DISCUSSION PAPER SERIES

DP12222
(v. 2)

Banks Defy Gravity in Tax Havens

Anne-Laure Delatte, Gunther Capelle-blancard and Vincent Bouvatier

FINANCIAL ECONOMICS

PUBLIC ECONOMICS

ISSN 0265-8003

Banks Defy Gravity in Tax Havens

Anne-Laure Delatte, Gunther Capelle-blancard and Vincent Bouvatier

Discussion Paper DP12222
First Published 14 August 2017
This Revision 04 February 2021

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

Banks Defy Gravity in Tax Havens

Abstract

Using country-by-country reports from the Systemically Important Banks in the European Union, we measure "abnormal" banking activity in tax havens (TH). Our assessment is based on a gravity model used to predict the expected international turnover of EU banks worldwide. We find that: 1) banks turnover in TH represents on average twice the gravity predictions; 2) the abnormal turnover of EU banks represents 1.46\% of GDP in TH and varies between 16\% of GDP and zero; 3) there is a large heterogeneity across TH with Hong Kong, Luxembourg and Singapore concentrating the bulk of the abnormal turnover; 4) we observe a decline and a concentration of abnormal turnover since the reporting requirement has been introduced in the EU.

JEL Classification: F23, G21, H22, H32

Keywords: Country-by-country reporting, tax evasion, International Banking, tax havens

Anne-Laure Delatte - anne-laure.delatte@dauphine.psl.eu
Dauphine university, CNRS and CEPR

Gunther Capelle-blancard - gunther.capelle-blancard@univ-paris1.fr
University Paris 1 Pantheon-Sorbonne, Labex Refi, Paris School of Business

Vincent Bouvatier - vincent.bouvatier@u-pec.fr
Paris Est Creteil University

Acknowledgements
The authors thank Jezabel Couppey-Soubeyran, Mathieu Crozet, Dhammika Dharmapala, Thierry Mayer, Tom Neubig, Franz Reiter, Bert Scholtens, Shyam Sunder, Farid Toubal, Michael Troege, Gabriel Zucman, and the participants of the 2017 National Tax Association Conference, Princeton University EU seminar, Columbia University (SIPA) seminar, CEPII, EU Policy Network, Groningen University, and University of Buenos Aires for helpful discussions. They thank Manon Aubry and Thomas Dauphin from Oxfam for sharing their database. They also gratefully acknowledge Mona Barake and Pranav Garg for excellent research assistance. This research has bene ted from the support of Research fellowships 2016-2017 with reference 2016 ECFIN 013/B. The usual disclaimer applies.

Banks Defy Gravity in Tax Havens *

Vincent Bouvatier † Gunther Capelle-Blancard ‡ Anne-Laure Delatte §

February 4, 2021

Abstract: Using country-by-country reports from the Systemically Important Banks in the European Union, we measure "abnormal" banking activity in tax havens (TH). Our assessment is based on a gravity model used to predict the expected international turnover of EU banks worldwide. We find that: 1) banks turnover in TH represents on average twice the gravity predictions; 2) the abnormal turnover of EU banks represents 1.46% of GDP in TH and varies between 16% of GDP and zero; 3) there is a large heterogeneity across TH with Hong Kong, Luxembourg and Singapore concentrating the bulk of the abnormal turnover; 4) we observe a decline and a concentration of abnormal turnover since the reporting requirement has been introduced in the EU.

Keywords: Tax haven; Country-by-country reporting; Tax arbitrage; Regulatory arbitrage; International banking.

JEL Code: F23, G21, H22, H32.

*The authors thank Thorsten Beck, Jezabel Couppey-Soubeyran, Mathieu Crozet, Dhammika Dharmapala, Thierry Mayer, Tom Neubig, Franz Reiter, Bert Scholtens, Shyam Sunder, Farid Toubal, Michael Troege, Gabriel Zucman, two anonymous referees, as well as participants in the 2017 National Tax Association Conference, and the seminars at Princeton University (EU seminar), Columbia University (SIPA), CEPII, EU Policy Network, Groningen University, and University of Buenos Aires for helpful discussions. They thank Manon Aubry and Thomas Dauphin from Oxfam. They also gratefully acknowledge Mona Barake, Pranav Garg and Stanislas Kihm for excellent research assistance. This research has benefited from the support of Research fellowships 2016-2017 with reference 2016 ECFIN 013/B. The usual disclaimer applies.

†University Paris Est Creteil, France. Email: vincent.bouvatier@u-pec.fr

‡University Paris 1 Pantheon-Sorbonne (*Centre d'Economie de la Sorbonne*), Labex ReFi (*Financial Regulation Lab*) & Paris School of Business. 106-112 Bd de l'Hopital 75647 Paris Cedex 13 France. Email: gunther.capelle-blancard@univ-paris1.fr. Phone: +33 (0)1 44 07 82 60.

§CNRS, University Paris Dauphine (*Leda*) & CEPR. Email: anne-laure.delatte@dauphine.psl.eu

"*Increased transparency regarding the activities of institutions, and in particular regarding profits made, taxes paid and subsidies received, is essential for regaining the trust of citizens of the Union in the financial sector. Mandatory reporting in that area can therefore be seen as an important element of the corporate responsibility of institutions towards stakeholders and society.*" − Recital (52) to CRD IV.

1 Introduction

A substantial part of the international banking activities of global banks is concentrated in a few tax havens (TH afterwards) and standard factors are not sufficient to account for it. This paper dissects new regulatory country-by-country activity data of individual banks to provide a quantitative assessment of the international activity of EU banks. While standard "gravity" factors explain international turnover in most countries, the turnover reported in some countries goes far beyond what these factors can account for. The countries where this "abnormal" turnover is the most substantial happen to be included in the list of TH established in previous works. In addition, abnormal turnover is highly concentrated, which is consistent with the growing evidence of a few TH being key platforms in global finance (Delatte et al., 2020).

Why investigating the abnormal activity of banks in particular? While there is increasing cross-country evidence that sheds light on orders of magnitudes, the contribution of banks -while presumably important- is less documented (Shaxson, 2018).[1] Our work bridges the gap and provides quantitative mapping of global banks' activity in the fiscal and regulatory arbitrage chain. In the context of a shrinking fiscal space due to the Covid-19 crisis, our findings can hopefully inform the design of a policy agenda against tax avoidance practices.

We exploit data on the international banking activities of large European banks that have become publicly available following the implementation of a new regulation in the European Union. More precisely, since 1 January 2015, according to the Article 89 of the EU Capital Requirements Directive

[1] In 2003, a US Senate report noted that major banks participated in providing potentially abusive or illegal tax products sold to individuals or corporations to help them reduce or eliminate their U.S. taxes (US Senate, 2003). In 2008, a former UBS employee, Bradley Birkenfeld, arrested in the United States, revealed detailed information according to which UBS maintained Swiss accounts for thousands of U.S. clients not disclosed to U.S. tax authorities (Levin and Coleman, 2008). More recently, the Offshore leaks (2013), the Luxleaks (2014), the Panama papers (2016) and the Paradise papers (2017) have provided anecdotal evidence about banks in TH.

IV (CRD IV), all Member States banks with a consolidated turnover above €750 million are required to publicly disclose the activity of all their affiliates (subsidiaries and branches) regarding the allocation of their turnover, employees, profit and taxes. We hand-collected these information for all Global- and Local-Systemically Important Banks (SIBs) in the EU from these country-by-country reports (CbCR) for the years 2015-2018, the first years the data were available. The resulting dataset includes 35 banks with headquarters in 10 EU countries. Raw statistics indicate that their foreign affiliates are located in 139 countries, with a disproportionate presence in countries listed as TH. Banks in our sample record 19% of their foreign turnover and 26% of foreign profit in TH while these countries represent 0.8% of the world population and only 2% of world GDP.[2]

We use a standard gravity model to predict the turnover of banks in each country. Our strategy assumes that gravity is a valid modelling strategy for international banking activity. In fact, the gravity model, initially developed to explain trade of goods across countries (Bergstrand, 1985; Anderson, 1979) has been extended to international banking by Buch (2002, 2003, 2005). It is now well-documented that bilateral commercial and financial transactions rise proportionately with the economic size of both countries ("mass") and are negatively correlated with resistance (the "distance", either geographical or socio-cultural) (Portes et al., 2001; Okawa and van Wincoop, 2012). Therefore, we use this model, estimated by Poisson pseudo maximum likelihood (PPML) (Santos Silva and Tenreyro, 2006) to predict the activity of foreign affiliates and we consider the difference between observed and predicted turnover "abnormal". Our empirical strategy implies model-dependence so we run six alternative estimates.The abnormal turnover estimated in the alternative specifications are highly correlated to our baseline and consistently identify the same big players, suggesting that our evidence about the global geography of abnormal banking activity are robust.

Our work documents several results. First, the mean abnormal turnover is around twice the prediction and varies between 20 times (Hong Kong and Monaco) and zero. Second, total abnormal turnover represents 1.46% of GDP in TH and varies between 16% of GDP (Jersey and Luxembourg) and zero. Third, relative to their economic size, three countries concentrate the bulk of abnormal turnover (Hong Kong, Luxembourg and Singapore). Finally, we observe a decline and a concentration of abnormal turnover since the introduction of CRD IV.

[2]In the paper we refer to the list of Dharmapala (2008), reproduced in the Appendix.

Some caveats in our data need to be mentioned. These data provide, for the first time, a comprehensive overview of the presence of foreign banks in TH. However, these data do not (yet) shed full light on tax optimization, tax evasion and regulatory arbitrage practices. Our empirical strategy makes it possible to effectively distinguish between activity that is driven by standard factors and activity that is not. But given the fact that no details on the source of income is provided in the data currently available: i) it is not possible to know what kind of activity drives the commercial presence of banks in TH ; ii) it is not possible to assess whether abnormal turnover is related to tax avoidance or tax evasion; iii) we do not know which clients banks serve, i.e. whether they are corporations or households; iv) we cannot distinguish whether banks locate themselves in TH for fiscal, regulatory or financial secrecy reasons. Despite these limitations, we attempt to show that CbCR is a key element of transparency and a first step forward in the fight against tax evasion, money laundering, and regulatory arbitrage.

Related Literature. A few papers have already exploited CbCR data (Fatica and Wildmer, 2018; Brown et al., 2019; Murphy et al., 2019; Dutt et al., 2019; Joshi et al., 2019; Overesch and Wolff, 2019). Overall, these papers evidence substantial profit shifting by banks (Fatica and Wildmer, 2018) and reporting strategies to dissimulate their activity in TH before the CbCR regulation (Brown et al., 2019; Dutt et al., 2019) and after enforcement (Joshi et al., 2019). So far, it is difficult to conclude that CbCR is associated with less tax avoidance in the European financial sector and the quality of the reporting is extensively discussed (Murphy et al., 2019). Our contribution is to explore a new dimension of CbCR, namely foreign turnover, which hopefully complements our knowledge on (i) the amplitude of banking activity in TH which so far has been documented using profit data (Fatica and Wildmer, 2018); (ii) the TH geography and the identification of big player countries for the banking industry versus for the non financial corporate sector, so far documented using international financial assets data (Haberly and Wójcik, 2015; Garcia-Bernardo et al., 2017; Damgaard et al., 2019; Delatte et al., 2020).

