyi
Gibraltar	OECD nyi, BIS
Grenada	OECD nyi
Guernsey	BIS
Hong Kong	Hines and Rice (1994) big seven
Isle of Man	BIS
Jersey	BIS
Lebanon	Hines and Rice (1994); BIS
Liberia	OECD nyi, Hines and Rice (1994) big seven
Liechtenstein	OECD nyi
Macao	BIS
Marshall Islands	OECD nyi
Mauritius	BIS
Montserrat	OECD nyi
Nauru	OECD nyi
Netherlands Antilles	OECD nyi, BIS
Panama	OECD nyi, BIS
Samoa	OECD nyi, BIS
San Marino	OECD nyi
Singapore	OECD: Other Financial Centers
St. Kitts and Nevis	OECD nyi
St. Lucia	OECD nyi
St. Vincent and the Grenadines	OECD nyi
Turks and Caicos Islands	OECD nyi
Uruguay	OECD nc
Vanuatu	OECD nyi, BIS

Notes**:** OECD nc: not committed to international tax standards according to OECD (2009). OECD nyi: international tax standards not yet implemented according to OECD (2009). Although included in the OECD list of non-cooperative countries, we exclude Malaysia and the Philippines, which are big countries and should attract the vast majority of investments for other reasons than for low taxation or secrecy; the Cook Islands, Niue, and Monaco are excluded from the list as these countries are not included as potential host countries in the FDI database used in this paper. Further, we should note that there are no German investments in seven of the countries above. The respective countries are excluded from the analysis below. While some offshore lists also include Cyprus, we decided against inclusion. As an EU member it should in principle be

bound by Directive 2011/16/EU or the respective predecessor Directive 77/99/EU. Another issue is that, unlike non-EU countries, it may have benefitted from the 2006 Cadbury-Schweppes decision of the European Court of Justice (cf. Ruf and Weichenrieder 2014).

Table 2 gives an overview of the TIEAs concluded (and ratified by January 2014) between Germany and partner countries. Following up on the pressure by OECD countries to conclude TIEAs the prevalence of such agreements has quickly expanded after 2008. With the exception of San Marino, these jurisdictions did not have a full-fledged double tax treaty with Germany before the signature of the TIEA. As of January 2014, 16 TIEAs with countries and territories have been signed since 2008.[4] As Monaco is not included in Table 1, 24 (=39 – 15) countries of Table 1 lack a TIEA with Germany. When we concentrate on jurisdictions in Table 1 that actually hosted *some* German investments in the period 1999-2011, then we have a total of 32 countries, out of which 12 countries have signed a TIEA with Germany so far and ratified it by January 2014. The reduction from 16 to 12 reflects that three of the TIEAs are agreed on with countries that do not act as hosts to German FDI and data for one jurisdiction, Monaco, is not separately available in the database, but is merged with France.

Finally, we briefly look at the secrecy levels of these tax haven jurisdictions. Table 12 in the annex shows that the signature and the non-signature jurisdictions do not differ with respect to the degree of secrecy they offer. A simple t-test indicates that the means of the secrecy scores of the signature and the non-signature jurisdictions are not significantly different. With regards to the homogeneity of the jurisdictions in our sample this similarity is important.

[4] Three of the treaties refer to countries that do not receive German FDI investment. There are a couple of older German treaties on tax cooperation with OECD countries, including one with the Netherlands, which are not included in the table.

Table 2: German TIEAs since 2000

Country or Territory	Signing of TIEA	Published as German Law	In Force since	Double tax treaty
Andorra	25 November 2010	5 December 2011	20 January 2012	No
Anguilla	19 March 2010	18 November 2010	11 April 2011	No
Antigua and Barbuda	19 October 2010	05 December 2011	Not yet in force	No
Bahamas	09 April 2010	22 June 2011	Generally applicable as of 1.1. 2012	No
Bermuda	03 July 2009	08 November	06 December 2012	No
British Virgin Islands	05 October 2010	30 September 2011	Generally applicable as of 1.1. 2012	No
Cayman Islands	27 May 2010	22 June 2011	20 August 2011	No
Gibraltar	13 August 2009	18 August 2010	04 November 2010	No
Guernsey	26 March 2009	18 August 2010	22 December 2010	No
Isle of Man	02 March 2009	18 August 2010	05 November 2010	No
Jersey	04 July 2008	18 June 2009	28 August 2009	Limited DTA, signed 4 July 2008
Liechtenstein	02 September 2009	18 August 2010	28 October 2010	DTA signed 17 November 2011
Monaco	27 July 2010	22 June 2011	Not yet in force	No
San Marino	21 June 2010	30 September 2011	21 December 2011	DTA signed 6 May 1986
St. Lucia	4 June 2010	03 March 2011	Generally applicable as of 01.01.2014	No
St Vincent and Grenadines	29 March 2010	25 February 2011	07 June 2011	No
Turks and Caicos	04 June 2010	30 September 2011	25 September 2011	No

Source: German Ministry of Finance, Stand der Doppelbesteuerungsabkommen und anderer Abkommen im Steuerbereich, 1 January 2014.

Notes: The table lists all TIEAs that were signed and eventually were ratified (by Jan 2014). Mauritius had a double tax treaty with Germany dating back to 1979, which however lacks the equivalent stringency of TIEAs in information exchange. A new treaty with improved information exchange became applicable only from 2013. Similarly, a new treaty with Uruguay, is applicable only from 2012.

3 German Investments in Tax Havens and Offshore Centers

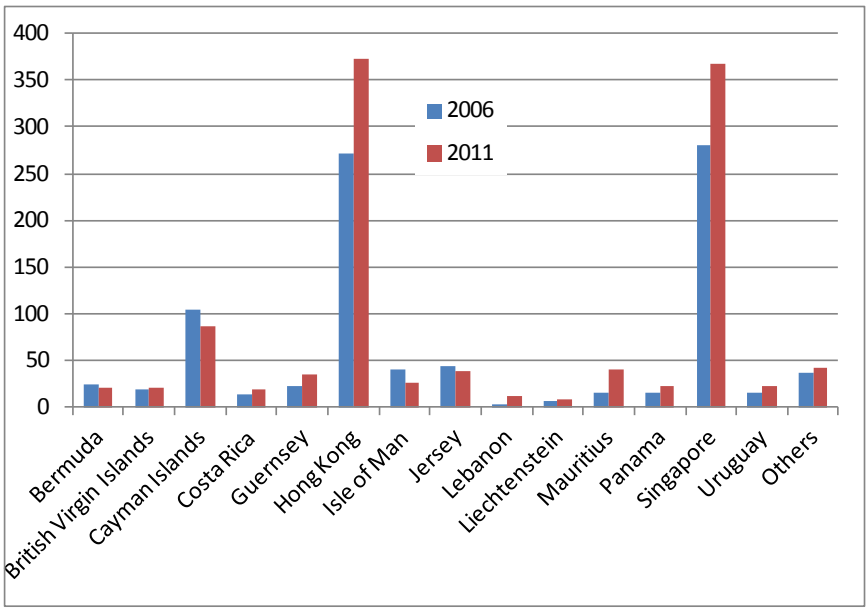
The empirical analysis in this paper is based on the German direct investment statistics which is compiled by the German National Bank (Deutsche Bundesbank). It is confidential data made available on site in Frankfurt for researchers in the MiDi database. German investors are legally required to disclose to the Bundesbank information regarding the financial statements and are also requested to report on non-balance sheet items such as employees and sales of their foreign affiliates. The reporting requirement applies for all German investors who hold at least 10% of voting rights or capital of a foreign operation if the balance sheet sum of the affiliate is €3m or more (see Lipponer, 2009). The database hence offers a comprehensive view of the German outbound investment at the micro-level.[5] At the time of writing of this paper, the MiDi dataset is available for the years 1999 to 2011.

