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# Shop till you drop those tax rates:

*Treaty shopping as a  
determinant for FDI stocks*

Sara Delgado



# Shop till you drop those tax rates: Treaty shopping as a determinant for FDI stocks

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Background Document with CPB Discussion Paper 290, 'Ranking the Stars: network analysis of bilateral tax treaties' - Maarten van 't Riet and Arjan Lejour

Note: the two regressions reported in the Discussion Paper are based on a slightly changed set of tax parameters, as for a number of countries local taxation had to be included in the rate of corporate income taxation. The results are therefore not completely identical to those reported in this background document. However, the discussions on the methodology, FDI data and robustness analyses remain the same.

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# 1 Introduction

This CPB Background Document supplements the CPB Discussion Paper ‘Ranking the Stars - network analysis of bilateral tax treaties’ (van 't Riet & Lejour, 2014). It analyses in more detail than the accompanying discussion paper to what extent FDI positions can be explained by treaty shopping behaviour. The issue is investigated by performing cross-sectional regressions, whereby standard models for inward and outward FDI are augmented with a betweenness centrality indicator, which reflects how attractive a country is as conduit for dividend flows. The document is structured as follows. Chapter 2 discusses and motivates the research methodology, while chapter 3 describes the data used in the analysis. In chapter 4, the baseline regression results are presented followed by a number of robustness checks. Finally, in chapter 5 we come to conclusions.

## 2 Methodology

In this section, the research methodology and the statistical procedures used to analyze the data will be discussed. The general aim of this study is to explain Foreign Direct Investment (FDI) stocks, whereby we specifically investigate whether treaty shopping behaviour can be identified as a significant determinant of these investments.

Treaty shopping refers to tax diversion practices whereby investments are channelled through an intermediate country to take advantage of treaty provisions not found between the host and the home country (Davies, 2004). The treaty shopping appeal of the countries in our sample is quantified by the concept of betweenness centrality, which is thoroughly discussed in the accompanying discussion paper (van 't Riet & Lejour, 2014). In essence the betweenness centrality indicates how attractive a country is as conduit for dividend flows.

If treaty shopping takes place in practice, this will affect FDI stocks. A share of the FDI stocks is strategically diverted by multinationals with the intention to enjoy tax benefits only offered in specific jurisdictions. As a consequence, FDI stocks only partially reflect genuine economic activity whereby value is added in a production process. Even though these components are not separately measured in the FDI-statistics, we can divide the inward FDI stocks into two components: (i) FDI for which the country is the final destination, which we will refer to as ‘genuine’ inward FDI and (ii) FDI for which the host country is merely an intermediate location on route to a final destination, which we refer to as diverted inward FDI. For the outward FDI stocks a similar distinction can be made, where ‘genuine’ outward FDI stocks refers to the FDI that originates from firms located in the parent country, while diverted FDI refers to investments originating from firms located in other jurisdictions, who merely use the country of interest as intermediate location.

Ideally, we would have cross-sectional data on diverted FDI stocks at our disposal, which we could use as the dependent variable. Unfortunately there is no ‘hard’ data on diverted FDI available. What we do have at our disposal are inward and outward FDI statistics that include FDI that runs through Special Purpose Entities (SPEs). These statistics give a good

indication of the total FDI, consisting of 'genuine' and diverted FDI. This relation can be represented by the following equations:

$$FDI_i^I = I_i + D_i$$

$$FDI_i^O = O_i + D_i$$

Where  $FDI_i^I$  and  $FDI_i^O$  stand for the total inward and outward FDI stocks respectively,  $I_i$  and  $O_i$  stand for the 'genuine' part of the inward and outward FDI and  $D_i$  represents diverted FDI<sup>1</sup>.  $D_i$  appears in both equations, because diverted FDI adds to the inward as well as the outward FDI stocks of the conduit country.

