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Differences in measuring FDI: do they matter for our economic conclusions?[1]

Konstantin M. Wacker,

University of Groningen

[1] This presentation was prepared for the meeting. The views expressed are those of the author and do not necessarily reflect the views of the BIS, IFC, BoP, ECB or the central banks and other institutions represented at the meeting.

Differences in measuring FDI: do they matter for our economic conclusions?

Konstantin M. Wacker, University of Groningen, k.m.wacker@rug.nl

Abstract

In this paper, I use two FDI data sets on ultimate ownership and compare it to two traditional FDI data sets based on the direct/immediate ownership principle. I find those data sets to be highly correlated and leading to essentially identical economic conclusions when applied to a gravity model for FDI. While there are substantial country(-pair) peculiarities in certain cases, I argue that they have an economic interpretation and that future research should explore those differences across data sets rather than dismissing the quality of traditional FDI data.

Keywords: FDI, measurement, ownership data, gravity model

JEL classification: F2, E01

Contents

1. Introduction

Foreign direct investment (FDI) accounts for about 29% of global cross-border liabilities and constitutes more than half of foreign financing in more than a third of the world's countries. While FDI flows as a share of GDP more than quadrupled since the 1980s, the number of academic articles on the subject even increased at a faster pace, with a bulk of empirical studies examining determinants of FDI or its effects. [1]

To what extent FDI data can be used as a proxy for multinational production has been heavily debated in the literature. Lipsey (2007, 2010) raises serious concerns about the use of FDI data because of the problem how to value assets of multinational firms, the intangible nature of most production generated by multinational corporations and the fact that even for the production of tangible products, important parts of the assets that enter production are intangible, especially financial assets. Technical measurement problems are also discussed, inter alia, in IMF (2004) and Linsi and Mügge (2019). Studies by Beugelsdijk et al. (2010) and Wacker (2016) corroborate those measurement problems but also stress that key data discrepancies are not due to 'poor measurement' but have an economically meaningful interpretation such as higher labor productivity or a capital-bias of multinational firms.

A number of recent contributions have furthered data concerns about FDI (e.g. Blanchard and Alcalin, 2016; Pastoris and Schmitz, 2019). Damgaard et al. (2019) claim that "phantom investment" with no substance and no real links to the local economy may account for almost 40 percent of global FDI. A common concern in these contributions is the round-tipping of FDI for pure tax evasion or financial reasons and the associated fact that a direct foreign owner needs not be identical to the ultimate owner.

Do we have to dismiss the bulk of empirical studies on FDI determinants and the associated economic insights because of those data problems? The increasing availability of bilateral direct and ultimate FDI data availability allows me to empirically address this question with the clear economic answer "No, but…"

In the following analysis, I use four bilateral FDI stock datasets for the year 2017 from OECD, the IMF CDIS, and UNCTAD (Casella, 2019), two of which record direct ownership relations while the other two record or estimate ultimate ownership status. I find that those datasets are highly correlated – with no correlation coefficient between all dataset pairs lower than 80%. I then apply a gravity model for FDI as motivated by Kleinert and Toubal (2010) and find that the estimated determinants of FDI are very similar across data sets – with no qualitative differences and only modest differences in magnitudes.

Because average statistical relationships can mask country(-pair) peculiarities, I then look at such idiosyncrasies and outliers and show them to be where one would expect. For example, Luxemburg and the Netherlands are much less important as an ultimate investor than the direct investor data suggest. This is consistent with the fact that a relevant part of FDI is channelled through these economies. Differences

[1] Sources: Wacker (2013), Lane and Milesi-Ferretti (2017), Harms and Wacker (2019). Blonigen (2005) provides an early survey on FDI determinants. For more recent studies, see the references in Schneider and Wacker (2020). Several influential studies on the determinants of multinational production have used affiliate sale data but often used FDI data at least in part of their analysis.

between ultimate vs. direct investor relationships are thus not necessarily a sign of 'poor data quality'. Rather, systematic analysis of such data discrepancies can potentially be helpful to understand firms' financial and tax considerations in maximizing global corporate profits and to design according policies.

The remainder of this article is organized as follows: I first describe the data sources in section 2. Section 3 looks at descriptive correlation patterns across data sets. Section 4 applies the gravity estimation, compares results across data sets, and takes a closer look at residuals and outliers of those estimation. Section 5 concludes.

2. Data sources

This analysis compares four different data sets of bilateral FDI stocks: OECD data on direct/immediate and ultimate ownership, the 'Coordinated Direct Investment Statistics' (CDIS) on direct/immediate ownership prepared by the International Monetary Fund (IMF), and a novel UNCTAD data set on estimated ultimate FDI ownership prepared by Casella (2019). All data are for 2017 because this is the only year available from Casella (2019).

2.1 OECD data

The Organisation for Economic Co-operation and Development (OECD) provides inward FDI stocks by *direct/immediate and ultimate investing country*, based on statistics provided by 36 OECD member countries on the basis of the 4th edition of the 'Benchmark definition of FDI' (BMD4). An advantage of this data is the consistent data source for direct and ultimate FDI. Coverage of the data in terms of countries is limited, however.

2.2 IMF CDIS

The IMF's Coordinated Direct Investment Statistics' uses consistent definitions and best practices in collecting FDI stock data. CDIS data reporting templates have built-in validation tools for national compilers before they submit FDI data to the IMF. The IMF Statistics Department then uses 'mirror data' of reported FDI partners to check consistency of the bilateral data and reaches out to national compilers in case of large bilateral asymmetries in data reported by source and host country (see IMF, 2015, ch: 6, for details). The data are for *direct/immediate bilateral ownership* and thus do not trace back the ultimate investor.

Following standard convention, I focus on using the inward position of FDI, which is usually more reliable. After dropping all values that are marked as "confidential", the CDIS allows to fill missing values with the 'derived' inward position from the 'mirror data'.

2.3 Ultimate ownership estimates by Casella (2019)

To trace ultimate owners of bilateral FDI stocks, Casella (2019) has developed a probabilistic approach, based on absorbing Markov chains. This approach assigns a certain probability to each bilateral FDI stock either being 'ultimate' (i.e. no further

direct investor than the one reported) or 'transient' (investing entity has a further direct investor). The underlying Markov chain converges to a final distribution of absorbing states, which serves as an estimate for ultimate ownership relations.

The data show the estimated percentage of FDI in a recipient country that is held by each ultimate investor. Those percentages are hence multiplied with the FDI inward stock of each country to obtain an estimate of the bilateral ultimate FDI positions.