On average across the years 1999 to 2011, German affiliates located in the countries listed in Table 1 make up for some 3.7% of all German-owned foreign affiliates, 3.4% of all after-tax foreign profits, but only 1.3% of all employees. In 2011, 64% of these tax haven affiliates are owned by holding companies.

Figure 1 shows the distribution of affiliates across selected countries from Table 1 for the year 2006 (i.e. two years before the signing of the first TIEAs) and for the latest available year, 2011. The largest recipients of affiliates are Hong Kong, Singapore, and the Cayman Islands.

[5] While not of relevance in this paper, MiDi also provides information on German inbound investment. See, e.g. Mintz and Weichenrieder (2010).

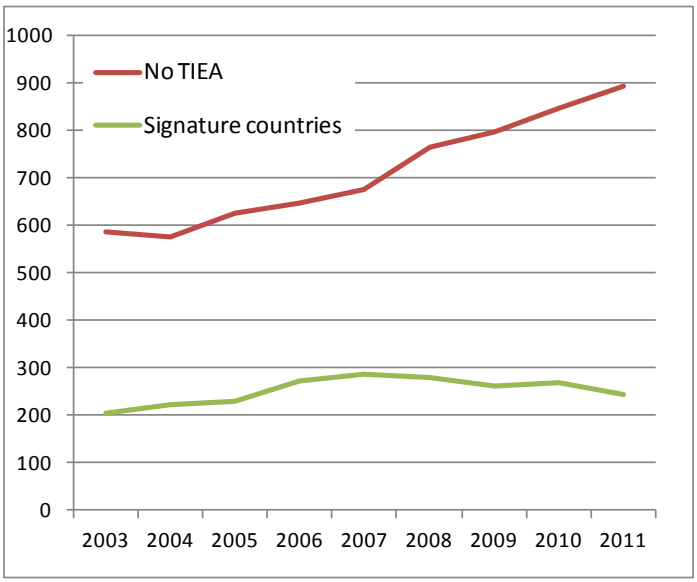
Figure 1: Affiliates in Tax Haven Jurisdictions and Offshore Financial Centers



Source: Deutsche Bundesbank, Microdatabase Direct Investments (MiDi) 1999-2011, own calculations

Our main interest is in potential evidence that the agreement of TIEAs has led to a reduction of German activity in these contracting countries compared to other tax haven countries and offshore centers. Figure 2 shows the development of the number of affiliates in the two groups of Table 1 countries that, between 2008 and 2010, had signed a treaty with Germany (signature countries) and those that have not. The figure suggests a trend that was mildly positive for both country groups until 2007 and diverging from 2007 onwards with a negative trend for signature countries and an accelerated positive trend for countries that have not signed a TIEA between 2008 and 2010. Figure 3 presents a similar picture with the aggregated balance sheet totals of the affiliates in the two country groups. Growth was positive before 2007 with a more positive development in the group of signature countries. After 2007, there is a reduction in the aggregated size of affiliates in TIEA countries but virtually no such reduction in non-signature countries. While only suggestive, the descriptive evidence seems to be compatible with an effect of TIEAs on the number of German owned affiliates. The next section will establish this more formally using a difference-in-difference approach.

Figure 2: Affiliates in Signature and Non-Signature Countries – Number of Affiliates



Source: Deutsche Bundesbank, Microdatabase Direct Investments (MiDi) 1999-2011, own calculations
Notes: The graph starts with year 2003 as three jurisdictions (Jersey, Guernsey, and the Isle of Man) are not separately shown in MiDi before 2003.

Figure 3: Affiliates in Signature and Non-Signature Countries – Balance Sheet Total

Source: Deutsche Bundesbank, Microdatabase Direct Investments (MiDi) 1999-2011, own calculations
Notes: See Figure 2.

4 Difference-in-Difference Results

As indicated in Table 2, all German TIEAs have been signed after 2007. Therefore, a natural design is to look at the differential development of investment activity between 2006, well before the negotiation process, and 2011.[6] We thereby compare signature countries to other tax havens and offshore centers listed in Table 1. As a restriction, we exclude all those countries for which MiDi neither reports a German affiliate in the base year 2006 nor in 2011, and which therefore had no relevance for German parents. Among the resulting 30 countries, we have 12 signature countries.

Table 3: Average number of affiliates per country

	2006	2011
Signature countries	22.8	20.3
Non-signature countries	36.2	48.4
Total	30.8	37.2

Table 3 shows the average number of affiliates per country conditional on whether the countries by 2011 had signed (and finally ratified) a TIEA (see Table 2). As already visible in Figure 2, the trends went into different directions with signature countries showing a slight decrease and the control group an increase. For our regressions we generated the left hand variable *y_06_11* that on a per country basis measures the difference between German affiliates in 2006 and 2011. A positive value indicates an increase. *tiea* is a dummy variable taking on the value one if Germany has signed a treaty with the respective country between 2006 and 2011. In column (1) of Table 4, *y_06_11* is simply regressed on a constant and the dummy *tiea*. The latter variable is negatively correlated with the development of German investment during the time window and significant at the 7% level.

A possible problem with this regression is that the amount of FDI in the beginning of the period could both have an influence on the decision of the country to agree on a treaty with Germany and on the further development of

[6] We also tested the window 2007-2011 with almost identical results (Table 8 in the annex).

bilateral FDI. For this reason, the initial number of affiliates in 2006, *y_06*, is added as a right hand variable. The positive sign of the coefficient for *y_06* suggests that a high number of initial affiliates in a country tends to be associated with a further positive development of the number of affiliates in the period before 2011. At the same time, the addition of *y_06* leaves the results for variable of interest, *tiea*, almost unchanged.