If multinationals are indeed shopping around in search for lower tax bills, they are most likely to divert their FDI stocks through countries that have a central position on the cheapest international tax routes. Van 't Riet and Lejour (2014) have estimated an indicator for betweenness centrality derived from network theory, mimicking these central positions. They have done this for 108 countries. The indicator is based on a network analysis that takes into account information on the CIT rates in the host and home country, double tax relief methods, standard withholding tax rates on dividends and the tax arrangement stipulated in bilateral tax treaties. We expect the betweenness centrality indicator to have a positive effect on both inward and outward FDI stocks.

We estimate the following two equations by means of cross sectional OLS regression:

$$\ln(FDI\_IN_i) = \alpha_0 + \alpha_1 \textit{Betweenness Centrality}_i + \gamma CI_i + \delta CD_i + \varepsilon_i$$

$$\ln(FDI\_OUT_i) = \beta_0 + \beta_1 \textit{Betweenness Centrality}_i + \gamma CO_i + \delta CD_i + \varepsilon_i$$

The dependent variables  $\ln(FDI\_IN_i)$  and  $\ln(FDI\_OUT_i)$  measure the aggregate inward and outward FDI stocks in logs for country  $i$  in 2011. We take the natural logarithms to correct for the wide distribution of the stocks and to enable us to interpret the coefficients as (semi-) elasticities. The coefficients of interest are  $\alpha_1$  and  $\beta_1$ , which reflect the extent to which the centrality within the tax network influences the total FDI inflow and outflow respectively.  $CI_i$  and  $CO_i$  are matrices containing additional controls for the part of the inward and outward FDI stock respectively, that consists of 'genuine' investment, while matrix  $CD_i$  contains controls for the diverted FDI. As the diversion of FDI impacts both the inward and the outward stocks of conduit countries, the  $CD_i$  matrix appears in both equations. Finally, the error term captures any other effects that influence the FDI stocks that are not included in the model. As we merely have cross-sectional data at our disposal, we are not able to correct

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<sup>1</sup> In the short term,  $D_i$  in the inward FDI stocks does not necessarily exactly equal the  $D_i$  in the outward FDI, because funds might be parked in traditional tax havens for a prolonged period of time. If this is the case,  $D_i$  in the inward FDI stocks is affected in one period, while  $D_i$  in the outward FDI stocks is affected in a later period. However in the long term the  $D_i$ 's in both equations are expected to level out.

for unobserved heterogeneity between countries by incorporating country specific fixed effects.

As mentioned by Van 't Riet and Lejour (2014) there are multiple centrality measures. All the indicators quantify how often a specific country appears on the optimal tax routes, but this can be specified in different ways. Whereas the strict centrality only considers the tax routes with the cheapest effective tax rates, the centrality with a range also considers tax routes that are slightly more expensive. The unweighted centrality attaches the same weights to all shortest routes, while the double GDP-weighted assigns more weight to the routes between countries with a high GDP. Often there are multiple optimal routes between a country pair available. The basic betweenness centrality is based on the share of shortest routes between each country pair on which a specific country is present, while the occurrence merely considers whether a country appears on at least one of the shortest paths between a country pair.

The preferred indicator for our analysis is the double GDP-weighted betweenness centrality with a range. We consider a small range to be appropriate as multinationals might prefer routes with slightly higher tax rates because of non-tax variables, such as the institutional environment in the conduit country. Furthermore, we prefer the double GDP weighted betweenness indicator over the unweighted variant, because the former takes into account the potential size of the stocks originating from or going towards different countries. Finally, the preference for the betweenness centrality over the occurrence is motivated by the fact that the latter does not take the multiplicity of shortest paths into account. The alternative centrality measures will be used to perform a number of robustness checks. The flows-variable, which indicates the hypothetical dividend flows including the double counting caused by the diversion of FDI, can also be considered as a relevant proxy for treaty shopping and will therefore also be used to test the robustness of our benchmark findings.