2.4 Other data

For estimating the gravity model in section 4, I additionally use GDP data for investing and recipient economy, taken from United Nations (logarithm of current 2017 GDP in USD), the (logarithm of the population-weighted) distance between investing and recipient country, taken from the CEPII GeoDist database, relative skill endowments which are calculated as the logarithm of the ratio between the investor and recipient human capital index, taken from the Penn World Tables 9.1, and corporate tax rates, taken from KPMG. Further details are provided in Schneider and Wacker (2020).

2.5 Summary statistics and coverage

Table 1 presents summary statistics of the four FDI data sets, all of which are measured in current million US dollars. Given that the OECD data is limited on data received by their member countries, coverage in terms of observations is more limited. Since OECD members are usually high-income economies with respectable economic size, it is not surprising that the mean of FDI stocks in those countries is higher than for the IMF CDIS and UNCTAD samples, which include many developing and low-income economies. Because parent companies can have liabilities with their affiliates, it is possible and not uncommon to have negative stock observations, especially in bilateral data. This is not the case for the UNCTAD data because it applies the bilateral ultimate owner probabilities (which are bounded at 0) to overall inward stocks, which do not display any negative values.

I will focus on comparing the two OECD data sets on the one hand side and on comparing the CDIS to the UNCTAD data on the other hand. This is informative for two reasons. First, one would expect that comparing the OECD data ensures a minimum data standard and consistency across data sets. Differences between those data sets could thus be interpreted as mainly due to differences between direct and ultimate ownership. Second, the CDIS and UNCTAD data cover a much broader range of countries and are also based on very different data sets. While CDIS data are *observed bilateral* FDI stocks, the constructed UNCTAD data set is an *estimate* of bilateral ultimate ownership based on stochastic methods, multiplied with *overall* inward stock of FDI. Discrepancies between both data sets are hence expected to be much more driven by different accounting standards and potentially also measurement error, given that lower-income countries in those samples usually have lower statistical capacity.

To understand the joint coverage of those FDI data sets, Table 2 presents the number of overlapping observations. The OECD data sets offer 2,587 overlapping observations, while CDIS and UNCTAD contain 13,647 overlapping country pairs. This clearly emphasizes that sample coverage is very different.

Summary statistics of FDI data sets (in mio. USD)

Table 1

Data set	Observations	Mean	Std.Deviation	Min	Max
OECD direct	6,207	4,152	35,462	-39,602	1,099,297
OECD ultimate	2,763	3,051	25,465	-1,580	614,865
IMF CDIS	25,417	1,556	20,051	-39,601	1,242,441
UNCTAD ultimate	23,544	1,316	17,952	0	985,444

Sources: own calculations based on data from OECD, IMF, and UNCTAD

Coverage of bilateral FDI data sets: number of observations

Table 2

Data set	OECD direct	OECD ultimate	IMF CDIS	UNCTAD ultimate
OECD direct	6,207	2,587	4,997	4,833
OECD ultimate		2,763	2,294	2,146
IMF CDIS			25,417	13,647
UNCTAD ultimate				23,544

Sources: own calculations based on data from OECD, IMF, and UNCTAD

3. Descriptive relations between FDI data sets

I start by looking at correlation coefficients across pairs of data sets, which are presented in Table 3. When looking at the OECD data sets of direct vs. ultimate ownership, the correlation coefficient equals 83%. I leave it to the reader to judge whether this is a high or low correlation, but it will be difficult to argue that both data sets measure completely different economic concepts. The correlation between the direct CDIS ownership data and the ultimate UNCTAD data is even higher, at 85%, even though both use different data and ownership concepts. The lowest pairwise correlation can be found between OECD's ultimate investment data and the direct investment data of CDIS, but this correlation coefficient still equals 80%.

Correlation coefficients between bilateral FDI data sets

Table 3

Data set	OECD direct	OECD ultimate	IMF CDIS	UNCTAD ultimate
OECD direct	1.00	0.83	0.99	0.87
OECD ultimate		1.00	0.80	0.93
IMF CDIS			1.00	0.85
UNCTAD ultimate				1.00

Sources: own calculations based on data from OECD, IMF, and UNCTAD

Such overall correlations can mask certain peculiarities. Figure 1 hence provides a scatter plot of the two OECD data sets. Observations on the upper left of the 45-degree line exhibit higher direct bilateral FDI stocks than their ultimate ownership relation would suggest. Not surprisingly, observations in this area where direct ownership deviates most from ultimate ownership include bilateral FDI positions that are booked as originating from tax-havens such as Luxemburg and the Netherlands in the direct FDI statistics but where the ultimate ownership of those countries is considerably smaller. In other words, this reflects that a considerable amount of FDI is channelled through those European tax havens. On the other end of the Figure 1 we see that the stock of FDI in Switzerland that is ultimately held by US investors is much larger than the bilateral direct FDI stock suggests. This suggests that a lot of US FDI in Switzerland is channelled via other countries and/or could also reflect that affiliates of US parent companies hold significant assets, probably of intangible nature, in Switzerland.

Figure 1: direct vs. ultimate bilateral FDI stocks (OECD data)

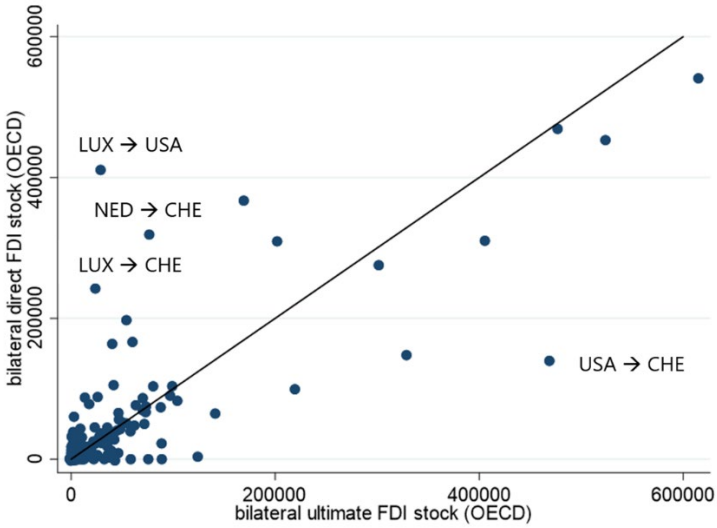
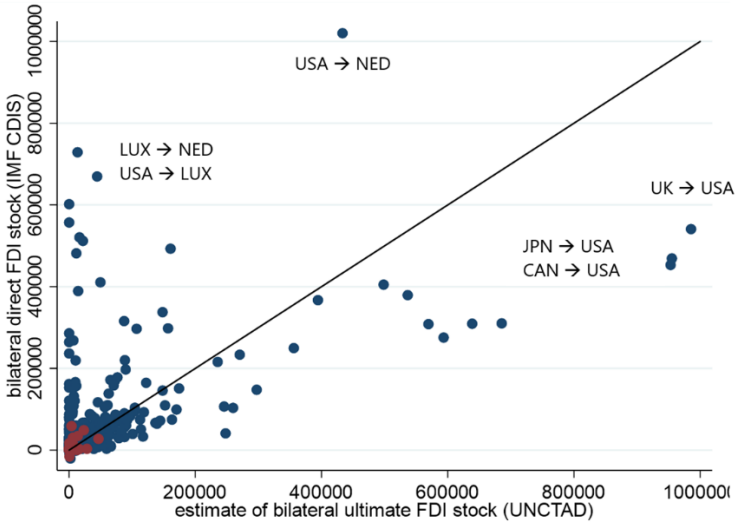