The third column presents a regression that follows the recommendation by Wooldridge (2002, p. 613) to account for a possibly endogenous treatment. Along with the *tiea* and *y_06*, it adds the interaction between *tiea* and the demeaned value of *y_06*. The coefficient of *tiea* can be interpreted as the average treatment effect. While the point estimate of *tiea* at 14.3 is very similar to the value in column (1), the precision and significance is considerably increased.

Table 4: Diff-in-Diff Results

VARIABLES	(1) y_06_11	(2) y_06_11	(3) y_06_11	(4) y_03_06
tiea	-14.58*	-10.58*	-14.26***	6.898
	(-1.92)	(-1.97)	(-5.83)	(-1.22)
y_06		0.297***	0.334***	
		(4.88)	(7.59)	
demeaned_y_06_tiea			-0.516***	
			(-9.47)	
y_03				0.120**
				(2.19)
demeaned_y_03_tiea				0.146
				(0.60)
constant	12.17	1.394	0.0809	-1.540*
	(1.68)	(0.84)	(0.06)	(-1.84)
Observations	30	30	30	30
R-squared	0.088	0.807	0.948	0.589

Notes: *y_06_11* (*y_03_06*) denote the absolute change of German affiliates in a country between 2007 and 2011 (2003 and 2006). *y_06* (*y_03*) denote the number of German affiliates in a country in the year 2007 (2003). *demeaned_y_06_tiea* (*demeaned_y_03_tiea*) is defined as the interaction between the demeaned value of *y_06* (*y_03*) and the dummy *tiea*. *** p<0.01, ** p<0.05, * p<0.1. t-statistics reported in parenthesis are based on heteroscedasticity robust standard errors (HC3). Compared to available alternatives, the HC3 heteroscedasticity consistent covariance matrix has been shown to be particularly appropriate for small samples (Long and Ervin 2000).

Column (4) presents results of a placebo test. The dummy variable is tested whether it produces a significantly negative result also for the comparison

of the years 2006 and 2003. For this we use the new left hand variable *y_03_06*, which counts the increase in affiliates between 2003 and 2006. Unlike the coefficient of *tiea* in the first columns, the coefficient is now positive and not significant. Since before 2007 the treaties should not have been anticipated, this insignificant result is expected and tends to support a causal interpretation of the results in columns (1) to (3). Instead of using the absolute increase in the number of affiliates we also used the relative increase as a left hand variable with closely related results and very similar significance levels.

The regressions support our hypothesis that treaties on information exchange in tax matters do not only influence cross-border bank deposits as has been established in previous work, but also the extent of bilateral FDI. The evidence presented in Table 4 suggests that TIEAs reduced the number of German affiliates in an economically significant way. At the same time, several caveats may be mentioned. One possible concern is that German investors were induced to move affiliates from signature countries to non-signature countries. This may contaminate the non-signature countries as a control group and may lead to an overestimation of the effect. Another concern is the restricted sample size that results from looking at country observations. For this reason, the next section will proceed to individual firm decisions to provide further evidence.

5 Firm Level Analysis

The signature of a TIEA implies that tax-related information may be exchanged between tax authorities of the two signatory states. In this section, we analyze whether this prospect influences individual firms' location decisions. We construct a sample including the 1080 German parent companies that have ever had a subsidiary in a tax haven country (see Table 1) in the period between 1999 and 2011. Furthermore, we restrict the sample to the 32 tax haven countries and other offshore jurisdictions as we define them in Section 2. Analogously to the approach taken in Section 3, we compare the investment positions of German firms in tax haven jurisdictions in the year 2006 to that of the year 2011. To

capture the effect of TIEAs on the location of affiliates in tax havens, we use binary choice and count data models.

We start by analyzing a German MNE's binary decision of whether or not to locate an affiliate in a specific tax haven. We investigate whether the likelihood that a German parent owns an affiliate in a specific tax jurisdiction changes between 2006 and 2011, depending on whether the jurisdiction is listed in Table 2 as a country that has signed a TIEA with Germany in the meantime.

We estimate the following equation, where subscripts *t, i,* and *j* respectively stand for time, country and parent firm:

$$y_{tij} = \alpha_0 + \alpha_1 tiea_yr_{jt} + \alpha_2 d_{2006} + \alpha_3 d_{2011} + \alpha_4 P_j + \alpha_5 lan_i + \alpha_6 \varepsilon_{tij} \qquad (1)$$

The left hand variable y_{tij} is a dummy variable taking the value of one if a parent company *j* has an affiliate in a specific haven jurisdiction *i* at time *t* and zero otherwise. As main explanatory variable we use a dummy variable, $tiea_yr_{jt}$, that is zero for all countries in 2006 and is one in 2011 if the respective host jurisdiction has, in the meantime, signed a TIEA with Germany that became eventually ratified. Further, d_{2006} and d_{2011} stand for the year dummies in 2006 and 2011, P_j depicts the parent-firm fixed effect, and lan_i the country fixed effect.

Table 5 shows the regression results for the binary choice models. Columns (2), (4) and (6), at the cost of losing some observations due to missing data, include the host country gross domestic product (*ln_gdp*), the corporate income tax rate (*cit*), and the withholding tax rate on dividends repatriated to Germany (*wht*) as additional control variables. As can be inferred, these variables are almost always insignificant, which may partly reflect that the reliability of these data is not very high in tax haven countries. In addition, information on headline taxes can be strongly deceptive in tax haven countries as important exceptions and negotiation possibilities often apply. All regressions include time and country fixed effects. Summary statistics are presented in the annex, Table 20.

The first two columns show the results for the linear probability model. While in principle the computed probabilities may fall outside the range of zero

and one, this model has the advantage that the magnitudes of the coefficients can directly be interpreted. Also, our main explanatory variable is in essence an interaction term between a year-dummy and the *tiea*-dummy, and the interpretation of interaction terms is particularly problematic in non-linear regression models (Ai and Norton, 2003). We also use a logit model, which ensures that the predicted probabilities are limited between zero and one. The results are shown in columns (3) and (4). Columns (5) and (6) show the results of the conditional logit model. The conditional logit model is a frequently used method to analyze the choice of a multinational company between several location alternatives. Also, the conditional logit model with parent-fixed effects, allows for unobserved heterogeneity at the firm-level.