### **Control variables**

In explaining inward FDI stocks it is standard to include GDP as a proxy for market potential and the level of institutional quality. More recently the level of corporate income taxation (CIT) has also been recognized as a potentially relevant determinant for inward FDI stocks (De Mooij & Ederveen, 2008). Matrix  $CI_i$  therefore contains data on the natural logarithms of the GDP with a time lag (2008), the level of institutional quality and the CITs.

An alternative proxy that is often used for the market potential is the GDP per capita. Our preference however is GDP, because it combines the potential market size (=population) with their purchasing power (=GDP/capita). This is especially relevant because our database contains a number of island economies and some of them have small populations with relatively high average income levels. In these situations GDP per capita cannot be considered a suitable proxy for market potential, because despite of high purchasing power these jurisdictions are not likely to attract high volumes of FDI given their limited economic size. However there could be possible reverse causality with GDP, because FDI is generally considered to have a positive impact on GDP through spillovers. The idea is that the productivity of the domestic firms in host countries is boosted by the diffusion of innovative

technology and superior managerial and marketing skills brought into the country by the foreign investors. We address this potential endogeneity issue by using a lagged GDP value. This doesn't entirely eliminate the issue, but at least makes the reverse relation less likely. In the regressions pertaining to the outward FDI stocks we control for the  $\ln(\text{GDP})$  2008, which serves as a proxy for the level of economic development, and for institutional quality. These variables are contained in matrix  $CO_i$ . Again we consider GDP to be a more appropriate measure than the GDP/capita. The small islands economies in our sample with relatively high GDP/capita levels are likely to have limited capital stocks, which constrains their outward FDI potential. Using the GDP/capita as a proxy would thus give a distorted image of the potential for outward FDI.

Matrix  $CD_i$ , which is included in both the inward and outward FDI model, contains a dummy for traditional tax havens in addition to data on the standard withholding tax rates on royalties and interest. The latter are included as controls, because the betweenness centrality indicator only focuses on profit repatriation through the payment of dividends, while in practice profits can also be repatriated in the form of interest or royalties. Countries with low withholding tax rates on interest and royalties are thus also likely to be attractive as conduits. Because we do not have data on the reduced withholding tax rates negotiated in the numerous bilateral tax treaties at our disposal, we simply control for the standard tax rates on these alternative flows.

### 3 Data

In this section, we discuss the data used in our analysis. Special attention is paid to our dependent variables, the inward and outward FDI stocks, because they are available in multiple databases, in which different definitions are applied. We discuss some discrepancies encountered when comparing the different databases and come to conclusions about the database that is most suitable for our analysis. The other variables used in our analysis are discussed more briefly.

#### Data on FDI stocks

There are three major sources that provide data on FDI stocks: the IMF, UNCTAD and the OECD. To perform our analysis, empirical data on FDI stocks that include the investment that run through SPEs is required, as that data encompasses genuine as well as diverted FDI. The IMF explicitly requests reporting countries to include the FDI that runs through SPEs and the UNCTAD makes the same request, as stipulated in their 2009 training manual on statistics. The OECD database differs in this respect, as they request their 34 members to report FDI stocks excluding the investment running through special entities. This implies that the OECD is the least suitable database for our analysis. Further comparison of the databases surprisingly indicates that in most cases the figures reported by the IMF are higher than those reported by UNCTAD and in general the UNCTAD figures seem to have more similarities with the OECD data than with the data provided by the IMF. This suggests that the UNCTAD figures often actually exclude FDI through SPEs. We presume that this



discrepancy is caused by reporting countries that do not always follow the reporting instructions.

For deeper investigation into the in- or exclusion of SPE-investments, we focus on the Netherlands, Luxembourg and Belgium, as these countries are often alleged of being major conduit countries. For these countries we therefore expect FDI stocks including SPEs to be considerably higher than the figures excluding SPE-investments. Remarkably a comparison of the databases indicates that the figures reported by the UNCTAD for the Netherlands and Luxembourg are much lower than those reported by the IMF, while for Belgium this is the other way around (see table 1).