Moreover, our paper contributes to the literature on the determinants of international activity of commercial banks (Demirgüç-Kunt and Huizinga, 2001; Buch, 2003; Papaioannou, 2009; Bouvatier and Delatte, 2015; Merz and Overesch, 2016).

Alworth and Andresen (1992) provided early evidence, based on aggregated bilateral deposit flows from the BIS, that tax differential between countries and bank secrecy are key determinants

of international banking deposits. Huizinga and Nicodème (2004) provided further evidence suggesting that a part of international deposits is intended to facilitate tax evasion. Johannesen (2014) examined how households reacted to the 2005 EU Saving Directive and showed that a fraction of offshore wealth was undeclared and that deposits were highly responsive to policy measures. Johannesen and Zucman (2014) confirmed the responsiveness of bank deposits to anti-tax evasion measures by showing that deposits shifted from TH that adopted bilateral information exchange treaties to TH that did dot. In sum, previous works have documented that tax and regulatory factors drive the dynamics of bank deposits (customer perspective). In turn, our work examines the perspective of banks, i.e. their commercial presence and quantifies the international banking activity that is not explained by standard factors.

The rest of the paper is organized as follows. Section 2 presents our new hand-collected data and a rich set of descriptive statistics. Section 3 describes our empirical strategy, based on the gravity model. Section 4 reports the empirical quantification of abnormal banking activity and its evolution. Section 5 is a robustness Section. Section 6 concludes and draws policy implications.

2 Data and descriptive statistics

Country-by-country reporting (CbCR) requires firms to provide detailed information regarding the geographic allocation of their activity. Since 2015, according to the Capital Requirements Directive IV (Article 89)[3], all banks in the EU with a consolidated turnover above €750 million have been required to publicly disclose the activity of all their affiliates (subsidiaries and branches) on a country-by-country basis for the following items: turnover (net banking income), number of employees (on a full time equivalent basis), profit or loss before tax, tax on profit or loss, and public subsidies received.

We collect yearly data for all Global- and Domestic-Systemically Important Banks (SIBs) in the EU from 2015 to 2018 (the first years the data were available). Our final sample includes 35 banks[4]

[3]This directive followed the French initiative, adopted in 2013 as part of the *Loi de séparation des activités bancaires*.

[4]There are 38 G-SIB and D-SIB in the EU, based on the EBA lists (2014-2020). We drop the Danish bank Nykredit because it has virtually no activity abroad, the French bank Banque Postale because it reports foreign activity in Monaco only (related with French public postal service), and the Spanish bank BFA (Bankia) because of missing information.

located in 10 EU countries: Austria (1), Belgium (1), Denmark (1) France (5), Germany (7), Italy (3), Netherlands (3), Spain (4), Sweden (4), and the United Kingdom (6). All these banks are large, with a leverage ratio exposure measure above €200 billion.

Panel A of Table 1 reports data at the bank-level on foreign turnover, employees, profit and tax, all averaged over 2015-2018. The banks in our sample report a turnover of €251 billion abroad, where they employ about 1.1 million people, for a total profit of €77 billion and a tax amount of €4.2 billion. The European banking market is relatively concentrated, so is our sample: the two largest banks in terms of foreign turnover, HSBC and BNP Paribas, account for 29% of the total foreign turnover of the sample; the top 5, including Deutsche Bank, BBVA, and Barclays account for 50% and the top ten, including Société Générale, Santander, Standard Chartered, ING, and Unicredit account for 75%.[5] On average, each bank reports activity in 26 foreign countries, and, unsurprisingly, the average number of destinations decreases with the size of the banks: 64, 51, 48, and 17 destination countries for the top 2, the top 5, the top 10 and the others banks, respectively.

Panel B of Table 1 reports the same indicators focusing on TH activity as a percentage of total activity. We observe large differences across banks, from banks reporting zero activity in TH (Caixa Bank, Erste Group, Sabadell, Swedbank) to Nationwide reporting 100% foreign activity in TH. Fig. 1 plots the banks' turnover in TH and their market share. Four small banks, Nationwide, RBS, DZ Bank, and NordLB have a large share of their foreign turnover in TH (above 50%), which yet represents small amounts (less than €2.5 billion in total). HSBC stands out with both a high percentage (40%) and a large amount (€17.9 billion) of foreign turnover in TH. There seems to be no relationship between the size of the banks and their presence in TH.[6]

Table 2 reports descriptive statistics at the country level. We aggregate the data by country listed as TH and non-TH in Dharmapala (2008). To produce more meaningful statistics, we distinguish medium (more than 1 million inhabitants), small (between 100,000 and 1 million) and extra-small (less than 100,000) countries, a classification in the vein of Dharmapala and Hines (2009). EU Banks report €46.5 billion turnover in TH and €204.4 billion in non-TH. They employ around 100,000 people in TH and 1,000,000 in non-TH. In other words, TH represent 19% of foreign turnover and

[5]Concentration is similar in terms of the number employees abroad, with market shares equal to 30%, 50% and 77%, for the top 2, the top 5 and the top 10, respectively.

[6]For more bank-level details, see also Table 4 which reports bank-level TH turnover in €millions, as a percentage of their domestic activity and as a contribution to total banking activity in TH. We comment the figures below in the Results Section when we compare our estimates with raw data.

9% of workforce abroad. It implies a turnover by employee of €468,000, i.e. more than twice larger than the ratio in non-TH, €205,000. The average profit of EU banks recorded in TH is €20 billion (26% of foreign profits), which represents a remarkable profit/turnover ratio of 43%, compared to 28% in non-TH. Last, the implicit tax rate (ITR), computed as the ratio of tax paid over profit, is equal to 4.8% in TH and 5.7% in non-TH, with very large differences between the first and the following years (we comment it below).

Table 2 also reports the variation over the period 2015-2018. The total foreign turnover decreases by 2.4% in 2018 compared to 2015, and this decline is more pronounced in TH than non-TH (-6.8% compared to -1.3%). The number of employees abroad decreases more sharply, at a pace that is also more important in TH than in non-TH (-13% and -8.3% respectively). In turn, total profit increases in non-TH (+30.2%) and decreases in TH (-7.1%). Thus, while the share of foreign profits reported in TH was 33% in 2015, it falls to 22% the following year and is around 26% in 2018. Last, we note that the variation of ITR is puzzling over the period: in 2015, it is equal to 24.6%, higher in non-TH (31.1%) than in TH (11.6%) and banks pay very little taxes abroad afterwards. In 2017, the total net amount of tax is even negative.[7]

Last, we examine each country's contribution to TH banking. Fig. 2 plots the turnover reported by banks in each TH as a share of total turnover reported in TH. Concentration is remarkable: five countries concentrate the bulk of EU banking activity in TH out of 26 countries with available data (Hong Kong, Luxembourg, Singapore, Ireland and Switzerland). The Crown dependencies (Jersey, Guernsey and Isle of Man) stand out as intermediate actors despite their very small economic size. Caribbean countries play a much less significant role. Last, Middle-Eastern TH are negligible.

In the following, we propose a method to disentangle the activity driven by standard factors, and the activity that is not.

[7]This is actually driven by the US, where the amount of taxes is equal to -1.3 billion in 2017; the total amount of taxes paid by EU banks in 2017 worldwide, except the U.S., is equal to 268 million.

3 Empirical strategy

3.1 Gravity framework

Our empirical strategy infers abnormal activity, i.e. the activity unexplained by economic and geographic factors, from a standard gravity framework applied to banks turnover. In sum, our strategy assumes that gravity is a valid modelling strategy for international banking activity. In fact, the gravity model, initially developed to explain trade of goods across countries (Anderson, 1979; Bergstrand, 1985), has been extended to FDI by Head and Ries (2008) and to international banking by Buch (2002, 2003, 2005). An important caveat emphasized by Okawa and van Wincoop (2012) is that the conditions giving rise to the exact gravity form are more restrictive in finance than in trade (they show that gravity applies properly to information friction only). Subsequently, we conclude that gravity based on a restricted vector can be a powerful model to predict international banking activity. We predict the turnover of banks in every country based on a gravity estimate and we consider the difference between actual and predictions (i.e. the residuals) as the abnormal turnover. A caveat of our strategy is that our predictions are model-dependent; to mitigate that, we carefully select our favorite model in four steps detailed below and we run six alternative estimates detailed in the Robustness Section.

We consider an exponential specification of a gravity model (Santos Silva and Tenreyro, 2006):

$$\begin{aligned} Y_{k,i,j,t} &= \exp(\alpha_k + \lambda_t + \beta_1 \log(GDPCAP_{j,t}) + \beta_2 \log(Pop_{j,t}) + \beta_3 \log(dist_{i,j}) \\ &\quad + \beta_4 \log(dist_{i,j})^2 + \beta_5 Contig_{i,j} + \beta_6 Lang_{i,j} + \beta_7 Colony_{i,j} + \beta_8 RTA_{i,j,t} \\ &\quad + \beta_9 Eur_{i,j} + \beta_{10} Territory_{i,j}) + \varepsilon_{k,i,j,t} \end{aligned} \tag{1}$$

where $Y_{k,i,j,t}$ is the turnover of bank k, headquartered in country i and reported in destination country j, at period t. We include time-fixed effects (λ_t) and bank-fixed effects (α_k) to control for unobserved heterogeneity at the bank level. It implies that parameters associated with gravity variables at the country i level cannot be identified, and are excluded from the specification.[8]

Regarding the vector of determinants, we decompose the total size effect into two components,

[8]More precisely, Population and GDP of country i could be included in the vector since these variables are time-dependent. However, given the small number of countries of origin and the limited time dimension, these variables are not significant and so are excluded from the vector.

one capturing the *volume* - the size of population in country j ($Pop_{j,t}$) - and the other capturing the *value* - the wealth of the country ($GDPCAP_{j,t}$). The standard gravity variables also include a set of bilateral variables at the country level: the geographical distance ($dist_{i,j}$) and the square of the distance ($dist^2_{i,j}$), as well as dummy variables indicating the presence of a common border ($Contig_{i,j}$), a common language ($Lang_{i,j}$), a colonial relationship ($Colony_{i,j}$), the signature of a regional trade agreement ($RTA_{i,j}$), the fact that both countries are a member of the euro area, ($Eur_{i,j}$) and whether the partner country j is a dependent territory of country i ($Territory_{i,j}$). In the gravity specification, the distance is considered to be the main friction, so β_3 is expected to be negative. However, the effect of distance can be overestimated for neighboring countries implying a positive sign expected for the estimated coefficient β_4. Similarly, the variables $Conting$, $Lang_{i,j}$, $Colony_{i,j}$, $RTA_{i,j}$, $Eur_{i,j}$ and $Territory_{i,j}$ are expected to positively affect the commercial presence.

We extend the sample to include the countries where banks have no activity to account for this information. The 35 banks are present in 139 countries in total. We complete the dependent variable with zeros and we collect the corresponding gravity variables for all the remaining countries. In total, we run our estimate on a sample including 227 destination countries.