Table 5: Results for the Binary Choice Models

	Lin. Probability		Logit		clogit	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
tiea_yr	-0.008***	-0.0153***	-0.299***	-0.392***	-0.331***	-0.439***
	(-5.28)	(-6.13)	(-2.83)	(-2.83)	(-2.87)	(-2.89)
ln_gdp		-0.0072**		-0.108		-0.013
		(-2.05)		(-0.51)		(-1.38)
cit		0.00003		-0.012		-0.0152
		(0.28)		(-1.38)		(-0.23)
wht		0.0004		-0.0155		-0.128
		(0.61)		(-0.25)		(-0.55)
constant	0.0141***	0.184**	-4.765***	-2.050		
	(6.14)	(2.29)	(-14.70)	(-0.42)		
Marginal effect tiea_yr			-0.006***	-0.011***		
p-value			0.007	0.008		
Year fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	69,120	47,520	64,800	46,440	48,128	32,604
Adj. R-squared	0.165	0.171	0.307	0.274	0.449	0.412

Notes: The dependent variable is a dummy variable taking the value of one if a company invests in a specific country and zero otherwise*; tiea_yr* is a dummy variable that becomes one in the year in which Germany and the respective host jurisdiction sign a TIEA (and remains one in the subsequent years); *ln_gdp* denotes the natural logarithm of host country gdp; *cit* represents corporate income tax rate in the host jurisdictions; *wht* means the dividend withholding tax rate on outgoing dividends to Germany. All observations are from year 2006 or 2011. Numbers in columns (3) to (6) represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-statistics are reported in parentheses. Standard errors are clustered at the parent firm level. Data sources are listed in Table 21.

All specifications indicate that the signature of a TIEA significantly reduces the likelihood that a German parent company operates in a signatory jurisdiction. The coefficients of the linear probability model and the marginal effect which we computed for the logit model without controls are -0.008 and -0.006 respectively. That is, when a haven jurisdiction signs a TIEA with Germany, a German multinational is about 0.7 percentage points less likely to run a subsidiary in this jurisdiction. This is a considerable effect when compared to the average probability of a parent in our sample to own an affiliate in one of the tax haven jurisdictions of some 3%.

As robustness tests, we ran similar regressions including all the years from 2006 to 2011. The results, which are shown in Tables 15 and 16 in the

annex, also yield statistically significant results for the influence of information exchange treaties on firm location choices. The estimated coefficients are slightly smaller, possibly reflecting that the signature year of a treaty is an imperfect trigger date for its effectiveness as different treaties may have been anticipated by German investors at different times. We therefore prefer the time-window approach presented in the main text, where the initial year 2006 is chosen in safe distance to the first signatures.

Akin to Section 3, we also resort to a placebo test (see Table 6). We examine whether TIEA countries had also a different development in the period 2003-2006.[7] The placebo variable (*tiea_placebo*) is one in 2006 for all countries that agreed on a TIEA later on and zero otherwise. It is not statistically significant. This result is as expected given that the German parents had not anticipated the signature of the TIEAs and corresponds to the placebo tests on the country level (see Table 4).

[7] As robustness test, we made the same regression analysis for the time window 2007 to 2011 (see Table 14 in the annex). Results remain largely unchanged.

Table 6: Results for the Binary Choice Models with a Placebo Test

	Lin. Probability		Logit		clogit	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
tiea_placebo	0.00002	-0.00175	0.0821	0.0376	0.0821	0.0343
	(0.01)	(-0.79)	(0.81)	(0.33)	(0.73)	(0.27)
ln_gdp		0.00393		0.0156		-0.0197
		(0.61)		(0.04)		(-1.19)
cit		-0.000134		-0.0185		-0.0531*
		(-0.87)		(-1.21)		(1.83)
wht		0.00103**		0.0463*		0.0580
		(2.20)		(1.78)		(0.13)
constant	0.00724***	-0.0885	-5.037***	-6.433		
	(2.84)	(-0.59)	(-14.46)	(-0.69)		
Marginal effect						
tiea_placebo			0.0014	0.0009		
p-value			0.413	0.738		
Year fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	69,120	44,280	60,480	43,200	36,544	22,755
Adj./pseudo R-squared	0.142	0.156	0.273	0.244	0.444	0.405

Notes: The dependent variable is a dummy variable taking the value of one if a company invests in a specific country and zero otherwise; *tiea_placebo* is a dummy taking the value of one in 2006 if the country later signs a TIEA with Germany as listed in Table 2; *ln_gdp* denotes the natural logarithm of host country gdp; *cit* represents corporate income tax rate in the host jurisdictions; *wht* measures the dividend withholding tax rate on outgoing dividends to Germany. All observations are from year 2003 or 2006. Numbers in columns (3) to (6) represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-statistics are reported in parentheses. Standard errors are clustered at the parent firm level. Data sources are listed in Table 21.

The results in Table 6 do not differentiate between the number of affiliates a parent has in a particular country but use a zero-one indicator. Yet, about a fifth of the German parent companies owns two or more subsidiaries in a tax haven. This suggests a count model for further robustness checks. We use the same specifications as for the binary choice models, including the placebo tests. Typically, the Poisson specification is the first option for count data models. However, this model assumes equidispersion, i.e. the mean and the variance of the dependent variable should be equal. As our data show overdispersion (see Table 20 in the Annex), we do not use a Poisson specification, but a negative binomial model. Also, the alpha test statistics from the likelihood ratio test, which are significantly greater than zero, confirm that the use of negative binomial rather than Poisson models is appropriate (see Table 7).

The results, represented in Table 7, indicate that in tax haven jurisdictions that have signed a TIEA with Germany, the number of affiliates has decreased substantially compared to the comparison group of countries. The effect is statistically significant at the 1% level and economically sizable: German multinationals have reduced the number of affiliates in the jurisdictions that have signed a TIEA with Germany by 47%. The magnitude of this result in column (1) matches the descriptive statistics at the country level in Table 3.[8] Again, a placebo test does not indicate a statistically significant impact of the TIEA-placebo dummy in the time window 2003 to 2006.

Table 7: Results for Count Data Models

	tiea		placebo	
VARIABLES	(1)	(2)	(3)	(4)
tiea_yr	-0.4689***	-0.602***		
	(-3.23)	(-3.56)		
ln_gdp		-0.142		0.003
		(-0.52)		(0.01)
cit		-0.0166		-0.0435**
		(-1.26)		(-2.12)
wht		-0.0292		0.0616**
		(-0.43)		(2.46)
tiea_placebo			0.206*	0.0805
			(1.72)	(0.77)
constant	-4.632***	-0.892	-5.039***	-5.835
	(-14.22)	(4.82)	(-14.53)	(-0.61)
Year fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	69,120	47,520	69,120	44,280
α-test statistics	1.536***	1.536***	1.817***	1.813***
	(4.82)	(4.82)	(4.90)	(4.89)

Notes: The discrete dependent variable counts the number of investment projects a German multinational has in a specific country and year; *tiea_yr* is a dummy that equals one if a country has signed a TIEA with Germany and the observation is from 2011; *tiea_placebo* is a dummy taking the value one in 2006 if the country has afterwards signed a TIEA with Germany; *ln_gdp* denotes the natural logarithm of host country GDP; *cit* denotes the corporate income tax rate in the host jurisdiction; *wht* is the dividend withholding tax rate on dividends paid to a German parent. All observations are from 2006 or 2011. *** p<0.01, ** p<0.05, * p<0.1. t-statistics are reported in parentheses. Standard errors are clustered at the parent firm level.