Figure 2 repeats this exercise for the IMF CDIS stock of direct vs. the UNCTAD stock of ultimate ownership relationships. Among relationships where the direct CDIS data suggests much higher bilateral FDI positions than UNCTAD's ultimate ownership data suggest, we find US FDI in Luxemburg and Netherlands and FDI from Luxemburg in the Netherlands. The latter is not too surprising as it possibly reflects multinationals' channelling holding structures through various tax havens. Maybe more surprisingly, the discrepancy for US FDI suggests that a considerable part of FDI into the tax-havens Luxemburg and Netherlands gets channelled through the US. One reason to be explored in future research may be favourable financing conditions or accounting standards from multinationals' corporate perspective in the US. On the other end of Figure 2 we observe that FDI from key US trading partners, UK, Japan, and Canada, into the US gets channelled via other countries.

Figure 2: direct CDIS vs. ultimate UNCTAD bilateral FDI stocks



Note: red dots indicate derived FDI positions from CDIS mirror data.

4. A gravity model for various FDI data sets

Do the reported differences in bilateral FDI data sets lead to different conclusions about the key determinants of global FDI? In other words, how susceptible are econometric models of FDI determinants to different data sets? To explore this issue, I apply a standard gravity model for bilateral FDI positions on the four data sets. This model is motivated by 'real', as opposed to financial, motives of multinational firms. In other words, it captures the economic rationale of profit-maximizing firms to avoid the costs of exporting (horizontal, market-seeking motives) and explore factor price differences (vertical motives).

4.1 Model setup

Kleinert and Toubal (2010) have shown that horizontal and vertical motives in FDI lead to a standard gravity representation in the form:

$$FDI\ stock_{sh} = b_1 lnGDP_s + b_2 ln\ GDP_h + b_3 \ln(D)_{sh} + b_4 RSkE_{sht} + b_5 \ln(GDP_s + GDP_h) + u_{sh},$$

where subscripts *s* and *h* indicate source (investor) and host (recipient), respectively, *D* is distance and *RSkE* is a measure of relative skill endowment (as described in section 2.4). The derivation of Kleinert and Toubal (2010) is appealing because parameter hypotheses can be used to discriminate between vertical and horizontal FDI motives. For example, the vertical model suggests $b_4 > 0$ and $b_5 > 0$, whereas those parameters should be 0 in the horizontal model.[2]

Following the standard in the literature (Bénassay-Quéré et al., 2007; Kleinert and Toubal, 2010; Demi and Hu, 2016), this model is estimated using PPML.[3] Accordingly, negative observations are dropped. The OECD data set is limited to bilateral observations where both, direct and ultimate FDI data exist, and similarly I restrict the CDIS and UNCTAD sample to observations where data from the respective other source is available. This ensures that differences in parameter estimates are not driven by sample composition effects.

4.2 Estimation results

Table 4 reports the results for the gravity estimation using the different FDI data sets. Qualitatively, estimates from all data sets are consistent with theory.[4] The positive coefficients of recipient GDP and the negative coefficients for distance are

[2] Strictly speaking, the model of Kleinert and Toubal (2010) is formulated for affiliate sales. The model and hypotheses can be extended to FDI stocks, however, as long as affiliate sales are a sufficiently simple function of FDI stocks.

[3] The inclusion of investor and recipient fixed effects was not possible because the maximum likelihood algorithm would not converge with those fixed effects. If anything, the omission of those fixed effects fosters the key message of this article because fixed effects would remove measurement issues particular to individual investing and recipient economies.

[4] Remember that the goal of this exercise is not causal identification of structural gravity parameters but to demonstrate susceptibility of estimates with respect to different data sets.

consistent with both, vertical and horizontal motives in FDI. The positive coefficient for investor GDP is consistent with a horizontal model of FDI, while the vertical model would suggest a unity (or positive) coefficient on relative skill endowment and a positive effect for the sum of GDPs, which can be found in all estimates (although the latter is not statistically different from 0 in all estimates).

With respect to quantitative magnitudes, there are some differences across data sets, e.g. the higher investor and recipient GDP elasticities for the ultimate ownership data of UNCTAD when compared to the IMF CDIS data or the elasticity for the sum of GDPs being double as large in the OECD's ultimate ownership data when compared to the direct ownership data. One may disagree how relevant those differences are. But it is hard to argue that results from using ultimate investor statistics differ from traditional direct investor statistics to a degree that completely turns around our economic understanding of the key drivers for bilateral FDI positions. Finally, it is worth highlighting that the size of the estimated coefficient for recipient GDP shows no clear pattern when moving from direct to ultimate ownership data: it decreases for the OECD data but increases when moving from the CDIS to the UNCTAD data. This casts doubt on the finding of Damgaard et al. (2019) that this coefficient increases with 'real' (non-phantom) FDI data and their claim that standard FDI statistics systematically underestimate the real investment links between large economies because much of the investment being channeled through small offshore financial centers. However, a definite statement on this elasticity is difficult, as recipient GDP is also reflected in the sum of GDPs.

4.3 Is there a pattern in the "outliers" and what can we learn from it?

The econometric gravity model allows us to look at predicted FDI stocks and compare them to the actual data. Figure 3 thus plots this residual from the CDIS data set (column 3 in Table 4) against the FDI stock the model would predict. A handful of actual observations are much higher than the estimated gravity model would suggest. Again, they include investments into tax havens, such as Luxemburg and the Netherlands, often for FDI directly coming from the US. Anther outlier is FDI from Hong Kong, China into the Peoples' Republic of China, a well-known case of FDI round-tipping.