**Table 1 Inward and Outward FDI stocks 2011 according to different sources**

	Inward FDI Stock (US \$, Billions)			Outward FDI Stock (US \$, Billions)		
	IMF	UNCTAD	OECD	IMF	UNCTAD	OECD
NLD	3.568	585	570	4.393	979	960
LUX	2.278	177	97	2.583	165	126
BEL	415	993	994	430	1.003	1.005

The statistics for Belgium suggest that the IMF database contains some inconsistencies as well, because if the IMF data would indeed include FDI that is held through SPEs, their figures should always be equal to or exceed the figures reported by the other sources, but lower figures are technically impossible. Belgium is actually not the only country for which the statistics reported by the IMF, that supposedly include investments through SPEs, turned out to be lower than those contained in the OECD-database who claim to exclude SPEs. There are 33 countries for which OECD statistics are available<sup>2</sup> and for 24% of them the inward FDI stocks reported by the IMF are more than 5% lower than those reported by the OECD. For the outward FDI this is also the case for 24% of the countries.

Overall, the comparison of the various databases indicates that the quality of FDI statistics is disputable. This might make it harder for us to find significant results in our analysis. Nonetheless it seems as though for the most part the IMF data does include the diverted FDI that runs through SPEs. The CDIS IMF database is therefore deemed most suitable for our analysis.

The IMF database provides FDI statistics up until 2012, but 2011 is the most recent year for which data on all reporting countries is available. In 2011 there were 88 countries who reported their inward FDI stocks and 64 countries reporting their outward FDI stocks, categorized according to 248 countries of origin and destination respectively. The reporting countries are the more developed countries and represent more than 90 percent of the worldwide FDI stocks. Given that the alleged traditional tax havens play an important role in our analysis, it is very relevant for us to include them in our sample. Even though they are not amongst the reporting countries we are able to approximate the outward stocks of non-reporting countries, using data on the inward stocks of the countries that do report to the

<sup>2</sup> The 34th OECD-member Germany was excluded, because the IMF does not provide data for that country for 2011.

IMF. In a similar fashion, data on the inward investments of the non-reporting countries are approximated. These approximated statistics are referred to as mirrored data. For the reporting countries we have both the original and the mirrored data at our disposal, which allows us to make an assessment of the quality of the mirrored data. For a number of countries the two statistics turned out to differ substantially. Mirroring the data therefore introduces some additional measurement error into our analysis. For the sake of consistency we use the mirrored data for the non-reporting as well as the reporting countries. As long as the measurement error is random, it will not introduce any troublesome bias into our estimates.

#### Other data and their sources

For the sake of consistency we use the mirrored data for the non-reporting as well as the reporting countries. As long as the measurement error is random, it will not introduce any troublesome bias into our estimates.

Data on GDP levels in 2008 was obtained from the Central Intelligence Agency (CIA). The most common source for GDP figures is the World Bank, but they only provides GDP data for countries with at least 30.000 inhabitants and a substantial part of the traditional tax havens that are relevant for our analysis do not meet this threshold. We opt for the data provided by the CIA, since their database also reports GDP levels for jurisdictions with a small number of inhabitants. To circumvent endogeneity issues GDP figures with a substantial lag (in respect to 2011) are required. Although the CIA provides GDP figures going back as far as 2000, 2008 is the first year for which a nearly complete dataset referring to the same year is available<sup>3</sup>.

As a proxy for institutional quality we use the World Governance Indicators by Kaufmann, Kraay and Mastruzzi for 2011. They distinguish 6 dimensions of governance: Voice and accountability (freedom in selecting government, freedom of expression and association), political stability and absence of violence, government effectiveness (quality of public and civil services), regulatory quality (government's ability to implement sound policies), rule of law (enforcement of property rights) and control of corruption. We expect all these dimensions to have an impact on incoming and outgoing FDI, but given the high correlation between the variables, it is not possible to include them separately in the regression as it would not be possible to identify the separate effects of the indicators. Furthermore, given our limited sample size we prefer to keep the model as parsimonious as possible. We therefore use the average of the six dimensions as a proxy for the general level of institutional quality<sup>4</sup>.