[8] As a robustness test, we also ran the same regressions including all the years from 2006 to 2011. The results, which are shown in Table 17 in the annex, similarly are statistically significant for the variable of interest, *tiea_yr*. As in the linear probability and logit models, the inclusion of all years reduces the estimated coefficient. For the reasons given above, we prefer the time-window approach presented in the main text.

These results thus confirm the findings seen at the country level. However, simultaneity and/or omitted variables could produce upward biased coefficients. To address this potential endogeneity, we change our model set-up slightly and implement an instrumental variable (IV) approach in the next section.

6 Instrumental Variable Estimation

This section further addresses potential endogeneity concerns. We transform our regression model (eq. 1) so that the change in a firm's investment position in a respective tax haven between 2006 and 2011 becomes the dependent variable (*delta_chloc*). Our new model can then be written as follows:

$$y_{2011ij} - y_{2006ij} = \alpha_0 + \alpha_1 tiea_{yr_{jt}} + \alpha_2 d_{2011} + \alpha_3 P_i + \alpha_3 lan_i + \alpha_4 \varepsilon_{2011ij}$$

$$-\alpha_5 - \alpha_6 tiea_{yr_{jt}} - \alpha_7 d_{2006} - \alpha_8 P_i - \alpha_9 lan_i - \alpha_{10} \varepsilon_{2006ij}$$

$$y_{2011ij} - y_{2006ij} = (\alpha_0 - \alpha_5) + \alpha_1 tiea_yr_{jt} + \alpha_2 d_{2011} - \alpha_3 d_{2006} + \alpha_4 \gamma_{tij} \qquad (2)$$

As in equation (1), y_{tij} is an indicator variable of firm *j's* investment position in jurisdiction *i* at time *t, tiea_yr* is 1 when a TIEA is in place between Germany and the respective jurisdiction, d_{2006} and d_{2011} stand for the year dummies in 2006 and 2011, P_j depicts the parent-firm fixed effect, and lan_i the country fixed effect. As can be seen in equation (2), time-invariant factors, such as country fixed effects, cancel out. Intuitively, country fixed factors such as the distance from Germany play a role in a firm's decision as of whether or not to invest in a country but do not influence how the firm's investment position changes over time.

Within this difference-in-difference set-up, we instrument the conclusion of a TIEA and estimate a two-stage least-squares (2SLS) model. For the incidence of a TIEA we use distance as an instrument. Germany clearly has a geographical strategy when choosing its partners with which it signs TIEAs. The OECD Peer Review for Germany (2013a) states:

> (…) Germany started in 2008 to negotiate TIEAs. A priority has first been given in this respect to the closest German jurisdictions and in particular the European jurisdictions (Gibraltar, Guernsey, Isle of Man, Jersey, Monaco, Liechtenstein). Germany now intends to extend its network in the Caribbean area and then in the Pacific area (p.73, para. 267).

Distance thus affects the likelihood of signing a TIEA, but does not directly impact the change in a firm's investment position beyond the indirect effect via TIEA-formation. The correlation table below (Table 8) and the F-test statistic (corrected for country clusters) in Table 9 (column 2) confirm that distance is a strong instrument.

Table 8: Correlations (34,560 observations)

	ln_dist	*tiea_yr*	*delta_chloc*
ln_dist	1.00		
tiea_yr	-0.62	1.00	
delta_chloc	0.02	-0.028	1.00

A "normal" IV approach does not allow estimating a nonlinear model at the first stage (see, e.g., Angrist and Pischke, 2009, p. 190-2). In order to circumvent this problem of the wrong linear form, Angrist and Pischke suggest estimating a probit model and "us[ing] the nonlinear fitted values as instruments" at the first stage. If the first stage is more appropriately represented by a nonlinear model, also "the resulting 2SLS estimates will be more efficient than those using a linear first stage".

Table 9 depicts the results of this 2SLS approach with a preceding probit model. Column (1) shows the probit model regressing *tiea_yr* on distance (*ln_dist*). *tiea_yr* has a default value 0, but switches to 1 for jurisdictions that switched to having a TIEA with Germany in 2011. As expected, distance has a negative and statistically significant impact on the likelihood of the conclusion of a TIEA even after clustering at the country level.

In the first stage of the 2SLS estimation we then use the fitted values of this probit regression *(fitted_probit)* instead of distance itself as the main

explanatory variable (column (2)). This variable shows the expected positive and significant impact on the likelihood of treaty formation.

Column (3) depicts the second stage of the 2SLS model. The instrumented TIEA *(tiea(iv))* proves to have a negative and statistically significant (at the 1% level after clustering at the parent level) influence on a firm's investment position, with the magnitude of the effect being similar to the one in the OLS approach (column (4)).

Hence, also when we account for potential endogeneity, the data show a statistically significant negative impact of TIEAs on the investments of German multinationals in tax havens. However, as the robust regression-based test for endogeneity (Wooldridge, 1995) does not indicate that the *tiea_yr* variable is endogenous (column (3)), the more efficient non-instrumented approach is our preferred specification. Table 18 in the annex, which presents IV-estimations that include additional control variables at the cost of losing observations, confirms our findings.

Table 9: *Results for Binary Choice Models 2SLS 2006-2011, with Preceding Probit*

	Probit	2SLS		OLS
		1st stage	2nd stage	
VARIABLES	(1)	(2)	(3)	(4)
ln_dist	-1.38***			
	(-4.05)			
fitted_probit		0.939***		
		(7.46)		
tiea_yr				-0.008***
				(-5.28)
tiea_yr (iv)			-0.009***	
			(-3.73)	
constant	11.67***	0.024***	0.009***	0.014***
	(3.85)	(0.25)	(6.45)	(6.14)
Observations	34,560	34,560	34,560	69,120
Pseudo R^2 /R^2	0.33	0.36	0.001	0.18
Wald-/F-test	16.37	55.62	13.28	
p-value	0.0001	0.000	0.0003	
Endogeneity test			0.29	
p-value			(0.59)	

Notes: The dependent variable is *delta_chloc* in columns (3) and (4), and *tiea_yr* in columns (1) and (2). *delta_chloc* denotes a change in a company's investment position between 2006 and 2011; *tiea_yr* is a dummy that equals one if a country has signed a TIEA with Germany, *fitted_probit* stands for the fitted values from the probit regression, *ln_dist* corresponds to the logarithm of distance between Germany and

the respective tax haven. All observations are from year 2006 or 2011. Numbers represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-/z-statistics are reported in parentheses. Standard errors are clustered at the parent firm level in columns (3) and (4). Reported standard errors in (1) and (2) were clustered at the country level to account for the fact that the TIEAs are agreed on at the country level. Data definitions and sources are listed in Table 21 in the annex.