Finally, we can also compare residuals from gravity models for direct ownership to those of ultimate ownership, which are depicted in Figures 4 (for OECD data) and 5 (for CDIS and UNCTAD data).[5] The figures suggest that, for example, actual bilateral FDI stocks of Luxembourg in Switzerland and the US overshoot the model prediction much more for direct FDI data than for ultimate data. It is reassuring that this is consistent for the OECD data as well as when looking at the direct CDIS vs. the ultimate UNCTAD data (Figure 5). On the other hand, actual bilateral FDI stocks of Ireland in the US and of the US in Switzerland surpass model prediction much more for ultimate ownership than for direct ownership. The latter is consistent with the earlier descriptive evidence of US FDI in Switzerland potentially being channeled through various countries.

[5] Note that the definition of residual is different to the definition in Figure 3: it is a deviance residual in Figures 4 and 5 and the prefix is inverse.

Gravity estimation results

Table 4

VARIABLES	OECD direct	OECD ultimate	IMF CDIS	UNCTAD
ln(GDP investor)	0.307**	0.438***	0.491***	0.806***
	(0.137)	(0.0979)	(0.0841)	(0.0714)
ln(GDP recipient)	0.841***	0.546***	0.457***	0.779***
	(0.237)	(0.211)	(0.0858)	(0.0805)
ln(distance)	-0.668***	-0.478***	-1.049***	-0.716***
	(0.140)	(0.146)	(0.0814)	(0.0678)
Relative skill	2.804***	2.677***	0.684***	0.482*
endowment	(0.634)	(0.520)	(0.206)	(0.255)
ln(sum of GDPs)	0.322	0.717***	0.390***	0.217
	(0.334)	(0.266)	(0.151)	(0.132)
Constant	-26.79***	-35.17***	-19.55***	-35.11***
	(5.372)	(5.354)	(2.573)	(2.521)
Observations	1,324	1,324	8,077	8,077
R-squared	0.158	0.180	0.168	0.288

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Sources: estimation based on data from OECD, IMF, and UNCTAD

Figure 3: Gravity residual vs. predicted value

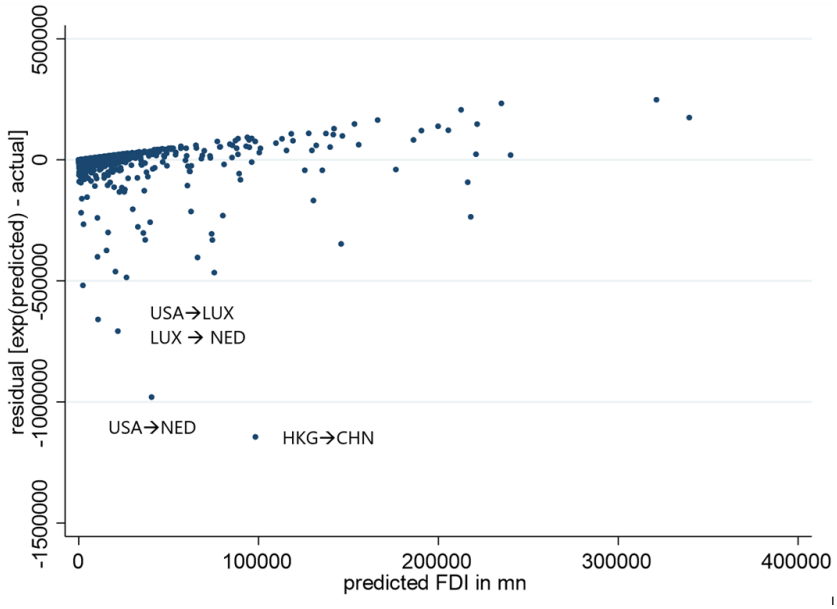


Figure 4: Deviance residuals: direct vs. ultimate ownership (OECD)

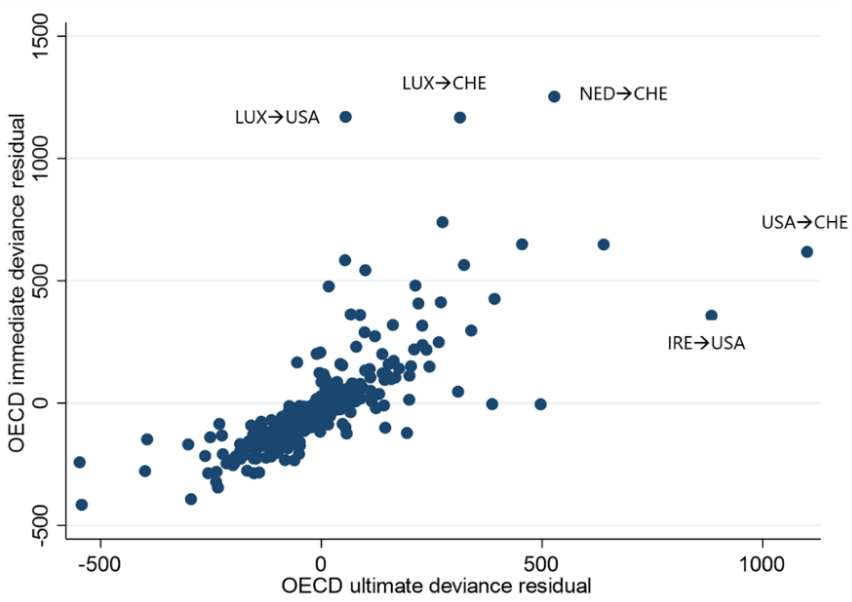
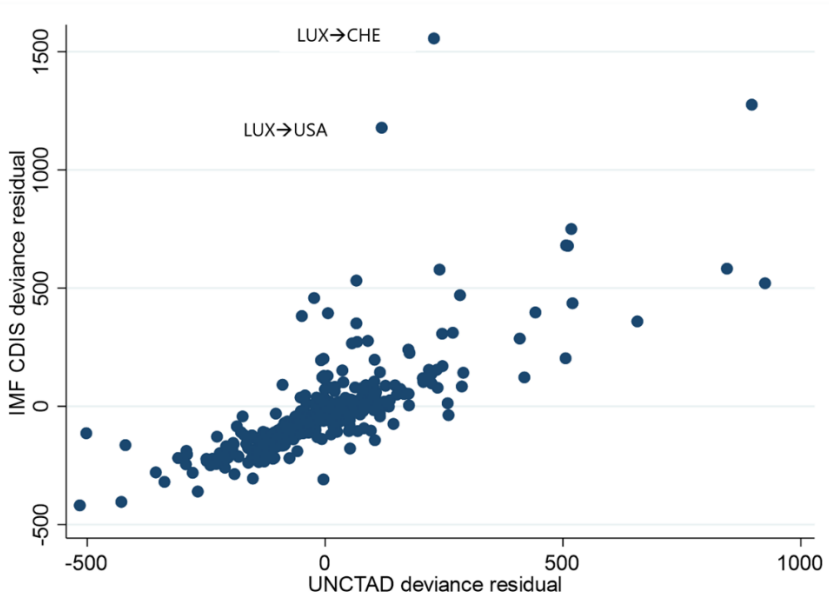


Figure 5: Deviance residuals: direct CDIS vs. ultimate UNCTAD ownership



Can we learn something from those residual patterns? On a global level, residual outliers from gravity models show FDI patterns that are difficult to justify with 'purely real' economic motives. Differences between direct and ultimate ownership in raw data and in model residuals provide some first evidence about global patterns of FDI round-tipping and multi-country investment chains. Future research could use those as a motivation to better understand the interaction of taxation, financing conditions, and accounting standards that lead to those global FDI networks beyond traditional motives for multinational production networks (e.g. 'complex vertical FDI' or 'complex FDI complements', see Antras and Yeaple, 2014).