3.2 Specification selection

We estimate the model using the Poisson pseudo-maximum-likelihood estimator (PPML). Standard errors are clustered by bilateral pair (bank k-country j). We select our preferred specification in four steps:

1. We start with a standard gravity specification on the full sample of countries (column 1 in Table 3) which confirms the gravity structure of our data: turnover increases with the size of the destination country (estimated coefficients of GDP per capita and Population are 1.50 and 0.7 resp.) and decreases with distance in a nonlinear way (estimated coefficients of distance and squared distance are -3.99 and 0.24 resp.); it also increases with common language (0.67), historical colony linkages (1.35) and the signature of a regional trade agreement (0.66); in turn, the presence of a common border and being a member of the Euro area are not associated with more turnover.

2. We introduce a dummy taking a value of 1 in TH and zero instead (column 2 in Table 3) to

verify whether there is a systematic disproportionate presence of banks in TH as highlighted in the descriptive statistics. The dummy is significant and the estimated coefficient is 0.81; note that the estimated coefficient of Euro-area membership becomes significant. This second set of results provides evidence that the turnover of banks is larger in TH *ceteris paribus*. TH attract more business *on average* than what the standard factors predict. A limit of the TH dummy is not to account for TH heterogeneity and to assume that the marginal effects of all the determinants are the same on turnover in TH and non-TH.

3. We interact the dummy with all determinants (column 3). Results confirm that the determination model differs in TH and non-TH: for example bilateral distance is a weaker determinant of banks' turnover in TH than in non-TH.[9] We conclude that our coefficients would capture effects specific to TH if we kept TH in the sample.

4. Therefore, we use a standard gravity specification on a sample of 184 countries including non-TH only (column 4). Estimated coefficients are consistent with expectations. Compared with the estimate in column (1), the same determinants have a significant estimated coefficient, but the value is different. This is our favorite model because it has the advantage of relying on a standard gravity specification where we minimize the distortion in the estimate due to TH.

We predict the turnover of banks for all destination countries based on this estimate and we consider the difference between actual and predictions as the abnormal turnover. To check the robustness of our results, we run six alternative estimates along two different samples, two different vectors of covariates, an alternative estimator and an alternative dependent variable. Results detailed in the robustness Section below indicates that alternative estimates are correlated and all specifications identify the same big players.

[9]The estimated coefficient of distance in TH is equal to 1.04 (-3.55+4.59) and of squared distance is -1.10 (0.20-0.30).

4 Results

4.1 Multi-dimension abnormal turnover

Table 4 presents different measures of distortions in TH at the destination country-level (Panel A) and at the bank-level (Panel B). More precisely, Panel A (Panel B) reports actual turnover (raw data) and abnormal turnover estimated using spec. 4 from Table 3 in €million, in percentage of country's GDP (of total bank turnover), and in percentage of total turnover in TH. Last column reports the predicted-to-turnover ratio.

Panel A indicates that the abnormal turnover in non-TH is €2,232 million out of total actual turnover of €204,384 million. It implies that the actual turnover is closed to model's predictions in non-TH, an expected result although reassuring in terms of estimation. In turn, the actual turnover in TH is 2.03 times the model's predictions, a result that suggests that the banks' activity in TH goes far beyond what standard factors would drive.[10] In total, the abnormmal turnover in TH amounts €23,783 million, which represents 1.46% of TH GDP on average, up to 9% of GDP in extra small TH, 6.2% of GDP in small TH and less than 1% of GDP in medium TH (see the bottom of Panel A). In sum, abnormal banking activity is a substantial source of revenues in several small TH. In the following, we explore heterogeneity across TH.

The last column in Panel A of Table 4 indicates that Monaco and Hong Kong host actual turnover respectively equal to 22.28 and 20.21 times the model's predictions. Vanuatu and Bermuda also display large distortions (6.34 and 6.28 resp. times the model's predictions). Other TH attracting abnormal activity include Curacao (5.21 times the model's predictions), Luxembourg (4.29), Jersey (5.1), Guernsey (4.15), Cayman Islands (3.59), Gibraltar (3.7), Isle of Man (3.29) and Malta (2.55). In the rest of the TH, banking activity is fairly in line with gravity predictions.

Most TH countries draw no or very little revenues from abnormal banking activity (see the ratio of abnormal turnover to GDP in Panel A of Table 4). In turn, it represents a substantial source of revenues in Luxembourg and Jersey (16.03% and 16.65% of GDP) as well as in Guernsey (13.1%) and Monaco (9.83%). These are the countries/ jurisdictions that are most likely to resist a political agenda limiting this activity. A third group of countries draws substantial revenues from abnormal

[10] We obtain a similar distortion with a specification including a TH dummy. More precisely, the estimated coefficient of the TH dummy (spec. 2 in Table 3) is equal to 0.815, implying that on average the turnover is $\exp(0.815) = 2.25$ larger than the model predictions.

banking activity, including Isle of Man (7.99% of GDP), Bermuda (6.46%), Cayman Islands (6.66%), Hong Kong (6.51%) and Virgin British Islands (4.87%).

Last, we turn to the ratio of country-specific abnormal turnover to the total abnormal activity in TH which informs us on the largest individual contributions. It is interesting to compare with raw data reported in the same Table 4 (column 4 and 7). Concentration is striking with Hong Kong, Luxembourg and Singapore representing the bulk of abnormal banking activity (72.7%, 24.5% and 16.47% of total abnormal activity).[11] Compared to raw data, our empirical strategy suggests that Switzerland and Ireland are not in the top contributors after controlling for standard factors. As a matter of fact, our model predicts more turnover than actual turnover in Switzerland and Ireland. This result has different explanations depending on the country. For Switzerland which has a longstanding tradition of facilitating tax reduction practices, the CbCR only reports data from foreign banks. However, the foreign penetration of the Swiss banking market is limited. For Ireland, which is criticized for using the tax weapon to attract economic activity, our results suggest that it does not concern foreign banking activity.

Fig. 3 synthesizes our findings at the country-level: Monaco and Hong Kong display the largest distortions, Luxembourg, the Crown Islands and Monaco's economic activity depend the most on abnormal banking activity and Hong Kong, Luxembourg and Singapore are the largest contributors to abnormal activity in TH. We conclude that a policy agenda against tax avoidance intermediated by banks may want to use most leverage on Hong Kong, Luxembourg and Singapore. Our results also suggest that Luxembourg may be the most defensive among the three because Luxembourg's economic activity is more dependent on abnormal banks turnover than Hong Kong and Singapore. Last, our analysis can inform on potential candidate countries that may be tempted to attract abnormal activity after regulation chases it away from large current contributors. Indeed Johannesen (2014) evidenced a perverse effect of regulation when banking deposits decrease in countries targeted by a certain regulation and increase in countries out of reach of the same regulation. In our case, regulators would need to overlook Channel Islands and Monaco, two countries where strong infrastructures already exist as mirrored in the share of domestic product drawn from abnormal banking activity.

[11] The sum of these three largest contributors exceed 100 while the sum of all countries contribution is precisely 100 because some TH counties have negative residuals- i.e. less actual than predicted turnover, and this implies negative ratios for these countries.

Last, but not least Panel B of Table 4 reports similar ratios at the bank-level. The last column indicates that the German DZ bank and NordLB have the largest activity distortions with actual turnover equal 20.7 and 13.5 times the model's predictions. Column 5 reports abnormal turnover in TH as a proportion of domestic turnover of each bank; it indicates that most banks draw no or very little revenues from abnormal activity in TH while it represents a substantial source of revenues for a few banks including Standard Chartered (130.9% of domestic turnover), HSBC (78.2%), DZ Bank (26.4%) and Deutsche Bank (22.5%). Last, the largest contributors to abnormal activity in TH are HSBC (51.6% of total TH activity), Standard Chartred (11.6%) and Deutsche Bank (10.6%).

In the following, we examine the evolution of these ratio since the implementation of the regulation.

4.2 Time-evolution analysis

Overall, our results suggest a significant decrease of abnormal turnover over the period. Fig. 4 plots the time-evolution of our measure of geographic distortions over 2015-2018. Candlestick represents all important pieces of information for that period: values in 2015 and in 2018 in the thick body; high and low in the candle wick; white (black) candles indicate an increase (decrease).

This representation easily grasps that geographic distortions have decreased over the period; and in fact, the aggregate ratio declines by one-third over the period. Most countries with a negligible abnormal activity in 2015 remain inactive over the entire period. In turn, several countries display a significant decline. The most striking is Monaco where distortions are reduced by half. Other significant declines are found in Curacao, Cayman Islands, Isle of Man and Virgin British Islands. The variation is mostly due to extensive margins: in fact, only a few banks operate in these small countries, implying that the interruption of activity of one bank generally explains the large variation observed. It is the case of Société Générale which stops reporting activity in Isle of Man and Virgin British Islands after 2015; of HSBC which was the most active bank in Cayman Islands in 2015 and reports negligible activity there afterwards; and of Rabobank which pulls out from Curacao from 2016 onward. On the contrary, two countries, Hong Kong and Vanatu, display the opposite trend with an increase in abnormal banking activity over the period. Without claiming a causal link, it is interesting to note that Rabobank starts reporting activity in Hong Kong from 2017 on and that the activity of HSBC increases in Hong Kong from 2017 on. In total, we confirm

that abnormal banking activity reported by banks affiliates has decreased after the introduction of CbCR. However, remember that Joshi et al. (2019) find evidence of an increase in income shifting by these banks' industrial affiliates, which are not subject to reporting and disclosure requirements under CRD IV, a strategy that we can not observe in our data.

Fig. 5 displays the evolution of abnormal activity as a percentage of GDP. The departure of banks commented above is associated with a significant drop of activity in Curacao, Cayman Islands, Isle of Man and Virgin British Islands. In addition, we observe a substantial reduction of abnormal banking activity as a share of GDP in Luxembourg and, to a lesser extent in Monaco. Last, Fig. 6 displays the evolution of the individual country's share in total abnormal activity. The most striking evolution is the rise of Hong Kong which started the period with a share of 60% of total abnormal activity in TH and ends up contributing to more than 80% of the total. The other country where abnormal activity has increased over the period is Luxembourg, although to a much lesser extent.

5 Robustness

We estimate the abnormal turnover using six alternatives : (i) *Small sample* is estimated on the sample of non-TH where banks report a non-null presence (115 countries); (ii) *Parsimonious* is estimated on a specification excluding non-significant coefficients; (iii) *Market Cap.* includes the market capitalization of country j as a proxy of agglomeration effect; (iv) *Employees* considers the number of employees instead of turnover as endogenous variable; (v) *NB QGPML* is the baseline model estimated with the NB QGPML estimator; (vi) *Including TH* is estimated on a full sample including TH countries.