We also test for endogeneity in the count data set-up, in which the change in the number of investment projects a German multinational has in a respective host country is the dependent variable (*delta_nb*). Also in these regressions with the preceding probit regression, the instrumented TIEA variable has a negative and statistically significant impact on the number of German affiliates in tax haven jurisdictions (see Table 10). The correlation table for these regressions is presented in Table 11, and Table 19 in the annex shows regression results including additional covariates at the cost of losing some observations. Also in this case the endogeneity test does not indicate an endogeneity problem. We thus feel assured that the coefficients of the non-instrumented regressions are unbiased.[9]

[9] We should note that the count data regressions have a lower number of observations as parents that face a reduction of tax haven affiliates between 2006 and 2011 imply observations with a negative left hand variable. We also tested the results with the time-window 2007 and 2011 with almost identical results. Results are available upon request.

Table 10: Results for Count Data Models 2SLS 2006-2011, with Preceding Probit

	Probit	2SLS	
		1st stage	2nd stage
VARIABLES	(1)	(2)	(3)
ln_dist	-1.38***		
	(-4.05)		
fitted_ probit		0.939***	
		(7.46)	
tiea_yr (iv)			-0.015***
			(-2.74)
constant	11.67***	0.024	0.012***
	(3.85)	(0.25)	(4.77)
Observations	34,560	34,560	34,560
Pseudo R^2 /R^2	0.33	0.39	0.001
F-test		55.62	
p-value		0.000	
Wald-Test	16.37		7.50
p-value	0.0001		0.01
Endogeneity test			0.001
p-value			0.98

Notes: The dependent variable is *delta_nb* in column (3) and *tiea_yr* in columns (1) and (2). *delta_nb* denotes the change in the number of affiliates a company has in a specific tax haven; the *tiea_yr* is a dummy that equals one if a country has signed a TIEA with Germany, *fitted_probit* stands for the fitted values from the probit regression, *ln_dist* corresponds to the logarithm of distance between Germany and the respective tax haven. All observations are from year 2006 or 2011. Numbers represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-/z-statistics are reported in parentheses. Standard errors in column (3) are clustered at the parent firm level. Reported standard errors in (1) and (2) were clustered at the country level to account for the fact that the TIEAs are agreed on at the country level. Data definitions and sources are listed in Table 21 in the annex.

Table 11: Correlations (34,560 observations)

	ln_dist	*tiea_yr*	*delta_nb*
ln_dist	1.00		
tiea_yr	-0.62	1.00	
delta_nb	0.02	-0.03	1.00

The IV regression results support our hypothesis that companies invest in tax haven jurisdictions not only because of their low tax rates. Rather, this

decision seems also to be influenced by a lack of transparency and information exchange from which companies can benefit in some of these jurisdictions.

7 Conclusion

In this paper, we empirically analyzed whether TIEAs, *i.e.* bilateral agreements that enable the tax authorities of the two signatory states to exchange on request tax-related information, impact German foreign direct investment in tax haven jurisdictions. The evidence presented in this paper indicates that German multinationals are likely to reduce the number of their affiliates in a tax haven jurisdiction if that jurisdiction signs a TIEA with Germany. The econometric evidence indicates an economically sizable effect. The number of investments in the jurisdictions that have signed (and eventually ratified) these treaties have decreased by about 46% compared to a control group. This may suggest that German multinationals use tax haven jurisdictions not only for the low tax rates but also for the secrecy these jurisdictions offer.

Our results support previous findings that exchange of information and enhanced transparency, as strongly promoted by the OECD, have measurable effects on investments in tax haven jurisdictions. While exchange of information treaties are usually motivated and supported by the fear of tax evasion by individuals via trusts or cross-border bank accounts, the present paper indicates that FDI is affected as well.

8 Annex

Table 12: Secrecy Levels of Tax Haven Jurisdictions

Jurisdiction	Secrecy Score	Rank
Marshall Islands	90	2
Turks & Caicos Islands	90	4
Belize	90	6
St Lucia	89	7
Vanuatu	88	10
Montserrat	86	11
Bermuda	85	12
Samoa	85	14
Brunei Darussalam	84	16
Bahamas	83	19
Macao	83	21
Netherlands Antilles	83	22
Grenada	83	23
Lebanon	82	26
Antigua & Barbuda	82	29
British Virgin Islands	81	30
Liberia	81	32
Liechtenstein	81	34
St Kitts & Nevis	81	36
Dominica	80	38
Barbados	79	40
Anguilla	79	41
San Marino	79	43
Jersey	78	45
Bahrain	78	46
Uruguay	78	47
Gibraltar	78	51
St Vincent & the Grenadines	78	52
Cayman Islands	77	58
Panama	77	59
Costa Rica	77	61
Mauritius	74	62
Aruba	74	63
Hong Kong	73	65
Andorra	73	66
Singapore	71	67
US Virgin Islands	68	68
Guernsey	65	69
Isle of Man	65	71

Notes: The jurisdictions that have signed a TIEA with Germany are in blue. The secrecy score ranges from 0 to 100, with higher values corresponding to higher levels of secrecy. Weighing the secrecy scores with the global importance of the jurisdictions as financial centres gives the rank. A lower rank stands for a more important secrecy jurisdiction (out of 73 jurisdictions that were assessed) Data are for 2011. Source: Financial Secrecy Index by the Tax Justice Network. (http://www.financialsecrecyindex.com).

Table 13: Diff-in-Diff Results with Alternative Time Window 2007-2011

	(1)	(2)	(3)	(4)
VARIABLES	*y_07_11*	*y_07_11*	*y_07_11*	*y_03_07*
y_07		0.231***	0.270***	
		(3.58)	(5.78)	
tiea	-14.42*	-12.21*	-15.24***	8.49
	(-1.98)	(-1.74)	(-5.91)	(1.67)
demeaned_y_07_tiea			-0.553***	
			(-10.18)	
y_03				0.176***
				(2.83)
demeaned_y_03_tiea				0.273
				(1.26)
constant	10.22	1.394	-0.0977	-1.583
	(1.66)	(0.89)	(-0.09)	(-1.50)
Observations	28	28	28	28
R-squared	0.099	0.713	0.943	0.782

Notes: *y_07_11* (*y_03_07*) denote the absolute change of German affiliates in a country between 2007 and 2011 (2003 and 2007). *y_07* (*y_03*) denote the number of German affiliates in a country in the year 2007 (2003). *demeaned_y_07_tiea* (*demeaned_y_03_tiea*) is defined as the interaction between the demeaned value of *y_07* (*y_03*) and the dummy *tiea*. *** p<0.01, ** p<0.05, * p<0.1. t-statistics reported in parenthesis are based on heteroscedasticity robust standard errors (HC3). Compared to available alternatives, the HC3 heteroscedasticity consistent covariance matrix has been shown to be particularly appropriate for small samples (Long and Ervin 2000).