Discrepancies are also important for individual country studies. For example, comparison of different FDI data sets suggest that about the 10-fold of ultimate Austrian FDI in Switzerland and Luxemburg is direct FDI from Austria in those countries with ultimate owners outside of Austria, while Austrian direct FDI in European tax havens like the Netherlands, Luxembourg, and Switzerland is about the threefold of what can be justified with real economic motives of a gravity model (see Wacker, 2020). Taken together, those numbers clearly suggest aggressive tax avoidance by multinationals originating from and/or being active in Austria.

5. Conclusion

Notwithstanding the skepticism about conventional direct-ownership data for foreign direct investment, this article documents that our picture of global bilateral FDI stocks and their key economic determinants does not substantially change if we use novel data on ultimate ownership. Researchers studying traditional FDI motives in bilateral data sets will usually do well when accounting for commonly known tax-haven and round-tipping patterns with bilateral fixed effects and/or excluding extremely small tax haven islands (see e.g. Schneider and Wacker, 2020).

This is not to say that this new generation of FDI data and associated effort by data compilers will not be helpful. On the contrary, I argue that it is not the question which data is better but that a comparison of bilateral FDI positions across different ownership principles will give us additional insights about the spread of global FDI networks and the financing and tax-evasion strategies of multinational firms.

On a final note, my rather optimistic conclusion about the use of traditional direct FDI statistics refers to the study of 'real' FDI determinants that are motivated from trade theory (see e.g. Antràs and Yeaple, 2014) and mostly use variation across countries, in some form or another, to identify those determinants. Evidence by Blanchard and Acalin (2016) and Lane (2020) suggest that more care may be needed if one investigates FDI patterns over time, especially at higher frequency.

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university of groningen

Differences in measuring FDI: do they matter for our economic conclusions?

Konstantin M. Wacker
University of Groningen

@KM_Wacker

Motivation

- Importance of FDI
  - 29% of global cross-border liabilities
  - More than quadrupled as a share of GDP since 1980s

- Number of FDI-related articles grew even faster than actual FDI, with may empirical applications.

- Several studies critical on FDI as a measure for multinational production (Lipsey 2007, 2010; Beugelsdijk et al., 2010; Wacker, 2016).

- Most recent concern: round-tipping and actual ownership (Blanchard and Alcalin, 2016; Pastoris and Schmitz, 2019; Damgaard et al., 2019)

Research question and contribution

- Do we have to dismiss empirical evidence on FDI determinants once we use different data, accounting for ultimate instead of direct ownership?

- No!
  - Very high correlation between data sets (>80%).
  - No substantial differences in parameter estimates for gravity model.

- But…
  - Average statistical relationships can mask country(-pair) peculiarities.
  - Those peculiarities have an economic interpretation and are worth studying.

Data

- **OECD inward FDI stocks** (BDM4)
  - direct/immediate investor
  - ultimate investor
- **IMF CDIS**
  - direct inward stock
  - where confidential or missing, filled with derived stock
- **UNCTAD ultimate investor estimate** (Casella, 2019)
  - based on absorbing Markov chain
  - percentages multiplied with UNCTAD inward stocks
  - limited to 2017

Data

- **Gravity and control variables**
  - GDP (in USD, UN)
  - distance (population-weighted, CEPII)
  - relative skill endowment (PWT):

$$RSkE = \ln(hc_{investor}/hc_{recipient})$$

  - corporate tax rates (KPMG)

Coverage

Coverage of bilateral FDI data sets: number of observations

Data set	OECD direct	OECD ultimate	IMF CDIS	UNCTAD ultimate
OECD direct	6,207	2,587	4,997	4,833
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IMF CDIS			25,417	13,647
UNCTAD ultimate				23,544

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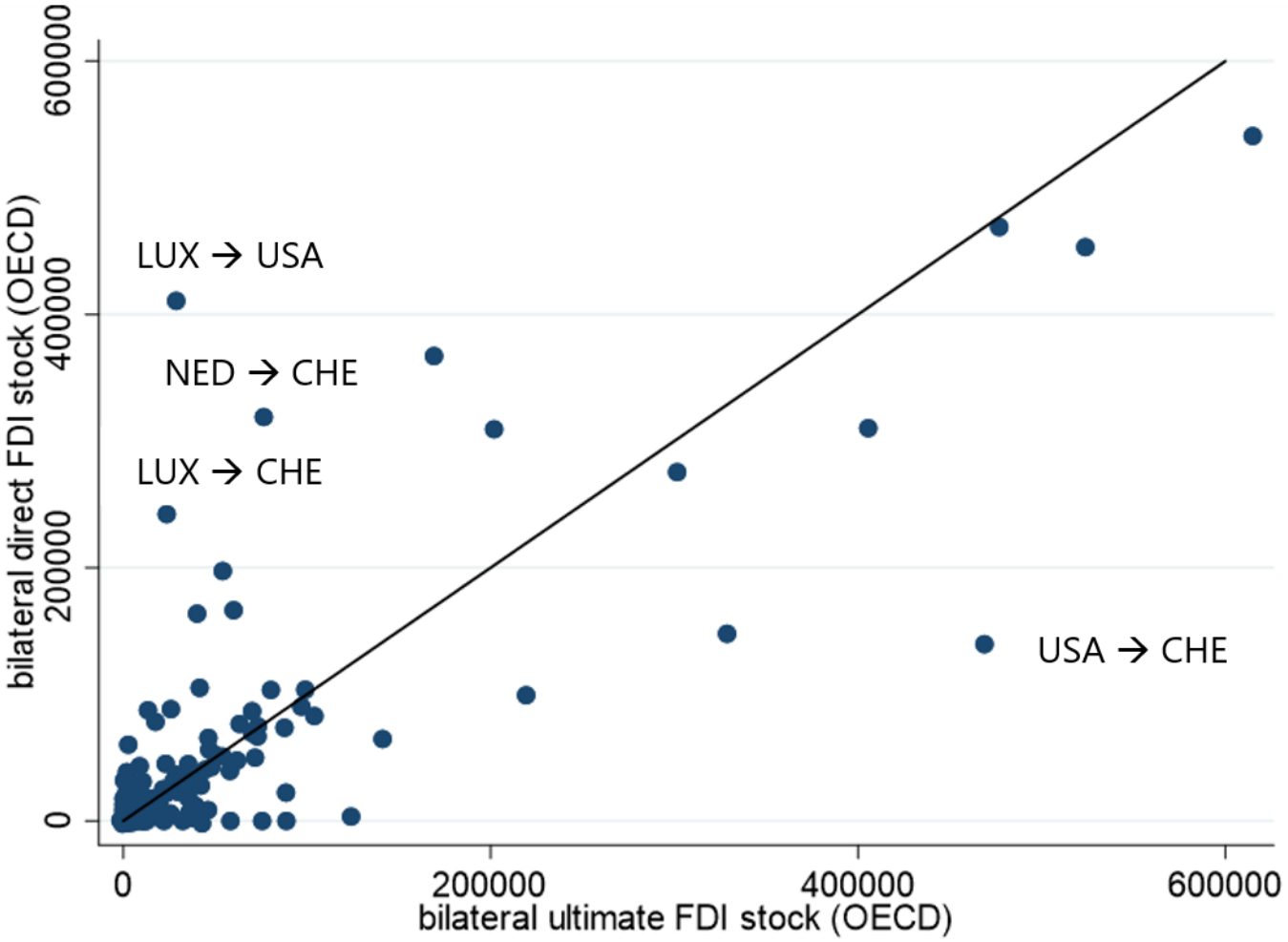
Correlation between FDI data