Fig. 7 plots the estimated abnormal turnover in the baseline and the six alternatives. In general, we observe a high correlation across the estimates. More precisely, most points gather around the line bisector with a few exceptions: some residuals of the estimate on Employees are larger than the residuals of the baseline, suggesting that our baseline is more conservative. In turn, most residuals of the estimate on the full sample including TH countries are lower than the baseline, which is in line with our expectations. In addition, Fig. 8 plots the abnormal turnover by TH along our baseline and five specifications (we exclude *Employees* because it is measured in persons and not in Euros

and so is not comparable). We observe that the values of the abnormal turnover are similar for most countries and differ for large (absolute) values. The bottom line is however that all specifications identify the same big players (Hong Kong, Luxembourg and Singapore).

In the following, we comment the estimate tables of the different alternatives. Unless it is too cumbersome, we report the results according to our four-step estimation procedure to check whether the inclusion/interaction of the TH dummy gives similar results. Last but not least, we report the standard errors of estimates using alternative clusters.

1. *Small sample.* Table A1 reports the estimate results using a small sample including the 139 countries where banks have an active presence (non-null turnover at least one year over the period). The significance of the estimated coefficient is the same as in the baseline with slightly different values most likely due to the characteristics of the sample of countries. For example, the estimated coefficient of GDP-per-capita and Population are lower in this alternative mirroring the fact that banks operate in relatively wealthy and populated countries.

2. *Parsimonious.* Column 1 in Table A2 reports the estimate results on a specification excluding non-significant coefficients. The coefficient values are unsurprisingly closed to the baseline.

3. *Agglomeration effects.* Tables A2 and A3 report the estimate results when controlling for financial agglomeration effects which could explain the concentration of banking activity in some TH. We report the results of the fourth step only given the number of alternatives. We test six different proxies: (i) stock market capitalization, (ii) trading volume, (iii) stock market turnover (in log), (iv) a dummy equal to 1 if there is a stock market in the jurisdiction and zero instead, (v) a dummy equal to 1 if the jurisdiction is in the category "deep and broad" in the Global Financial Center Index published by and (vi) the percentage share of assets of the top 100 banks located in the jurisdiction. All in all, the estimates suggest no agglomeration effects.

4. *Employees.* Tables A4 and A5 report the estimate results using Employees instead of Turnover as the dependent variable in the full sample and in the sample of active destinations respectively. The TH dummy is not significant when it is included in the specification (column 2) but it is significant in some cases when it interacts with the determinants.

5. *Alternative estimator.* Table A6 reports the estimate results using the Negative Binomial Quasi-Generalised Pseudo-Maximum Likelihood estimator (NB QGPML) proposed by Bosquet and Boulhol (2014). The NB QGPML estimator encompasses the Poisson assumption as a special case and might be more efficient when the dependent variable exhibit over-dispersion (i.e., the conditional variance of the dependent variable increases more than proportionally with the conditional mean). Previous conclusions are not modified.

6. *Including TH.* Spec. 1 in Table 3 reports the results of estimating Eq. 2 on the large sample including TH countries. Estimated coefficients differ from our baseline as already commented.

Last, the Huber-White-type standard errors without clustering yield heteroskedasticity-consistent standard errors but assume independence of the observations. Therefore, we rely on the "cluster–robust" standard errors to relax the assumption of independence of the observations. More precisely, in all the estimates reported previously, standard errors are clustered by bilateral pair to account for serial-correlation (and heteroskedasticity). However, alternative types of clustering might be considered due to the different dimensions of the data. In Table A7, baseline standard errors (i.e. clustered by bilateral pair) are reported in column 2 (for a sake of comparison) and alternative types of standard errors are considered in the consecutive columns. We consider standard errors: without clustering (column 3), clustered by bank (column 4), clustered by destination country (column 5), and doubled clustered by bank and destination country (column 6). Therefore, we account for potential correlation within base groups (i.e., banks in column 4 and destination countries in column 5), as well as combination of the base groups (column 6). Table A7 shows that standard errors are smaller when they are not clustered. Further, alternative types of clustering do not modify previous conclusions. We only note that variable common language ($Lang_{i,j}$) can turn non significant at the 10% level in column (4) and (6).

6 Conclusion

We examine new regulatory data informing the foreign activity of EU banks. We use the gravity framework to disentangle the foreign activity which can be explained by standard factors from what can not; abnormal activity represents twice the predictions of the model on average and we

point to important heterogeneity across TH. We find that CbCR was associated with a decrease in abnormal activity by one third on average but in the meanwhile, Hong Kong has experienced a growing abnormal activity. In total, we find that abnormal activity is even more concentrated than at the time CbCR was introduced.[12]

CbCR proves to be a very interesting source of data, which raises subsequent research avenues. To fully benefit from this new information, its dissemination needs to be improved. It is possible without significant costs. As of now, the data need to be manually and separately collected for each bank. The data are usually provided within the financial reports, not readily available, and with notable differences across banks. Several recommendations of the International Open Data Charter could be applied.[13] The data need to be provided in open, multiple, and standardized formats, so that it can more easily be processed and used by a wide range of parties (scholars, journalists, NGOs, etc.). Once standardized, the data need to be published on a central portal managed by the European Central Bank or the European Banking Authority. Additional information reporting could be reported without additional costs: the number and the names of affiliates, total asset and more generally some aggregate items of the balance sheet to better reflect affiliates underlying activity. Finally, the CbCR has first been applied to financial institutions, but there are strong pressures in Europe and the US to impose the CbCR to all large MNEs. Such extension would constitute a highly valuable source in research.

References

Alworth, J. and Andresen, S. (1992). The determinants of cross-border non-bank deposits and the competitiveness of financial market centres. *Money Affairs*, 5(2):105–33.

Anderson, J. E. (1979). A Theoretical Foundation for the Gravity Equation. *American Economic Review*, 69(1):106–116.

Bergstrand, J. H. (1985). The gravity equation in international trade: some microeconomic foundations and empirical evidence. *The review of economics and statistics*, pages 474–481.

Bosquet, C. and Boulhol, H. (2014). Applying the GLM variance assumption to overcome the scale-dependence of the Negative Binomial QGPML estimator. *Econometric Reviews*, 33(7):772–784.

[12] We already mentioned the finding of Joshi et al. (2019) who showed that income shifting of non banks affiliates increased over the period.

[13] In July 2013, G8 leaders signed the G8 Open Data Charter, which outlined a set of core open data principles. See http://opendatacharter.net/

Bouvatier, V. and Delatte, A.-L. (2015). Waves of international banking integration: A tale of regional differences. *European Economic Review*, 80:354–373.

Brown, R. J., Jorgensen, B. N., and Pope, P. F. (2019). The interplay between mandatory country-by-country reporting, geographic segment reporting, and tax havens: Evidence from the european union. *Journal of Accounting and Public Policy*, 38(2):106–129.

Buch, C. M. (2002). Are banks different? evidence from international data. *International Finance*, 5(1):97–114.

Buch, C. M. (2003). Information or regulation: What drives the international activities of commercial banks? *Journal of money, Credit and Banking*, pages 851–869.

Buch, C. M. (2005). Distance and international banking. *Review of International Economics*, 13(4):787–804.

Damgaard, J., Elkjaer, T., and Johannesen, N. (2019). *What Is Real and What Is Not in the Global FDI Network?* International Monetary Fund.

Delatte, A. L., Guillin, A., and Vicard, V. (2020). Grey zones in global finance: the distorted geography of cross-border investments. CEPR Discussion Paper 14756, Center for Economic Policy Research.

Demirgüç-Kunt, A. and Huizinga, H. (2001). The taxation of domestic and foreign banking. *Journal of Public Economics*, 79(3):429–453.

Dharmapala, D. (2008). What problems and opportunities are created by tax havens? *Oxford Review of Economic Policy*, 24:661–679.

Dharmapala, D. and Hines, Jr., J. R. (2009). Which countries become tax havens? *Journal of Public Economics*, 93:1058–1068.

Dutt, V. K., Nicolay, K., Vay, H., and Voget, J. (2019). Can european banks' country-by-country reports reveal profit shifting? an analysis of the information content of eu banks' disclosures. *An Analysis of the Information Content of EU Banks' Disclosures*, pages 19–042.

Fatica, S. and Wildmer, G. (2018). Profit shifting by eu banks: evidence from country-by-country reporting. Technical report, JRC Working Papers in Economics and Finance.

Garcia-Bernardo, J., Fichtner, J., Takes, F. W., and Heemskerk, E. M. (2017). Uncovering offshore financial centers: Conduits and sinks in the global corporate ownership network. *Scientific Reports*, 7(1):1–10.

Haberly, D. and Wójcik, D. (2015). Regional blocks and imperial legacies: Mapping the global offshore fdi network. *Economic Geography*, 91(3):251–280.

Head, K. and Ries, J. (2008). Fdi as an outcome of the market for corporate control: Theory and evidence. *Journal of International Economics*, 74(1):2–20.

Hines, Jr., J. and Rice, E. (1994). Fiscal paradise: Foreign tax havens and American business. *Quarterly Journal of Economics*, 109:149–182.

Huizinga, H. and Nicodème, G. (2004). Are international deposits tax-driven. *Journal of Public Economics*, 88(6):1093–1118.

Johannesen, N. (2014). Tax evasion and swiss bank deposits. *Journal of Public Economics*, 111:46–62.

Johannesen, N. and Zucman, G. (2014). The end of bank secrecy? an evaluation of the g20 tax haven crackdown. *American Economic Journal: Economic Policy*, 6(1):65–91.

Joshi, P., Outslay, E., and Persson, A. (2019). Does public country-by-country reporting deter tax avoidance and income shifting? evidence from the european banking industry. *Contemporary Accounting Research*.

Levin, C. and Coleman, N. (2008). Tax haven banks and US tax compliance senate hearing 110-614. Washington, DC: US Senate.

Merz, J. and Overesch, M. (2016). Profit shifting and tax response of multinational banks. *Journal of Banking & Finance*, 68:57–68.

Murphy, R., Janskỳ, P., and Shah, A. (2019). Beps policy failure—the case of eu country-by-country reporting1. *Nordic Tax Journal*, 1.

Okawa, Y. and van Wincoop, E. (2012). Gravity in international finance. *Journal of International Economics*, 87(2):205–215.

Overesch, M. and Wolff, H. (2019). Financial transparency to the rescue: effects of country-by-country reporting in the eu banking sector on tax avoidance. *Available at SSRN 3075784*.

Papaioannou, E. (2009). What drives international financial flows? politics, institutions and other determinants. *Journal of Development Economics*, 88(2):269–281.

Portes, R., Rey, H., and Oh, Y. (2001). Information and capital flows: the determinants of transactions in financial assets. *European Economic Review*, 45(4):783–796.

Santos Silva, J. M. C. and Tenreyro, S. (2006). The Log of gravity. *The Review of Economics and Statistics*, 88(4):641–658.

Shaxson, N. (2018). How to crack down on tax havens: Start with the banks. *Foreign Affairs*, March-April:94–107.

US Senate (2003). Tax shelter industry the role of accountants lawyers and financial professionals. Washington, DC: US Senate.