Table 14: Results for the Binary Choice Models, Time Window 2007-2011

	Lin. Probability		Logit		clogit	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
tiea_yr	-0.007***	-0.014***	-0.279***	-0.269**	-0.312***	-0.311**
	(-5.27)	(-5.95)	(-3.07)	(-2.20)	(-3.14)	(-2.33)
ln_gdp		-0.0068*		0.108		0.0991
		(-1.94)		(0.46)		(0.38)
cit		-0.00003		-0.00737		-0.00788
		(-0.34)		(-0.92)		(-0.91)
wht		0.0004		-0.030		-0.0307
		(0.69)		(-0.48)		(-0.46)
constant	0.0144***	0.174**	-4.598***	-7.105		
	(5.61)	(2.17)	(-14.59)	(-1.31)		
Year fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	69,120	47,520	60,480	46,440	46,912	31,768
Adj. R-squared	0.170	0.175			0.457	0.419

Notes**:** The dependent variable is a dummy variable taking the 1 if a company invests in a specific country and the 0 otherwise*; ln_gdp* denotes the natural logarithm of host country gdp; *cit* denotes corporate income tax rate in the host jurisdictions; *wht* denotes the dividend withholding tax rate on outgoing dividends to Germany. All data is from year 2007 or 2011. Numbers in columns (3) to (6) represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-statistics are reported in parentheses. Standard errors are clustered at the parent firm level. Data definitions and sources are listed in Table 21.

Table 15: Results for the Binary Choice Models for the Time Period 2006-2011

	Lin. probability		Logit		clogit	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
tiea_yr	-0.004***	-0.006***	-0.148**	-0.117*	-0.188**	-0.157**
	(-4.40)	(-6.13)	(-2.17)	(-1.79)	(-2.49)	(-2.16)
ln_gdp		-0.0007		0.103		0.106
		(0.28)		(0.69)		(0.62)
cit		0.00005		0.0003		0.0007
		(0.92)		(0.09)		(0.18)
wht		0.0007		0.0240		0.0282
		(1.48)		(0.35)		(0.40)
constant	0.0123***	-0.0026	-4.766***	-7.223**		
	(5.36)	(-0.05)	(-15.23)	(-2.13)		
Marginal effect tiea_yr			-0.003**	-0.003*		
p-value			0.035	0.08		
Year fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	207,360	141,480	200,880	139,320	155,328	105,193
Adj./pseudo R-squared	0.173	0.182	0.311	0.271	0.422	0.380

Notes**:** The dependent variable is a dummy variable taking the value of one if a company invests in a specific country and zero otherwise*; tiea_yr* is a dummy variable that becomes one in the year in which Germany and the respective host jurisdiction sign a TIEA (and remains one in the subsequent years); *ln_gdp* denotes the natural logarithm of host country gdp; *cit* represents corporate income tax rate in the host jurisdictions; *wht* means the dividend withholding tax rate on outgoing dividends to Germany. All data come from years 2006-2011. Numbers in columns (3) to (6) represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-statistics are reported in parentheses. Standard errors are clustered at the parent firm level. Data definitions and sources are listed in Table 21.

Table 16: Results for the Binary Choice Models with tiea Placebo for the Time Period 2003-2006

	Lin. Probability		Logit		clogit	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
tiea_placebo	-0.00005	-0.0009	0.0741	0.0627	0.0663	0.0535
	(-0.05)	(-0.57)	(0.94)	(0.75)	(0.74)	(0.55)
ln_gdp		0.00102		-0.0286		0.0049
		(0.21)		(-0.09)		(0.01)
cit		-0.00009		-0.0115		-0.0122
		(-0.86)		(-1.17)		(-1.13)
wht		0.0003		0.0120		0.0161
		(1.56)		(0.81)		(0.96)
constant	0.00716***	-0.0204	-5.068***	-5.747		
	(3.15)	(-0.18)	(-14.92)	(-0.74)		
marginal effect						
tiea_placebo			0.0013	0.0014		
p-value			0.345	0.452		
Year fixed effects	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
Observations	138,240	87,480	120,960	85,320	75,520	46,251
Adj./pseudo R-squared	0.148	0.166	0.276	0.246	0.431	0.394

Notes**:** The dependent variable is a dummy variable taking the value of one if a company invests in a specific country and zero otherwise*; tiea_placebo is a dummy taking the value of one in 2006 if the country later signs a TIEA with Germany; ln_gdp* denotes the natural logarithm of host country gdp; *cit* represents corporate income tax rate in the host jurisdictions; *wht* means the dividend withholding tax rate on outgoing dividends to Germany. All data are from year 2003 and 2006. Numbers in columns (3) to (6) represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-statistics are reported in parentheses. Standard errors are clustered at the parent firm level. Data definitions and sources are listed in Table 21.

Table 17: Results for Count Data Models Period 2006-2011 & Placebo 2003-2006

	tiea		placebo	
VARIABLES	(1)	(2)	(3)	(4)
tiea_yr	-0.240***	-0.206**		
	(-2.59)	(-2.02)		
ln_gdp		0.156		0.0107
		(0.53)		(0.32)
cit		0.003		-0.0293**
		(0.50)		(-2.20)
wht		-0.008		0.0222
		(-0.13)		(1.47)
tiea_placebo			0.147	0.0773
			(1.51)	(0.94)
constant	-4.680***	-8.270	-5.020***	-8.697
	(-14.82)	(-1.23)	(-14.67)	(-1.10)
Year fixed effects	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes
Observations	207,360	141,480	138,240	87,480
α-test statistics	1.569***	1.568***	1.835***	1.832***
	(4.73)	(4.73)	(4.79)	(4.78)

Notes: The discrete dependent variable counts the number of investment projects a German multinational has in a specific country and year*; tiea_yr* is a dummy that equals one if a country has signed a TIEA with Germany and the observation is from the signature year or thereafter; *tiea_placebo* is a dummy taking the value one in 2006 if the country has afterwards signed a TIEA with Germany*; ln_gdp* denotes the natural logarithm of host country GDP; *cit* denotes the corporate income tax rate in the host jurisdiction; *wht* is the dividend withholding tax rate on dividends paid to a German parent. *** p<0.01, ** p<0.05, * p<0.1. t-statistics are reported in parentheses. Standard errors are clustered at the parent firm level. Data definitions and sources are listed in Table 21.