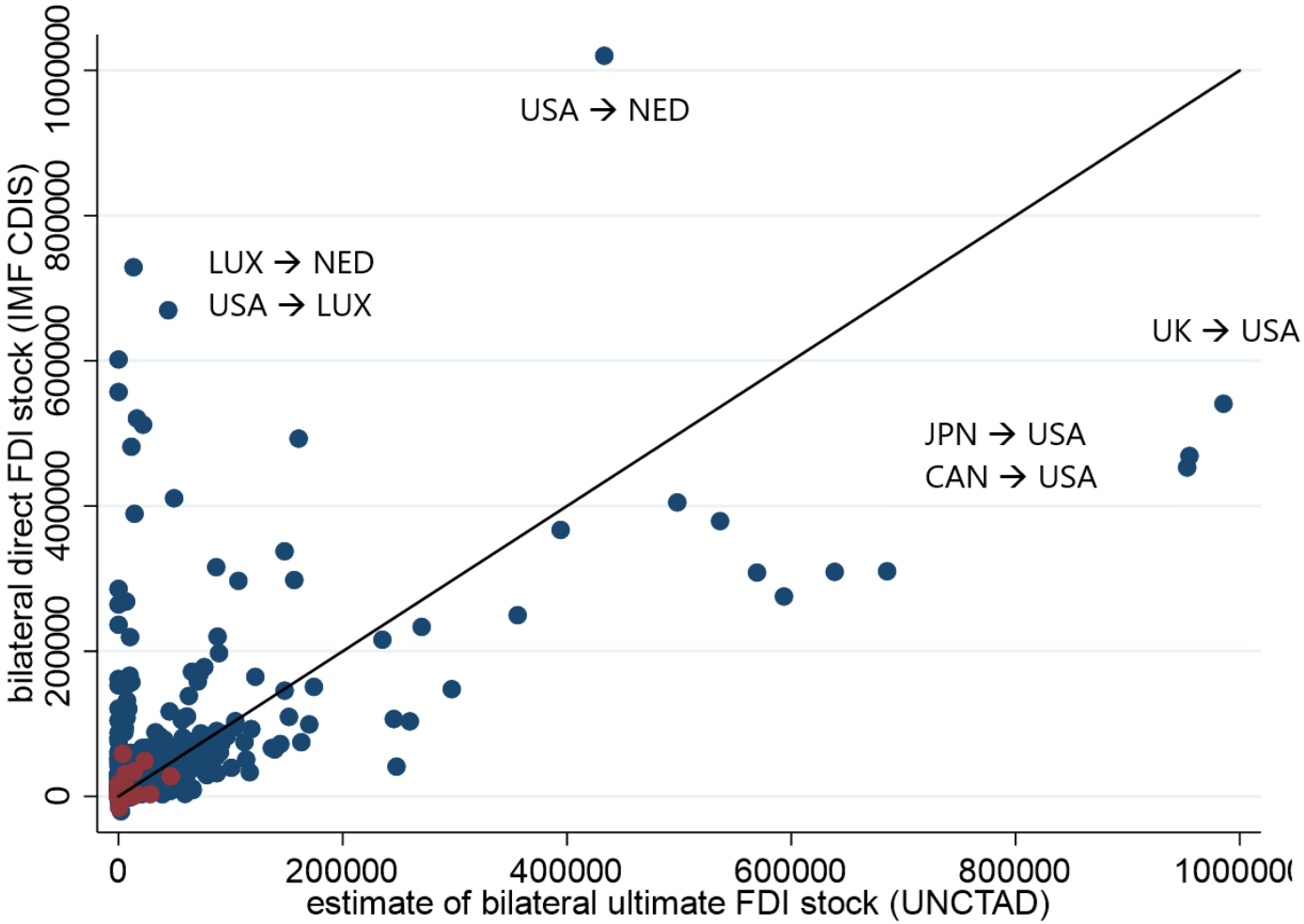
Correlation coefficients between bilateral FDI data sets

Data set	OECD direct	OECD ultimate	IMF CDIS	UNCTAD ultimate
OECD direct	1.00	0.83	0.99	0.87
OECD ultimate		1.00	0.80	0.93
IMF CDIS			1.00	0.85
UNCTAD ultimate				1.00

Correlation: OECD data



Correlation: CDIS vs. UNCTAD data



A gravity model of FDI

› Kleinert and Toubal (2010)

$$\text{FDI stock}_{sh} = b_1 \ln GDP_s + b_2 \ln GDP_h + b_3 \ln(D)_{sh} + b_4 RSkE_{sht} + b_5 \ln(GDP_s + GDP_h) + u_{sh}$$