Tables

Table 1: Descriptive Statistics at the bank level

This table reports for each bank the country of origin, the number of foreign destinations, total foreign turnover, the total number of employees, total profit and the total amount of tax paid. Figures are averages over 2015-2018 in Euros million (except Employees). Source: Banks' annual reports 2015-2018, Country by country reporting (CbCR). Authors' calculations.

Panel A. In all foreign countries

Bank name	Country	No.	Turnover	Employees	Profit	Tax
ABN Amro	NLD	16	1,680	3,881	481	113
BBVA	ESP	34	17,984	100,496	7,048	1,866
BNP Paribas	FRA	66	28,917	130,949	8,327	-1,191
BPCE	FRA	59	4,931	11,777	1,621	-51
Banca Mps	ITA	6	114	444	24	-7
Barclays	GBR	41	16,251	59,530	3,569	1,050
Bayern LB	DEU	5	120	145	29	2
Caixa Bank	ESP	4	425	2,497	.	.
Commerzbank	DEU	9	2,656	9,536	1,032	225
Crédit Agricole	FRA	46	9,249	34,856	3,230	-492
Crédit Mutuel	FRA	17	2,874	12,881	938	-304
DZ Bank	DEU	19	1,360	3,009	467	-77
Danske Group	DNK	15	3,209	9,519	1,302	-304
Deutsche Bank	DEU	52	18,688	53,637	933	-377
Erste Group	AUT	6	3,592	28,604	1,479	-267
HSBC	GBR	62	43,961	200,448	17,032	2,611
Handelsbanken	SWE	16	1,600	4,616	597	-152
Helaba	DEU	4	247	260	114	-51
ING	NLD	37	11,917	38,336	5,000	760
Intesa Saopaolo	ITA	31	4,910	25,658	2,660	-226
KBC	BEL	17	3,051	18,178	1,574	9
LBBW	DEU	8	251	233	152	-13
Lloyds	GBR	7	659	1,410	347	1
Nationwide	GBR	2	58	67	53	3
NordLB	DEU	5	359	390	138	5
Nordea	SWE	19	7,546	23,159	3,481	-276
RBS	GBR	41	2,065	22,219	-1,244	31
Rabobank	NLD	36	8,743	11,182	1,347	450
SEB	SWE	17	3,235	7,952	998	-232
Sabadell	ESP	2	1,101	7,846	134	-42
Santander	ESP	33	12,322	44,386	4,021	1,029
Société Générale	FRA	76	13,431	80,997	4,963	-418
Standard Chartered	GBR	58	12,235	84,272	2,116	757
Swedbank	SWE	5	767	7,016	413	83
Unicredit	ITA	23	10,657	54,756	3,080	-311
Total			251,163	1,095,137	77,454	4,207

Table 1: Descriptive Statistics at the bank level (continued)

Panel B. In TH (relative to the total foreign turnover)

Bank name	Turnover	Employees	Profit	Tax
ABN Amro	26.0%	23.8%	37.1%	12.4%
BBVA	1.3%	0.3%	2.0%	0.7%
BNP Paribas	11.7%	8.2%	11.8%	9.7%
BPCE	10.4%	8.6%	13.8%	3.5%
Banca Mps	0.7%	0.1%	3.9%	3.8%
Barclays	15.1%	6.4%	26.9%	8.4%
Bayern LB	7.3%	8.0%	22.6%	-16.7%
CaixaBank	0.0%	0.0%	0.0%	0.0%
Commerzbank	15.0%	7.4%	18.7%	8.5%
Crédit Agricole	19.2%	13.0%	18.8%	11.8%
Crédit Mutuel	17.4%	11.1%	21.3%	15.0%
DZ Bank	62.7%	50.2%	70.6%	76.5%
Danske Group	5.4%	1.5%	7.5%	0.7%
Deutsche Bank	19.9%	9.8%	172.0%	9.2%
Erste Group	0.0%	0.0%	0.0%	0.0%
HSBC	40.6%	19.2%	55.9%	41.9%
Handelsbanken	1.7%	2.0%	0.5%	1.5%
Helaba	17.7%	40.7%	5.3%	0.5%
ING	8.1%	4.3%	10.4%	7.4%
Intesa Saopaolo	33.0%	2.2%	37.6%	33.3%
KBC	20.0%	7.3%	28.6%	132.4%
LBBW	10.0%	25.6%	5.9%	9.4%
Lloyds	29.9%	56.4%	22.2%	-303.9%
Nationwide	100.0%	100.0%	100.0%	100.0%
NordLB	52.3%	59.9%	41.0%	61.9%
Nordea	5.2%	2.3%	6.5%	10.8%
RBS	64.8%	24.7%	-30.4%	80.8%
Rabobank	12.1%	4.9%	12.1%	2.4%
SEB	11.5%	5.6%	7.1%	5.5%
Sabadell	0.0%	0.0%	0.0%	0.0%
Santander	0.6%	0.2%	0.9%	0.4%
Société Générale	17.0%	5.8%	19.8%	8.2%
Standard Chartered	36.2%	16.1%	45.8%	14.1%
Swedbank	0.0%	0.0%	0.0%	0.0%
Unicredit	7.5%	0.9%	8.3%	5.3%

Table 2: EU banks foreign activities

This table provides measures of foreign activity by EU banks (in Million Euros except for Employees and Panel B). The sample includes 35 Global- and Domestic-Systemically Important Banks (SIBs) in the EU. Turnover = total net turnover; Employees = number of employees; Profit = profit made before tax; Tax = income tax due in the country as a reason of the profits made in the current year in that country. Data are displayed separately for tax havens (TH) and other countries (Non-TH). TH are also breakdown by size: XSmall = Population < 100,000; Small = 100,000 < Population < 1 million; Medium = Population > 1 million. Source: CbCR. Authors' calculations.

	2015	2016	2017	2018	Average 2015-2018	Growth 2015-2018
Turnover	245,448	279,368	240,359	239,476	251,163	-2.4%
TH	49,640	44,997	46,220	46,259	46,779	-6.8%
XS	3,922	2,967	2,597	2,378	2,966	-39.4%
S	10,254	9,128	8,568	9,338	9,322	-8.9%
M	35,464	32,902	35,055	34,543	34,491	-2.6%
Non-TH	195,809	234,371	194,139	193,217	204,384	-1.3%
Employees	1,110,842	1,235,517	1,034,454	1,013,321	1,098,534	-8.8%
TH	106,055	101,735	99,847	92,224	99,965	-13.0%
XS	9,677	7,861	7,310	7,146	7,998	-26.2%
S	14,544	14,143	14,152	14,234	14,268	-2.1%
M	81,834	79,732	78,386	70,844	77,699	-13.4%
Non-TH	1,004,787	1,133,782	934,606	921,097	998,568	-8.3%
Profit	66,775	81,703	81,767	78,647	77,223	17.8%
TH	22,261	18,035	19,631	20,675	20,151	-7.1%
XS	1,598	1,429	1,160	934	1,280	-41.6%
S	6,041	5,542	4,634	4,953	5,293	-18.0%
M	14,622	11,064	13,837	14,788	13,578	1.1%
Non-TH	44,513	63,668	62,136	57,972	57,072	30.2%
Tax	16,410	756	-1,086	788	4,217	-95.2%
TH	2,584	545	169	539	959	-79.1%
XS	212	19	59	66	89	-68.9%
S	628	-532	-621	-548	-268	-187.3%
M	1,743	1,059	731	1,022	1,139	-41.4%
Non-TH	13,826	211	-1,256	249	3,258	-98.2%

Table 2: EU Bank activities in foreign countries (continued)

	2015	2016	2017	2018	Average 2015-2018	Growth 2015-2018
Turnover/Employees	220,957	226,114	232,354	236,327	228,635	7.0%
TH	468,059	442,292	462,907	501,591	467,951	7.2%
XS	405,338	377,448	355,259	332,835	370,849	-17.9%
S	705,009	645,434	605,413	656,002	653,328	-7.0%
M	433,363	412,653	447,218	487,590	443,905	12.5%
Non-TH	194,876	206,716	207,723	209,768	204,677	7.6%
Profit/Turnover	27.2%	29.2%	34.0%	32.8%	30.7%	20.7%
TH	44.8%	40.1%	42.5%	44.7%	43.1%	-0.3%
XS	40.7%	48.2%	44.7%	39.3%	43.2%	-3.6%
S	58.9%	60.7%	54.1%	53.0%	56.8%	-10.0%
M	41.2%	33.6%	39.5%	42.8%	39.4%	3.8%
Non-TH	22.7%	27.2%	32.0%	30.0%	27.9%	32.0%
Tax/Profit	24.6%	0.9%	-1.3%	1.0%	5.5%	-95.9%
TH	11.6%	3.0%	0.9%	2.6%	4.8%	-77.5%
XS	13.3%	1.3%	5.1%	7.1%	6.9%	-46.8%
S	10.4%	-9.6%	-13.4%	-11.1%	-5.1%	-206.5%
M	11.9%	9.6%	5.3%	6.9%	8.4%	-42.1%
Non-TH	31.1%	0.3%	-2.0%	0.4%	5.7%	-98.6%

Table 3: The gravity model applied to bank international turnover: Baseline estimates

This table provides estimates from the gravity model, using the PPML approach. The sample includes 35 Global- and Domestic-Systemically Important Banks (SIBs) in the EU (2015-2018). All estimates include bank-fixed effects and year-fixed effect Standard errors are clustered by bilateral pair (bank-destination). Robust standard errors in parenthesis: *** p<0.01, ** p<0.05, * p<0.10.