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<sup>3</sup> By default, we use GDP data for 2008, but for 7 of the smaller jurisdictions GDP figures for 2008 were not available. In these cases the GDP levels in the most recent year for which data was available was used instead.

<sup>4</sup> The World Governance Indicators were not available for Guernsey, Isle of Man and Bermuda. In these cases we used the indicators for closely related jurisdiction instead. Guernsey and Isle of Man were assigned the indicators pertaining to Jersey, while for Bermuda we used the indicators for the British Virgin Islands.

To keep the jurisdiction that are generally considered as traditional tax havens apart, we created a dummy variable based on the tax haven list compiled by Gravelle (2013). This list combines a number of other formal lists of tax havens, amongst which a list set up by the OECD.

**Table 2** Overview variables and their sources

Variable	Source
Mirrored Inward FDI stocks ( 2011)	IMF CDIS
Mirrored Outward FDI stocks (2011)	IMF CDIS
Betweenness Centrality measures (2013):	Van 't Riet & Lejour ( 2014)
-Double GDP weighted with range	
-Unweighted with range	
-Double GDP weighted strict	
-Flows	
CIT (2013)	Van 't Riet & Lejour ( 2014)/EY (2013)
Market potential = GDP 2008	CIA
Institutional quality = Average of 6 World Governance Indicators (WGI)	Kaufmann, Kraay and Massimo - World Bank (2013)
Traditional tax haven dummy	Created based on Gravelle (2013)

## 4 Results

This section presents the results of our analyses. We start by briefly discussing the descriptive statistics for the most relevant variables in our regressions. Next we discuss the results from the models in which the double GDP weighted betweenness centrality with a range is the main variable of interest. Finally, we present a number of robustness checks.

**Table 3** Descriptive Statistics

Variables	Mean	Median	Std. Dev	Minimum	Maximum
ln(Inward FDI stock)	10.480	10.747	2.195	4.644	14.896
ln(Outward FDI stock)	9.740	9.505	2.633	2.021	14.955
Betweenness Centrality (weighted with range)	0.0108	0.0034	0.0168	0	0.0957
Betweenness Centrality (unweighted with range)	0.0125	0.0050	0.0187	0	0.0951
Betweenness Centrality (weighted strict)	0.0057	0.0006	0.0145	0	0.1078
Occurrence (weighted with range)	0.1919	0.1277	0.1928	0	0.5826
Flow	2.01	1.01	2.86	0.0021	17.7507
CIT	22.56	24.75	9.88	0	50
ln(GDP 2008)	11.635	11.80	2.065	6.750	16.505
Institutional quality	0.472	0.615	0.860	-1.367	1.864
Tax haven dummy	0.24	0	0.43	0	1
Standard withholding tax rate - Royalties	14.02	15	10.07	0	34
Standard withholding tax rate - Interest	12.83	15	10.03	0	35

### Descriptive statistics

Table 3 provides descriptive statistics for the main variables in our sample consisting of 108 countries. Our preferred proxy for treaty shopping, the weighted betweenness centrality with a range, ranges between 0 and 0.0957 and has an average of 0.0108. The range, mean and the standard deviation of the unweighted and strict centrality measures are very similar, but the distributional pattern of the occurrence and the flow-variable differ substantially. The average CIT level is 22.56%, but it varies drastically from country to country with a

minimum of 0% and a maximum of 50%. Furthermore we see that a quarter of the countries within our sample are considered to be traditional tax havens.

### Baseline regression results

Next, we present the quantitative effects of the betweenness centrality on the aggregate inward and outward FDI stocks (see table 4). We start with the results concerning the inward FDI stocks (column 1). The effects of the standard withholding tax rates on royalties and interest turn out to be insignificant. This finding is not very surprising, because in reality multinationals often do not face these standard rates, but rates that are substantially reduced by all the bilateral tax treaties that are in place. As these standard rates are insignificant, they can harmlessly be removed from the model, resulting in our baseline specification (column 2).