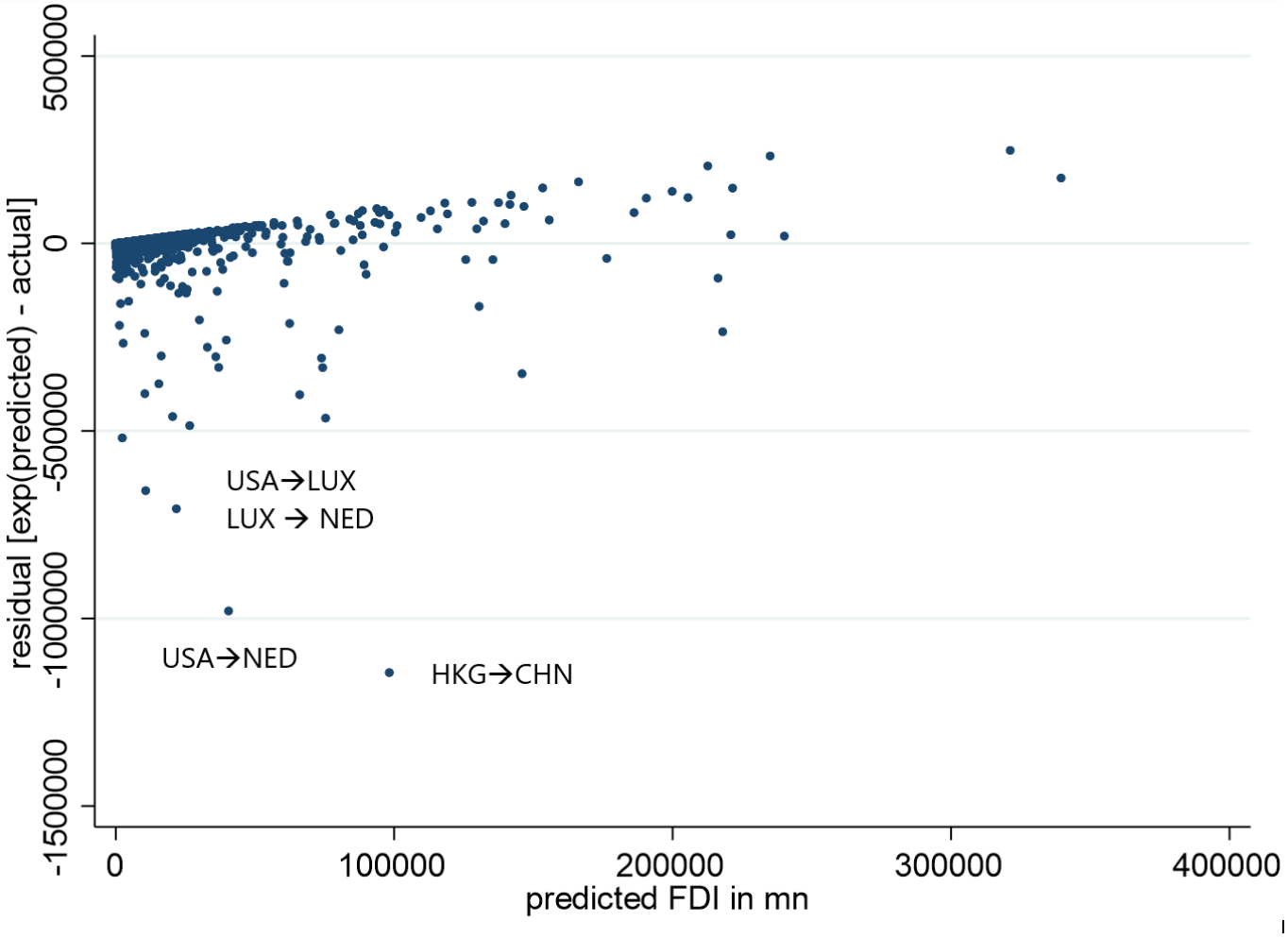
› Inference on parameters allows to distinguish between horizontal and vertical motives in FDI.

› Estimated using PPML.