	(1)		(2)		(3)		(4)	
Endogenous variable:	Turnover		Turnover		Turnover		Turnover	
Destinations:	All		All		All		non-TH	
$\log(\text{GDPCAP}_{j,t})$	1.5004***	(0.0993)	1.4072***	(0.0906)	1.3560***	(0.1084)	1.3589***	(0.1066)
$\log(\text{Pop}_{j,t})$	0.7012***	(0.0617)	0.7885***	(0.0444)	0.8568***	(0.0552)	0.8575***	(0.0548)
$\log(\text{dist}_{i,j})$	-3.9900***	(0.6818)	-4.3443***	(0.7538)	-3.5532***	(0.7737)	-3.4909***	(0.7563)
$\log(\text{dist}_{i,j})^2$	0.2450***	(0.0450)	0.2679***	(0.0502)	0.2097***	(0.0514)	0.2049***	(0.0503)
$\text{Euro}_{i,j}$	0.3618	(0.2365)	0.5004*	(0.2649)	-0.1206	(0.2788)	-0.1658	(0.2782)
$\text{Contig}_{i,j}$	0.0674	(0.3158)	-0.0725	(0.3449)	0.4737	(0.3378)	0.4945	(0.3449)
$\text{L}_{i,j}$	0.6741***	(0.2313)	0.6029**	(0.2359)	0.5653**	(0.2660)	0.5970**	(0.2580)
$\text{Colony}_{i,j}$	1.3555***	(0.1840)	1.3644***	(0.1903)	1.4143***	(0.2446)	1.3859***	(0.2472)
$\text{RTA}_{i,j}$	0.6600***	(0.2411)	0.7007***	(0.2439)	1.0676***	(0.2657)	1.0497***	(0.2581)
$\text{Territory}_{i,j}$	0.3612	(0.5820)	0.4337	(0.5305)	0.5655	(0.6385)	0.5852	(0.6421)
TH_j			0.8155**	(0.3747)	-11.5500	(7.4486)		
$\log(\text{GDPCAP}_{j,t})\times\ \text{TH}_j$					-0.3046	(0.4632)		
$\log(\text{Pop}_{j,t})\times\ \text{TH}_j$					0.0279	(0.1607)		
$\log(\text{dist}_{i,j})\times\ \text{TH}_j$					4.5916**	(2.1297)		
$\log(\text{dist}_{i,j})^2\times\ \text{TH}_j$					-0.3041**	(0.1450)		
$\text{Euro}_{i,j}\times\ \text{TH}_j$					2.6667***	(0.7722)		
$\text{Contig}_{i,j}\times\ \text{TH}_j$					-0.5613	(0.6686)		
$\text{L}_{i,j}\times\ \text{TH}_j$					1.4533***	(0.5423)		
$\text{Colony}_{i,j}\times\ \text{TH}_j$					-0.6122	(0.4846)		
$\text{RTA}_{i,j}\times\ \text{TH}_j$					-3.6627***	(1.1143)		
$\text{Territory}_{i,j}\times\ \text{TH}_j$					-0.9140	(0.8411)		
No. obs.	31640		31640		31640		24888	
No. positive obs.	3192		3192		3192		2552	
No. banks	35		35		35		35	
No. partners	227		227		227		184	
No. TH	43		43		43			
Log Likelihood	-1270044		-1245134		-1125760		-946563	
R^2	0.2836		0.2900		0.4151		0.4306	
Pseudo-R^2	0.6608		0.6675		0.6993		0.6675	

Table 4: Bank distortions in tax havens

This table provides some measures of banking distortions by EU banks in tax havens (TH). The results are displayed for each TH, and aggregated for TH and other countries (Non-TH). Column 1: Country. Column 2: Size (XSmall = Population < 100,000; Small = 100,000 < Population < 1 million; Medium = Population > 1 million). Columns 3-5: Turnover (yearly average). Column 6-8: Abnormal turnover (estimated using spec. 4 from Table 3). Turnover and abnormal turnover are displayed successively in €million (col. 3 and 6), in percentage of GDP (col. 4 and 7), in percentage in the total for TH (col. 5 and 8). The sample includes 35 Global- and Domestic-Systemically Important Banks (SIBs) in the EU over 2015-2018. Source: CbCR. Authors' calculations.

Panel A. Breakdown by TH

Country code	Size	Turnover			Abnormal turnover			Turnover/
		€million	% of GDP	% of TH	€million	% of GDP	% of TH	Predicted
BHR	M	244	0.51	0.52	104	0.22	0.68	1.74
BHS	S	2	0.03	0.01	-67	-0.94	-0.06	0.04
BMU	XS	310	7.69	0.66	261	6.46	1.03	6.28
CHE	M	2,637	0.74	5.64	-4,350	-1.23	-10.79	0.38
CUW	XS	89	3.88	0.19	72	3.13	0.31	5.21
CYM	XS	169	9.23	0.36	122	6.66	0.52	3.59
CYP	M	18	0.08	0.04	-182	-0.87	0.05	0.09
GGY	XS	434	17.25	0.93	330	13.10	1.25	4.15
GIB	XS	64	4.51	0.14	47	3.29	0.23	3.70
HKG	M	21,239	6.85	45.40	20,188	6.51	72.70	20.21
IMN	XS	561	11.48	1.20	391	7.99	1.58	3.29
IRL	M	4,282	1.95	9.15	-4,444	-2.02	-14.64	0.49
JEY	XS	839	20.71	1.79	674	16.65	2.54	5.10
JOR	M	29	0.05	0.06	-238	-0.39	0.04	0.11
LBN	M	28	0.04	0.06	-573	-0.93	0.04	0.05
LUX	S	8,706	20.90	18.61	6,677	16.03	24.48	4.29
MAC	XS	100	0.22	0.21	-19	-0.04	0.30	0.84
MCO	XS	542	10.29	1.16	518	9.83	1.88	22.28
MDV	S	15	0.37	0.03	5	0.12	0.04	1.49
MLT	S	398	3.35	0.85	242	2.03	1.19	2.55
PAN	M	13	0.02	0.03	-414	-0.63	-0.16	0.03
SGP	M	6,001	1.70	12.83	4,425	1.25	16.47	3.81
SXM	XS	3	1.03	0.01	-12	-4.52	0.01	0.19
VGB	XS	44	12.17	0.09	18	4.87	0.27	1.67
VUT	S	12	2.34	0.03	10	1.97	0.04	6.34
TH	All	46,779	1.99	100	23,783	1.46	100	2.03
	XS	3,055	11.35	6.53	2,419	8.99	10.17	4.80
	S	9,233	8.32	19.74	6,848	6.17	28.79	3.87
	M	34,491	2.31	73.73	14,516	0.97	61.04	1.73
Non-TH		204,384	0.86		2,232	0.01		1.01

Table 4: Bank distortions in tax havens (continued)

Panel B. Breakdown by banks

Bank	Turnover in TH			Abnormal turnover in TH			Turnover/
	€million	% domestic	% of TH	€million	% domestic	% of TH	Predicted
ABN Amro	437	6.14	0.93	355	4.99	1.49	5.34
BBVA	226	3.57	0.48	-467	-7.38	-1.96	0.33
BNP Paribas	3,374	23.95	7.21	562	3.99	2.36	1.20
BPCE	514	2.69	1.10	27	0.14	0.12	1.06
Banca Mps	1	0.02	0.00	-12	-0.29	-0.05	0.06
Barclays	2,457	14.39	5.25	-487	-2.85	-2.05	0.83
Bayern LB	9	0.54	0.02	0	-0.02	0.00	0.97
CaixaBank	0	0.00	0.00	-17	0.00	-0.07	0.00
Commerzbank	397	5.64	0.85	214	3.04	0.90	2.17
Crédit Agricole	1,779	14.48	3.80	956	7.79	4.02	2.16
Crédit Mutuel	500	5.12	1.07	238	2.44	1.00	1.91
DZ Bank	853	27.77	1.82	812	26.43	3.41	20.75
Danske Group	172	2.37	0.37	51	0.70	0.21	1.42
Deutsche Bank	3,724	33.34	7.96	2,511	22.47	10.56	3.07
Erste Group	0	0.00	0.00	-200	0.00	-0.84	0.00
HSBC	17,857	113.63	38.17	12,286	78.18	51.66	3.21
Handelsbanken	27	0.97	0.06	-34	-1.25	-0.14	0.44
Helaba	44	2.53	0.09	27	1.57	0.11	2.65
ING	967	17.10	2.07	247	4.37	1.04	1.34
Intesa Saopaolo	1,621	8.75	3.46	1,251	6.76	5.26	4.39
KBC	611	18.66	1.31	454	13.87	1.91	3.90
LBBW	25	0.96	0.05	7	0.26	0.03	1.36
Lloyds	197	0.93	0.42	98	0.46	0.41	1.99
Nationwide	58	1.52	0.12	-418	-10.92	-1.76	0.12
NordLB	188	5.88	0.40	174	5.44	0.73	13.52
Nordea	394	13.73	0.84	119	4.14	0.50	1.43
RBS	1,338	9.59	2.86	1,183	8.48	4.97	8.63
Rabobank	1,061	4.38	2.27	555	2.29	2.33	2.10
SEB	372	8.09	0.80	262	5.70	1.10	3.38
Sabadell	0	0.00	0.00	-43	0.00	-0.18	0.00
Santander	71	4.08	0.15	-407	-23.53	-1.71	0.15
Société Générale	2,279	19.66	4.87	1,051	9.07	4.42	1.86
Standard Chartered	4,424	210.09	9.46	2,757	130.93	11.59	2.65
Swedbank	0	0.00	0.00	-30	0.00	-0.12	0.00
Unicredit	805	9.07	1.72	-302	-3.41	-1.27	0.73
All banks	46,779	17.43	100	23,780	8.86	100	2.03

Figures

Figure 1: Banks turnover in tax havens and market shares

This figure shows, for each bank k, the market share (turnover of bank k in all foreign countries / turnover of all banks in all foreign countries) in the x-axis, and the share of foreign turnover in tax havens (turnover of bank k in tax havens / turnover of bank k in all countries) in the y-axis; the size of the circles is proportionate to the turnover of bank k in tax havens (TH). Source: Authors' computation based on CbCR data.

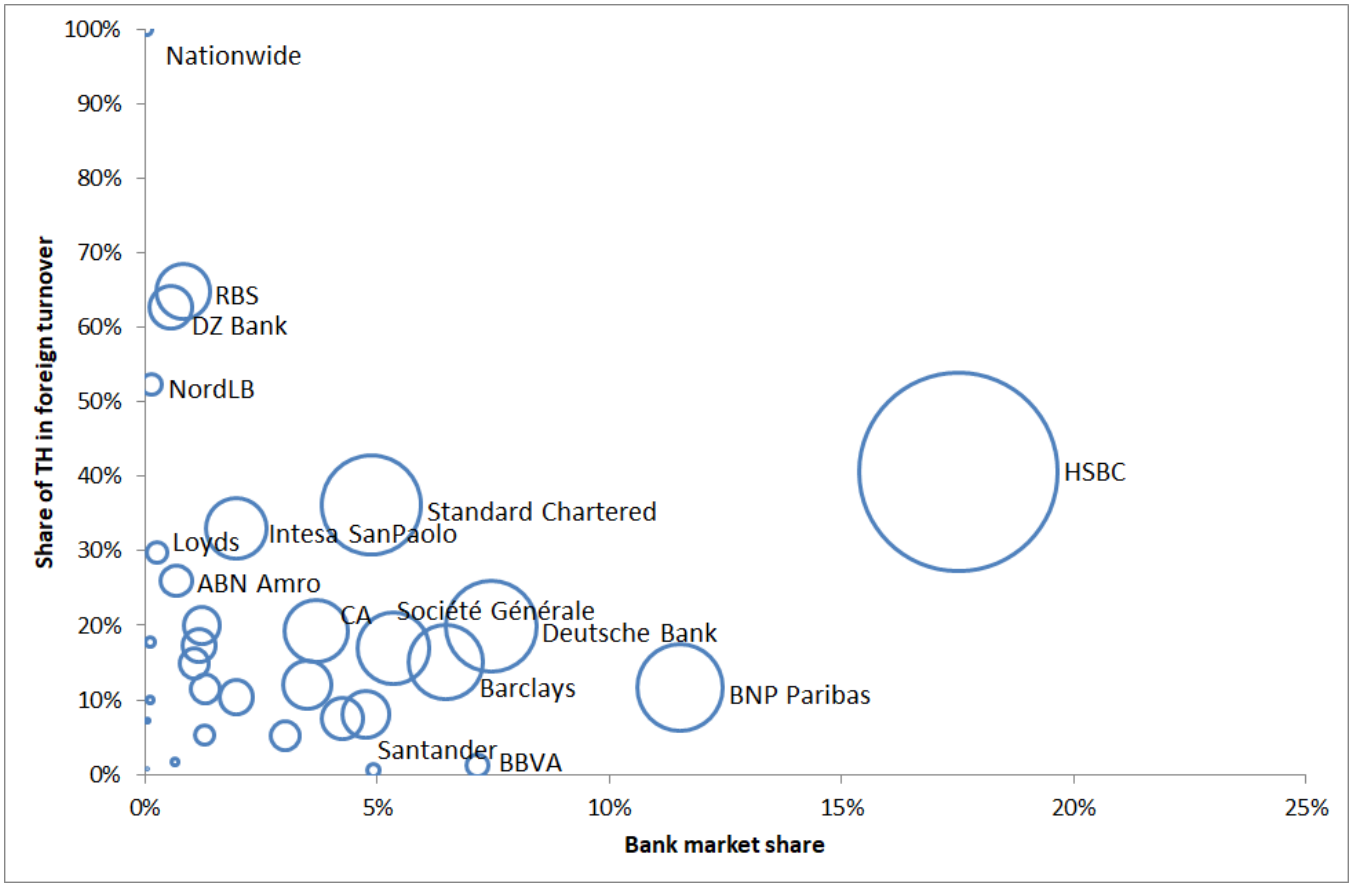


Figure 2: Country contribution to Tax Havens Banking

This figure shows the share of turnover in the total turnover of TH. Colors correspond to regions: Asia (green), UE (blue), UK (purple), Caribbean (yellow), Middle-East (pink). Source: Authors' computation based on CbCR data.