As expected market size has a significant positive impact on the inward investments. This is a standard result in the literature, see also Brainard (1997), Shatz and Venables (2000) and Markusen and Maskus (2001). The larger the market size, the larger the inward FDI stocks and the higher the level of economic development, the higher the outward FDI stocks. Institutional quality, measured by the World Governance Indicators of Kaufman et al. (2011), also positively influences both inward and outward FDI stocks (see Globerman and Shapiro, 2002) for a similar result). Holding all other variables constant, an increase in the market potential of one percent is associated with 0.86% higher inward investment stocks, while an increase in the level of institutional quality with 0.1 unit on average attracts 7.5% more FDI. In line with our expectations the effect of the CIT rate is negative; a decrease in the CIT rate with 1 percentage-point is associated with a 0.04% increase in inward investment stocks. In addition we see that the traditional tax havens display significant higher levels of inward FDI stocks compared to the other countries within our sample. Holding all other variables constant, the inward FDI stocks for traditional tax havens are 134% higher.

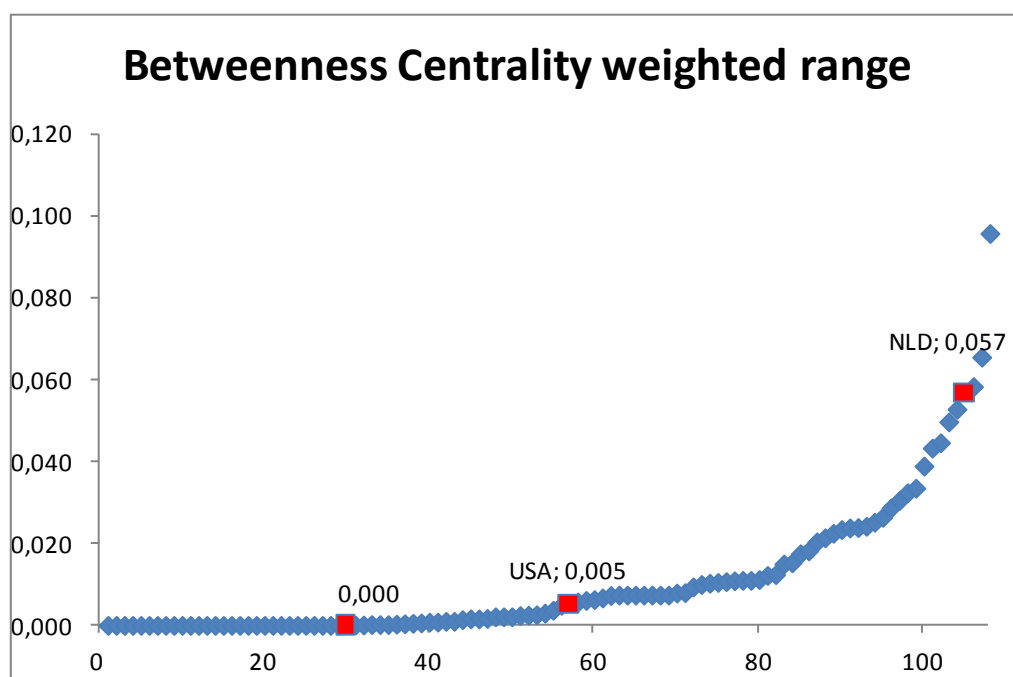
**Table 4** Effect Betweenness Centrality on Inward and Outward FDI stocks