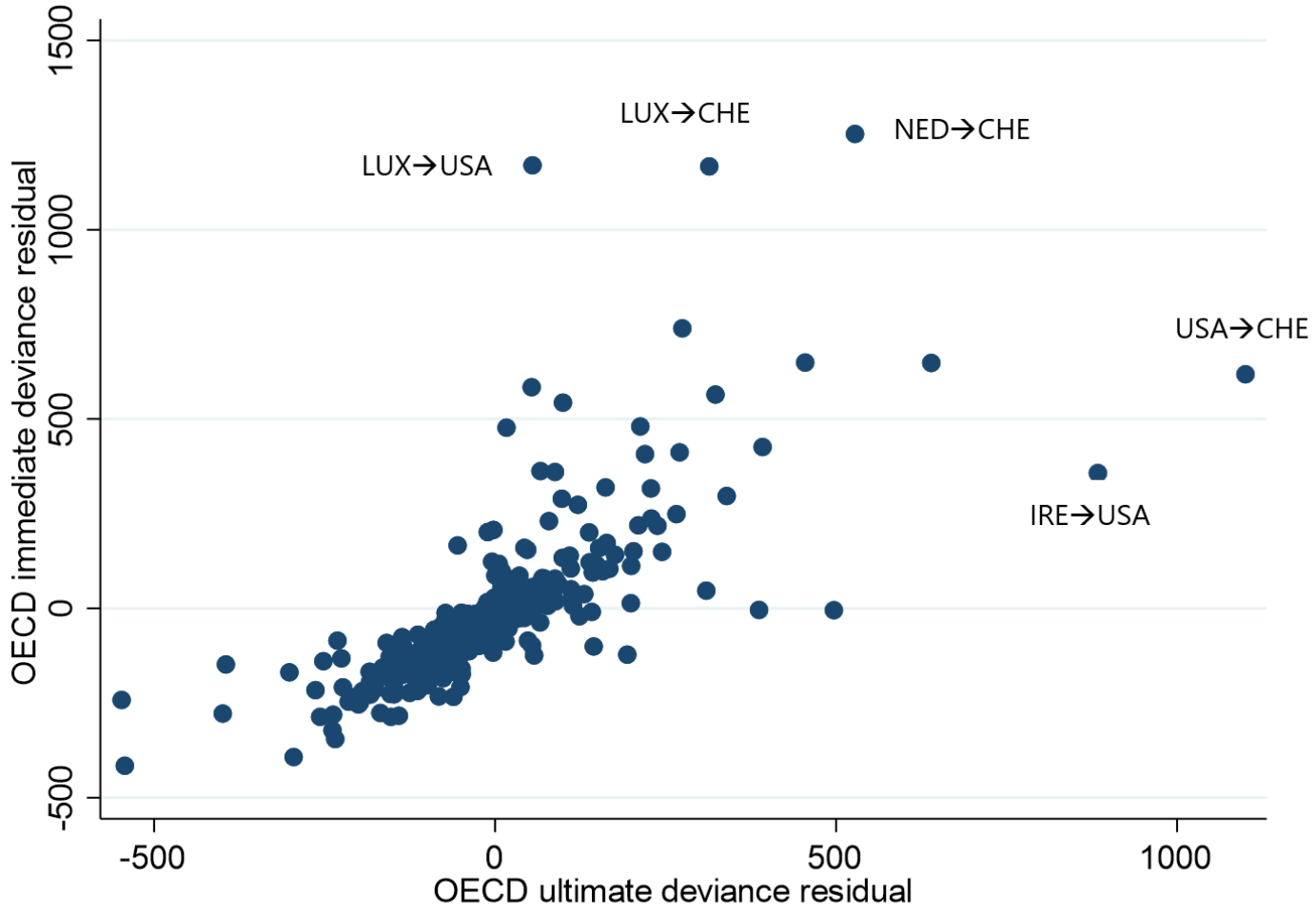
FDI gravity model: results

VARIABLES	OECD direct	OECD ultimate	IMF CDIS	UNCTAD
ln(GDP investor)	0.307**	0.438***	0.491***	0.806***
	(0.137)	(0.0979)	(0.0841)	(0.0714)
ln(GDP recipient)	0.841***	0.546***	0.457***	0.779***
	(0.237)	(0.211)	(0.0858)	(0.0805)
ln(distance)	-0.668***	-0.478***	-1.049***	-0.716***
	(0.140)	(0.146)	(0.0814)	(0.0678)
Relative skill endowment	2.804***	2.677***	0.684***	0.482*
	(0.634)	(0.520)	(0.206)	(0.255)
ln(sum of GDPs)	0.322	0.717***	0.390***	0.217
	(0.334)	(0.266)	(0.151)	(0.132)
Constant	-26.79***	-35.17***	-19.55***	-35.11***
	(5.372)	(5.354)	(2.573)	(2.521)
Observations	1,324	1,324	8,077	8,077
R-squared	0.158	0.180	0.168	0.288

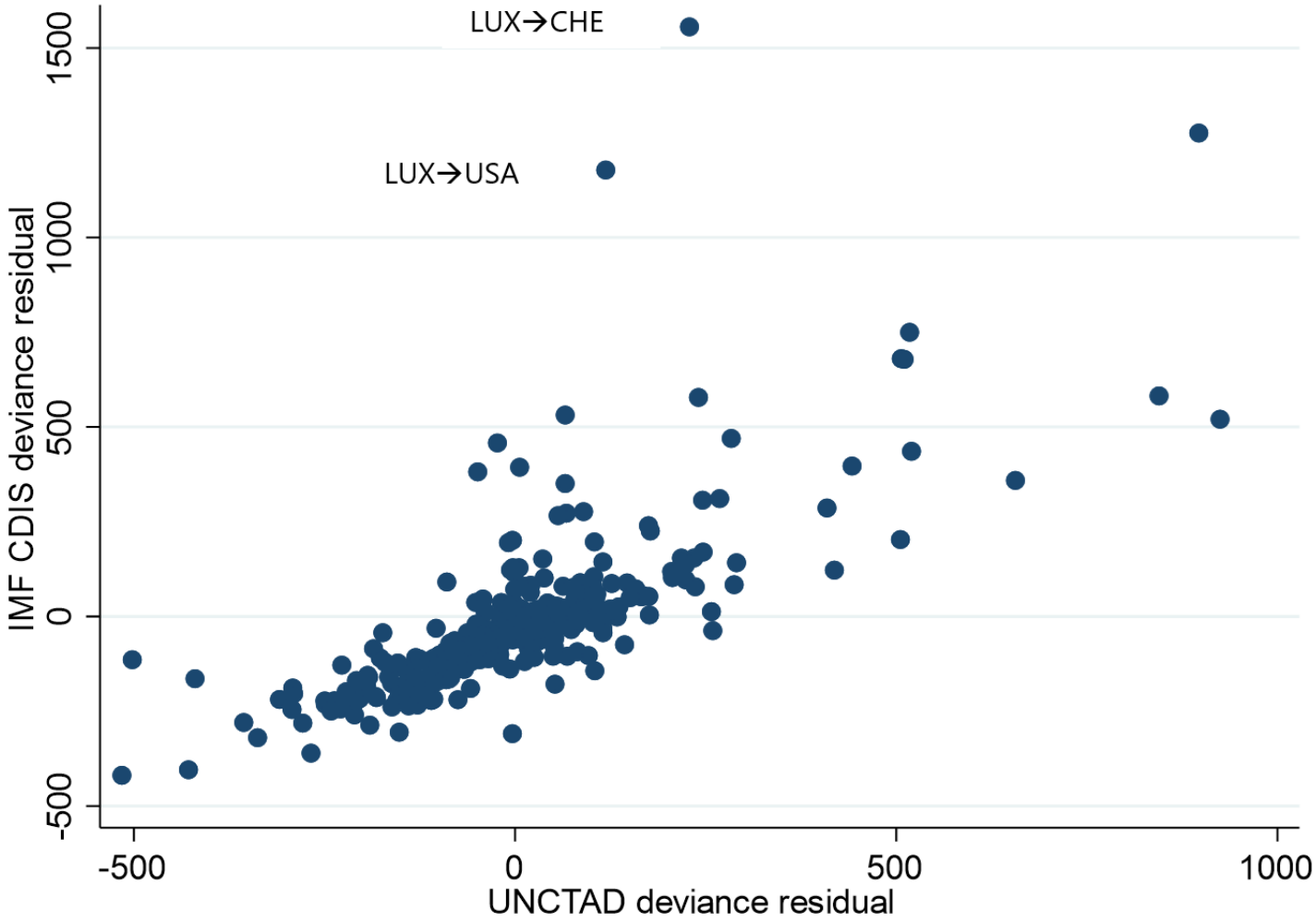
Outlier inspection (CDIS model)



Residuals: direct vs. ultimate investor model



Residuals: direct vs. ultimate investor model



Summary and conclusion

- On average, no key differences between FDI data sets that would change our picture of global FDI landscape.
- But substantial country(-pair) peculiarities.
- Those peculiarities have an economic interpretation.
  - Better to put effort in understanding those peculiarities than principally dismissing aggregate FDI data.
  - Difficult to 'easily' explain peculiarities with economic variables.
  - Helpful to understand firms' financial and tax considerations in profit maximization and to design according policies.