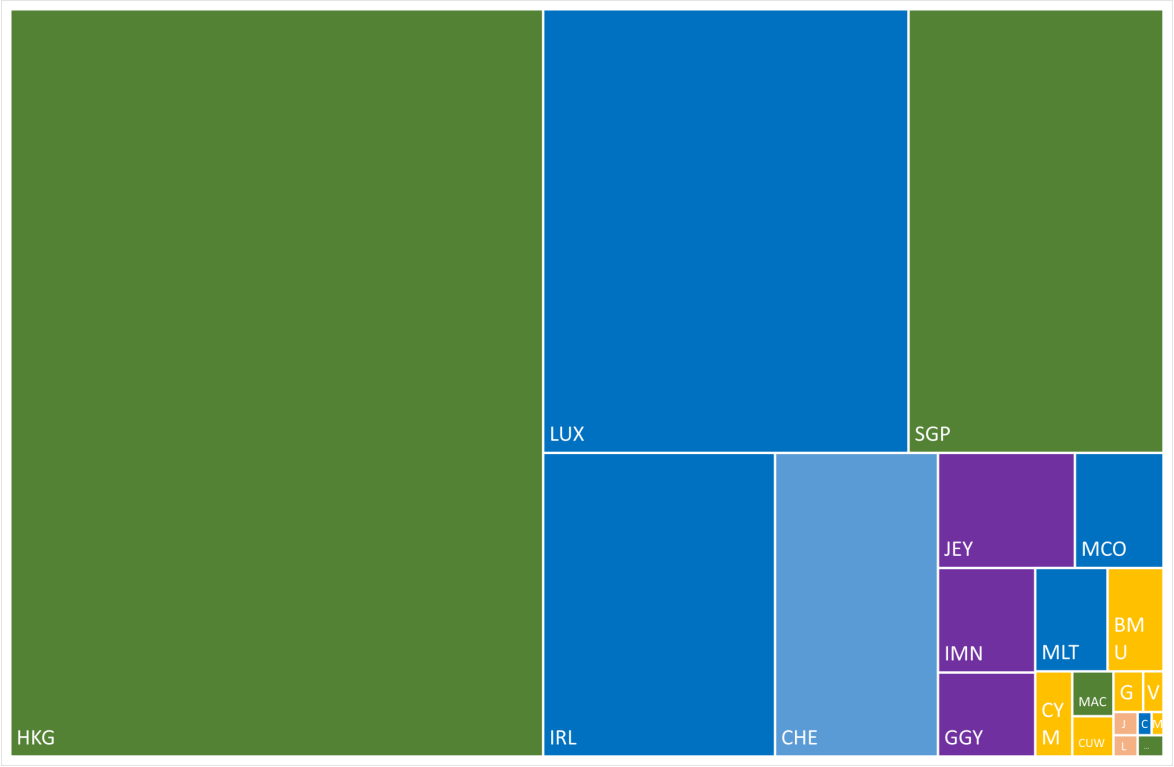


Figure 3: Abnormal banking activity in TH

This Figure plots the abnormal turnover of banks as a ratio of country j GDP (x-axis), the actual-to-predicted turnover in country j (y-axis), the share of abnormal turnover in country j in the total abnormal activity in TH (size of the circles) from the values reported on Panel A of Table 4. Countries with negative residuals are not represented. Colors correspond to regions: Asia (green), UE (blue), UK (purple), Caribbean (yellow), Middle-East (pink).

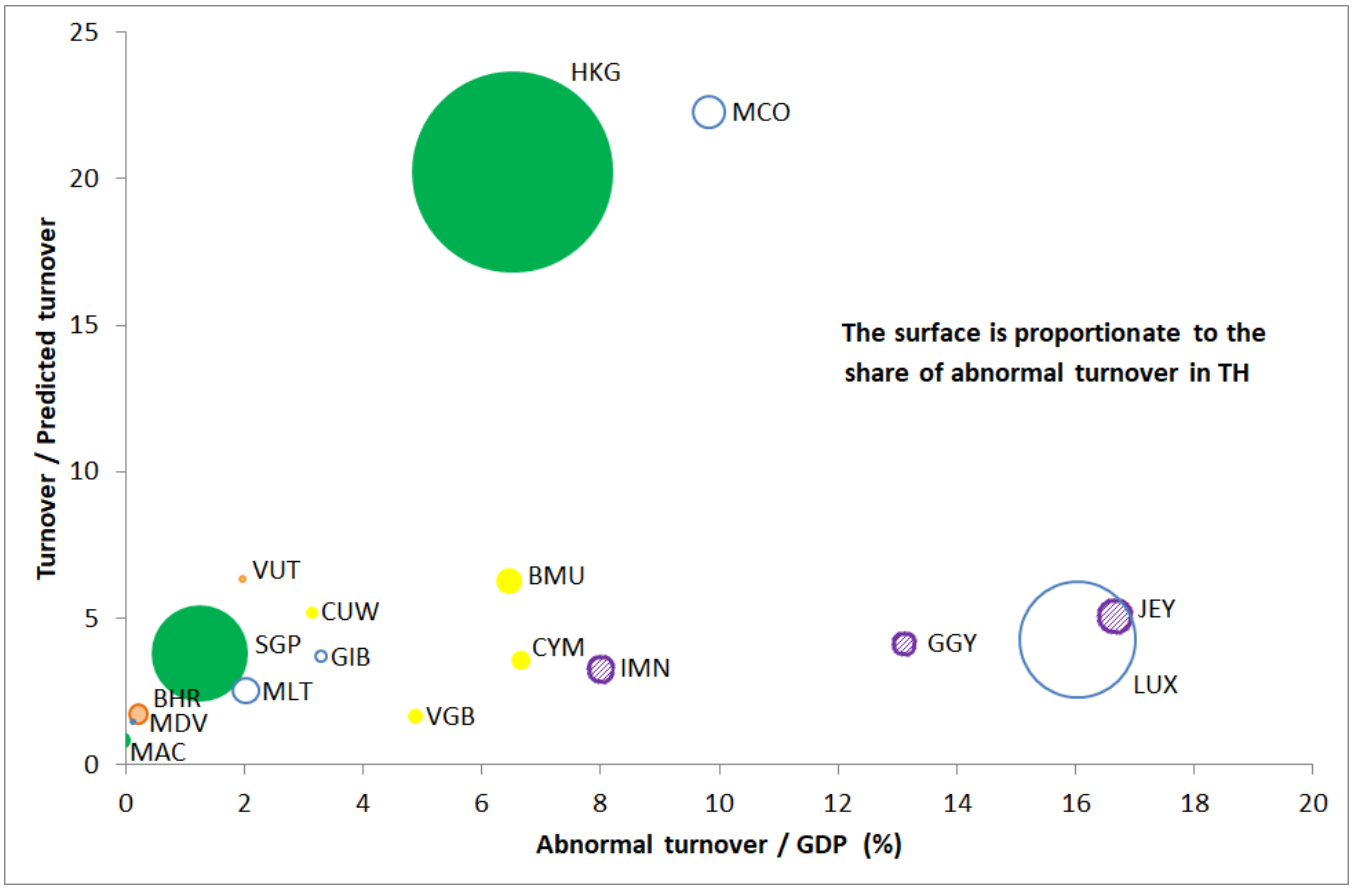


Figure 4: Geographic distortions: Time-Evolution

This Figure shows the value of actual turnover as a share of model's predictions by year and on average over 2015-2018. The prediction values are based on spec. 3 in Table 3. The thick body of the candlestick shows the first (2015) and the last (2018) values; wicks show the highest and lowest values; white (black) candles indicate an increase (decrease).