Variables (exp. sign)	Inward FDI Stocks		Outward FDI Stocks	
	1	2	3	4
Betweenness centrality (+)	17.37* (8.90)	17.32** (8.67)	16.83* (9.41)	18.43* (9.32)
Controls Real FDI:				
GDPt-3	0.86*** (0.08)	0.86*** (0.08)	0.95*** (0.09)	0.90*** (0.08)
Institutional quality (+)	0.74*** (0.18)	0.75*** (0.18)	1.47*** (0.19)	1.49*** (0.19)
CIT (-)	-0.04*** (0.01)	-0.04*** (0.01)		
Controls Diverted FDI:				
Tax haven dummy (+)	1.34*** (0.40)	1.35*** (0.39)	2.51*** (0.42)	2.64*** (0.41)
Royalties - standard tax rate (-)	0.003 (0.02)		-0.005 (0.02)	
Interest - standard tax rate (-)	-0.008 (0.02)		-0.03 (0.02)	
Adj. R2	0.63	0.64	0.71	0.71

Moving to our main variable of interest we find that, *ceteris paribus*, the betweenness centrality has a positive influence on inward FDI stocks, which is significant with  $\alpha=0.05$ . The betweenness centrality has a coefficient of 17.32, indicating that an increase in the betweenness centrality with 1 percentage point increases the inward FDI stocks with about 17%.

For improved interpretation of the coefficient, we look at the actual distribution of the betweenness centrality indicator, which is illustrated in figure 1. Around 28% of the countries within our sample have a betweenness centrality of zero. This is for example the case for Mexico, Jamaica, Jordan and Pakistan.

**Figure 1** Betweenness Centrality weighted with range



If these countries, that currently are totally not attractive as conduits, would be able to alter their tax system in such a way that their betweenness centrality increases to the same level as the USA, this could potentially increase their inward FDI stocks with 8.7% ( $=1732\% \cdot 0.005$ ). In case they would succeed in increasing their betweenness centrality to the level of a country such as the Netherlands, which is amongst one of the highest ranking countries, the total inward FDI stocks could almost double ( $1732\% \cdot 0.0567 = 98.2\%$ ).

Shifting our focus to the outward FDI stocks (column 3), we again see that the standard rates on royalties and interest are not significant. In our baseline specification they are therefore excluded (column 4). The level of economic development and the institutional quality both have a significant positive impact on the outward investments. An increase in the level of economic development by 1 percent is associated with 0.90% higher outward investment stocks, while an increase in the level of institutional quality with 0.1 unit increases outward FDI with 14.9%. As expected the traditional tax havens have significant higher levels of outward FDI vis-à-vis the non-tax havens.

Our main variable of interest, the centrality measure, has a positive impact on outward FDI stocks, but here it is only significant at the ninety percent significance level. An increase in the betweenness centrality with 1 percentage point increases the outward FDI stocks with about 18%. An increase in the betweenness centrality thus has a similar sized effect on the inward and outward FDI stocks.

The betweenness centrality thus has a positive impact on both inward and outward FDI stocks. This can be interpreted as indirect evidence that treaty shopping occurs in practice and it is affecting FDI stocks.

#### **Robustness checks: using alternative centrality indicators**

In our baseline specification the double GDP weighted betweenness centrality with a range was used as proxy for treaty shopping. However, we also have an unweighted and a strict variant of the indicator at our disposal. Furthermore, the occurrence and the flow-variable can also be considered suitable indicators for the conduit potential offered by a country. In this section we test whether the results obtained in the benchmark specification are robust to alternative specifications of the centrality variable.

The unweighted centrality indicator (table 5, column 1 and 5), the occurrence (column 3 and 7) and the flows-variable (column 4 and 8) turned out to have a significant positive effect on the inward as well as the outward FDI stocks, *ceteris paribus*. The results obtained in the benchmark regression are thus confirmed.

To assess whether the size of the effects of the different centrality indicators are similar, we cannot directly compare the coefficients obtained from the OLS-regressions. For a comparison we multiply these by the standard deviation of the corresponding centrality measure (see table 3). We find that the effects of a standard deviation change in the alternative indicators are within a similar range. The standardized coefficients of weighted betweenness centrality within a range are 0.29 and 0.31 for the regressions on inward and outward FDI stocks, respectively (based on the coefficients in table 4). These coefficients are somewhat lower than those of the alternative indicators with statistically significant coefficients in the regressions.