Table 18: Binary Choice Models. 2SLS 2006-2011, with Covariates incl. Probit Regressions

	Probit	2SLS	
		1st stage	2nd stage
VARIABLES	(1)	(2)	(3)
ln_dist	-1.38***		
	(-4.05)		
fitted_probit		0.874***	
		(4.95)	
tiea_yr (iv)			-0.009***
			(-3.73)
delta_cit		0.006	-0.00003
		(1.13)	(-0.33)
delta_wht		0.009	-0.0001
		(0.88)	(-0.78)
delta_gdp		-0.793***	-0.006
		(-2.93)	(-1.49)
constant	11.67***	0.356*	0.009***
	(3.85)	(1.93)	(6.45)
Observations	24,840	24,840	24,840
Pseudo R^2 /R^2	0.33	0.62	0.002
Wald-/F-test	16.37	57.70	50.05
p-value	(0.000)	(0.000)	(0.000)
Endogeneity test			0.27
p-value			(0.60)

Notes: The dependent variable is *delta_chloc* in columns (3) and (5) and *tiea_yr* in columns (1), (2) and (4). *delta_chloc* denotes change in a company's investment position between 2006 and 2011; *tiea_yr* is a dummy that equals one if a country has signed a TIEA with Germany, *fitted_probit* stands for the fitted values from the probit regression, *ln_dist* corresponds to the logarithm of distance between Germany and the respective tax haven. *delta_gdp* denotes change in the natural logarithm of host country GDP; *delta_cit* denotes the change in the corporate income tax rate in the host jurisdiction; *delta_wht* is the change in the dividend withholding tax rate on dividends paid to a German parent. All observations are from year 2006 or 2011. Numbers represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-/z-statistics are reported in parentheses. Standard errors are clustered at the parent firm level in columns (3). To account for the correlation of policies at the country level reported standard errors in columns (1) and (2) are clustered at the country level. Data definitions and sources are listed in Table 21.

Table 19: Count Data Model, 2SLS 2006-2011, with Covariates incl. Probit Regressions

	Probit	2SLS	
		1st stage	2nd stage
VARIABLES	(1)	(2)	(3)
ln_dist	-1.38***		
	(-4.05)		
fitted_probit		0.874***	
		(4.95)	
tiea_yr (iv)			-0.024***
			(-3.38)
delta_cit		0.006	-0.0001
		(1.13)	(-0.54)
delta_wht		0.009	0.0001
		(0.88)	(0.49)
delta_gdp		-0.793***	-0.008
		(-2.93)	(-0.82)
constant	11.67***	0.356*	0.021***
	(3.85)	(1.93)	(3.16)
Observations	24,840	24,840	24,840
Pseudo R^2 /R^2	0.33	0.62	0.001
Wald-/F-test	16.37	57.70	38.90
p-value	(0.000)	(0.000)	(0.000)
Endogeneity test			0.02
p-value			(0.89)

Notes: The dependent variable is *delta_nb* in columns (3) and *tiea_yr* in columns (1) and (2). *delta_nb* denotes the change in the number of affiliates a company has in a specific tax haven; the *tiea_yr* is a dummy that equals one if a country has signed a TIEA with Germany, *fitted_probit* stands for the fitted values from the probit regression, *ln_dist* corresponds to the logarithm of distance between Germany and the respective tax haven. *delta_gdp* denotes change in the natural logarithm of host country GDP; *delta_cit* denotes the change in the corporate income tax rate in the host jurisdiction; *delta_wht* is the change in the dividend withholding tax rate on dividends paid to a German parent. All observations are from year 2006 or 2011. Numbers represent coefficients rather than odds ratios. *** p<0.01, ** p<0.05, * p<0.1. t-/z-statistics are reported in parentheses. Standard errors are clustered at the parent firm level in columns (3). To account for the correlation of policies at the country level reported standard errors in columns (1) and (2) are clustered at the country level. Data definitions and sources are listed in Table 21.

Table 20: Summary Statistics

VARIABLES	Observations	Mean	Std. deviation
logit model in Table 5, column (4)			
chloc	46,440	0.0313	0.1742
tiea_yr	46,440	0.2093	0.4068
ln_gdp	46,440	22.9345	1.5174
cit	46,440	13.7209	12.2913
wht	46,440	3.1163	5.2395
logit model in Table 6, column (4)			
chloc	43,200	0.0278	0.1643
tiea_placebo	43,200		
ln_gdp	43,200	22.7022	1.3740
cit	43,200	17.8875	12.2333
wht	43,200	3.0875	5.4677
nbreg model in Table 7, column (2)			
nb	47,520	0.0439	0.4014
tiea_yr	47,520	0.2273	0.4191
ln_gdp	47,520	22.8868	1.5324
cit	47,520	13.9773	12.2666
wht	47,520	3.6136	6.1209

Table 21: Data Sources of the Variables Used in the Regressions

Variable	Definition	Sources
chloc	Dummy indicating whether or not a firm invests in tax haven jurisdiction	Deutsche Bundesbank, Microdatabase Direct Investments (MiDi) 1999-2011
cit	Statutory corporate income tax rate in the host jurisdictions	Mintz and Weichenrieder (2010), IBFD Tax Research Platform, pwc Worldwide Tax Summaries – Corporate Taxes, International Tax Review – World Tax, Euromoney, KPMG European Tax Handbook, Ernst and Young: Worldwide Corporate Tax Guide, various years
delta_chloc	The change in the investment position of a German firm in a tax haven jurisdiction between 2006 and 2011	*see chloc*
delta_nb	The change in the number of affiliates that a German firm has in a respective tax haven jurisdiction between 2006 and 2011	*see nb*
ln_dist	Distance between Germany and respective tax haven	CEPII Database
ln_gdp	the natural logarithm of host country gross domestic product	gross domestic product in current USD (United Nations); BEA Bureau of Economic Analysis; national governments and statistics offices
nb	Number of affiliates a German firm has in a specific tax haven jurisdiction	Deutsche Bundesbank, Microdatabase Direct Investments (MiDi) 1999-2011
wht	dividend withholding tax rate on outgoing dividends to Germany	IBFD Tax Research Platform, pwc Worldwide Tax Summaries – Corporate Taxes, International Tax Review – World Tax, Euromoney, KPMG European Tax Handbook, Deloitte, The International Tax Handbook, Deloitte, Global Tax Handbook, Ernst and Young, Worldwide Corporate Tax Guide, various years
tiea	dummy variable taking the value of one for a country if the country signs a TIEA with Germany at some stage	OECD (http://eoi-tax.org) and German Ministry of Finance (www.bundesfinanzministerium.de)
tiea_yr	dummy taking the value of one if the country has signed a TIEA with Germany – starting in the year the treaty is signed	OECD (http://eoi-tax.org) and German Ministry of Finance (www.bundesfinanzministerium.de)

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