With regard to the strict betweenness centrality indicator our findings are less robust. For the inward FDI stocks the strict indicator still has a significant positive impact, but it is merely significant at the 90% statistical significance level (column 2). For the outward FDI the strict variant turns out not to be significant (column 6). This inability to find a significant effect can probably be attributed to the fact that multinationals do not necessarily opt for the strictly shortest routes, but in practice are just as likely to use routes that offer an overall effective tax rate that lies slightly above the one obtained on the strictly shortest route. This might especially be the case if some of the countries on the strictly shortest route do not offer a favourable institutional environment.

**Table 5** Explaining inward FDI stocks with alternative centrality indicators

Variables (exp. sign)	Inward FDI stocks			Outward FDI stocks				
	1	2	3	4	5	6	7	8
	Between- ness Centrality Unweighted within range	Between- ness Centrality Weighted Strict	Occurrence Weighted Range	FLAWS	Between- ness Centrality Unweighted within range	Between- ness Centrality Weighted Strict	Occurrence Weighted Range	FLAWS
Centrality indicator (+)	20.01*** (7.66)	16.69* (9.65)	2.27*** (0.81)	0.12* (0.06)	21.49*** (8.18)	12.66 (10.48)	2.64*** (0.83)	0.17*** (0.06)
Standardized coefficients	0.37	0.24	0.44	0.34	0.40	0.18	0.51	0.49
ln(GDPt-3) (+)	0.85*** (0.08)	0.86*** (0.08)	0.86*** (0.08)	0.77*** (0.09)	0.89*** (0.08)	0.91*** (0.08)	0.91*** (0.08)	0.77*** (0.10)
Institutional quality (+)	0.73*** (0.17)	0.80*** (0.17)	0.64*** (0.18)	0.79*** (0.17)	1.46*** (0.18)	1.58*** (0.18)	1.32*** (0.19)	1.49*** (0.18)
CIT (-)	-0.04*** (0.01)	-0.04*** (0.01)	-0.03** (0.01)	-0.04*** (0.01)	x	x	x	x
Tax haven dummy (+)	1.27*** (0.38)	1.33*** (0.39)	1.44*** (0.38)	1.23*** (0.39)	2.53*** (0.41)	2.63*** (0.42)	2.71*** (0.40)	2.46*** (0.41)
Constant	0.56 (0.95)	0.67 (0.98)	0.07 (0.96)	1.55 (1.12)	-2.21** (1.01)	-2.24** (1.04)	-2.64*** (0.99)	-0.81 (1.16)
Adj. R2	0.65	0.63	0.65	0.64	0.71	0.70	0.72	0.71

## 5 Conclusions

In this paper, we investigate to what extent FDI positions can be explained by multinationals displaying treaty shopping behaviour, whereby betweenness centrality indicators are used to quantify the attractiveness of a country as conduit for dividend flows.

We find that the betweenness centrality has a significant positive influence on the inward as well as the outward FDI stocks. An increase in the betweenness centrality with 1 percentage point raises both the inward and outward FDI stocks with more than 17%. This can be interpreted as indirect evidence that treaty shopping is taking place in practice.

The effect of the betweenness centrality on FDI stocks is robust to the use of most alternative centrality indicators, but the use of the centrality indicator that merely considers the strictly shortest paths, rather than allowing for a small range, results in insignificant effects. This inability to find a significant effect can probably be attributed to the fact that in practice multinationals are indifferent between the strictly shortest routes and the routes that offer an overall effective tax rate that lies slightly above the one obtained on the strictly shortest route.

## 6 Literature

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P.O. Box 80510 | 2508 GM The Hague

T +31 70 3383 380

[info@cpb.nl](mailto:info@cpb.nl) | [www.cpb.nl](http://www.cpb.nl)

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