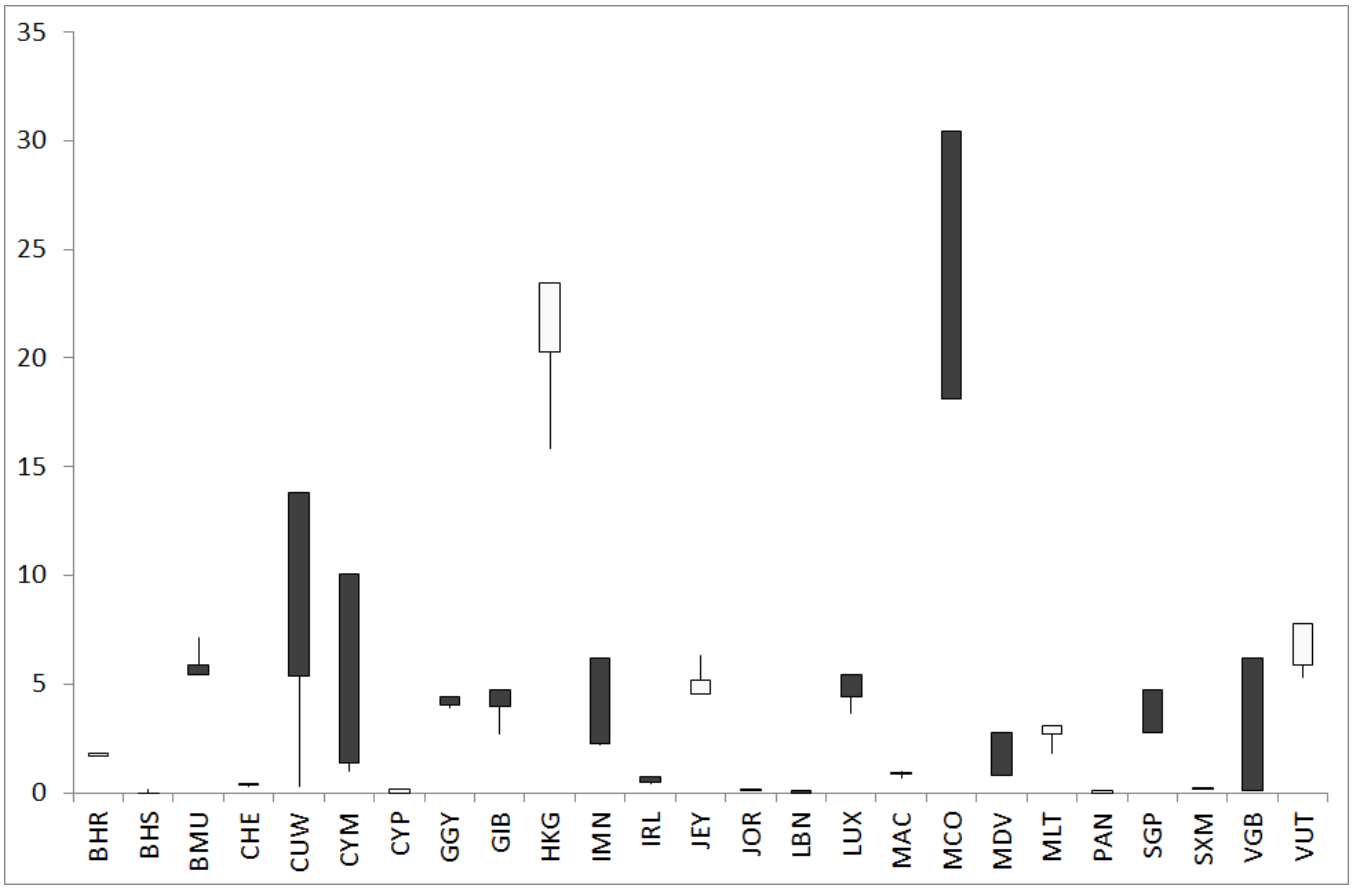


Figure 5: Economic share: Time-Evolution

This figure shows the value of the abnormal turnover to GDP by year and on average over 2015-2018. The prediction values are based on spec. 3 in Table 3. The thick body of the candlestick shows the first (2015) and the last (2018) values; wicks show the highest and lowest values; white (black) candles indicate an increase (decrease).

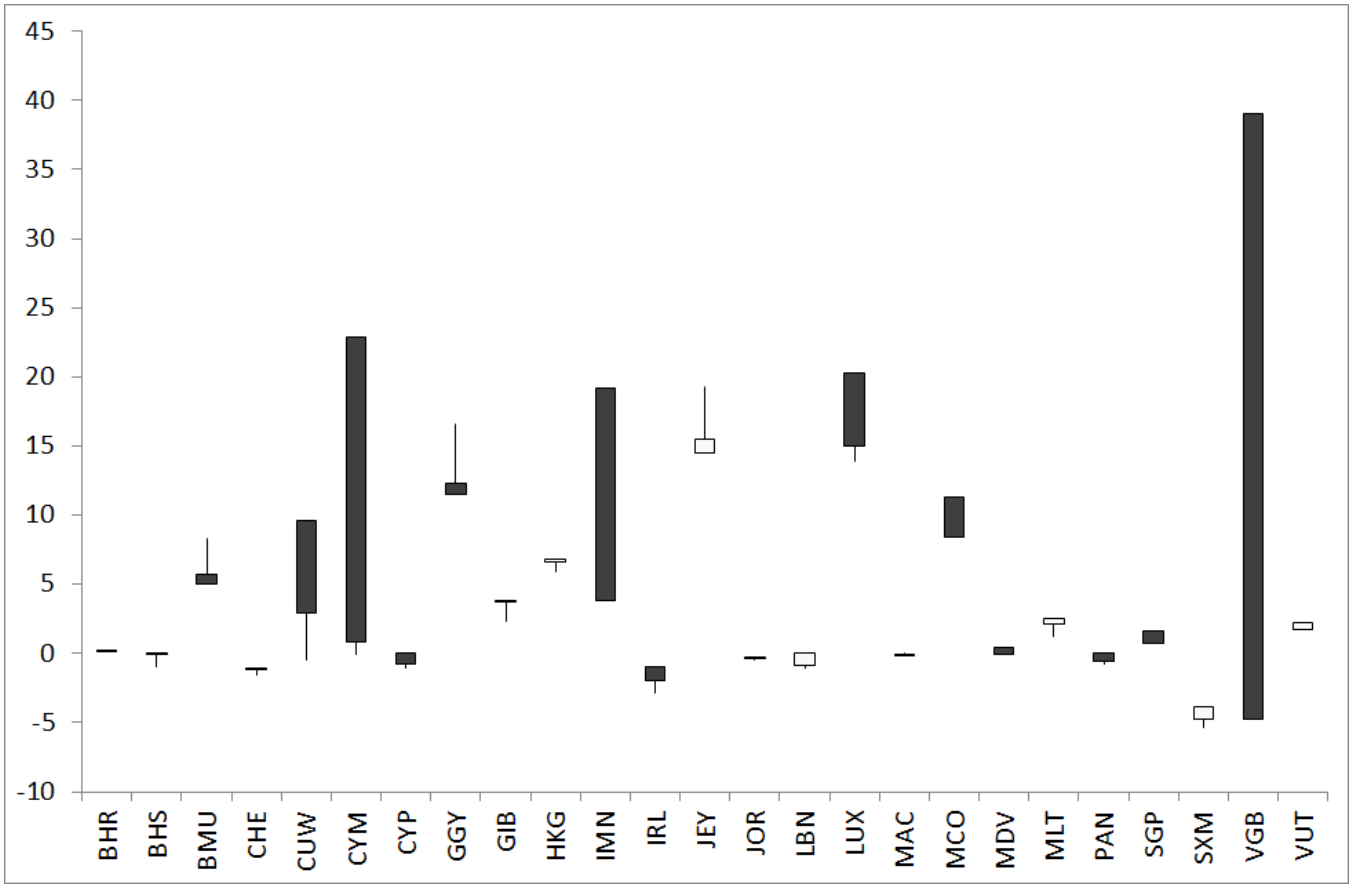


Figure 6: Individual contribution: Time-Evolution

This figure shows the ratio of abnormal turnover to total abnormal turnover booked in TH by year and on average over 2015-2018. The prediction values are based on spec. 3 in Table 3. The thick body of the candlestick shows the first (2015) and the last (2018) values; wicks show the highest and lowest values; white (black) candles indicate an increase (decrease).

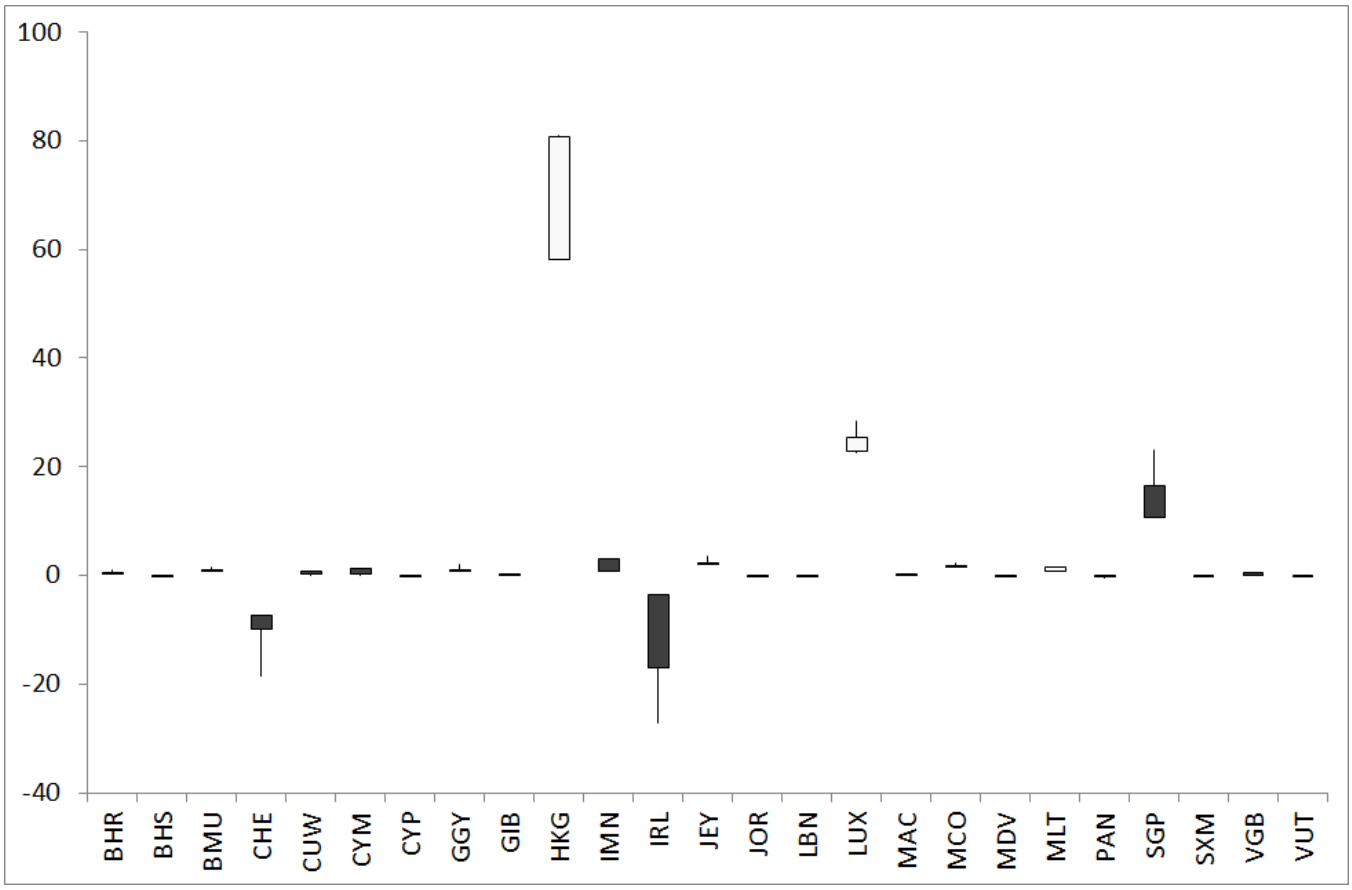


Figure 7: Robustness: Abnormal turnover across alternative specifications: scatter plot

This figure plots the values of abnormal turnover estimated from the baseline (x-axis) and six alternative estimates respectively (y-axis). Baseline corresponds to spec. 4 in Table 3. The six alternatives are *Small sample* is estimated on the sample of non-TH where banks report a non-null presence (115 countries); *Parsimonious* is estimated on a specification excluding non-significant coefficients; *Market Cap.* includes the market capitalization of country j as a proxy of agglomeration effect; Employees considers the number of employees instead of turnover as endogenous variable; *NB QGPML* is the baseline model estimated with the NB QGPML estimator; *Including TH* is estimated on a full sample including TH (spec. 1 in Table 3).

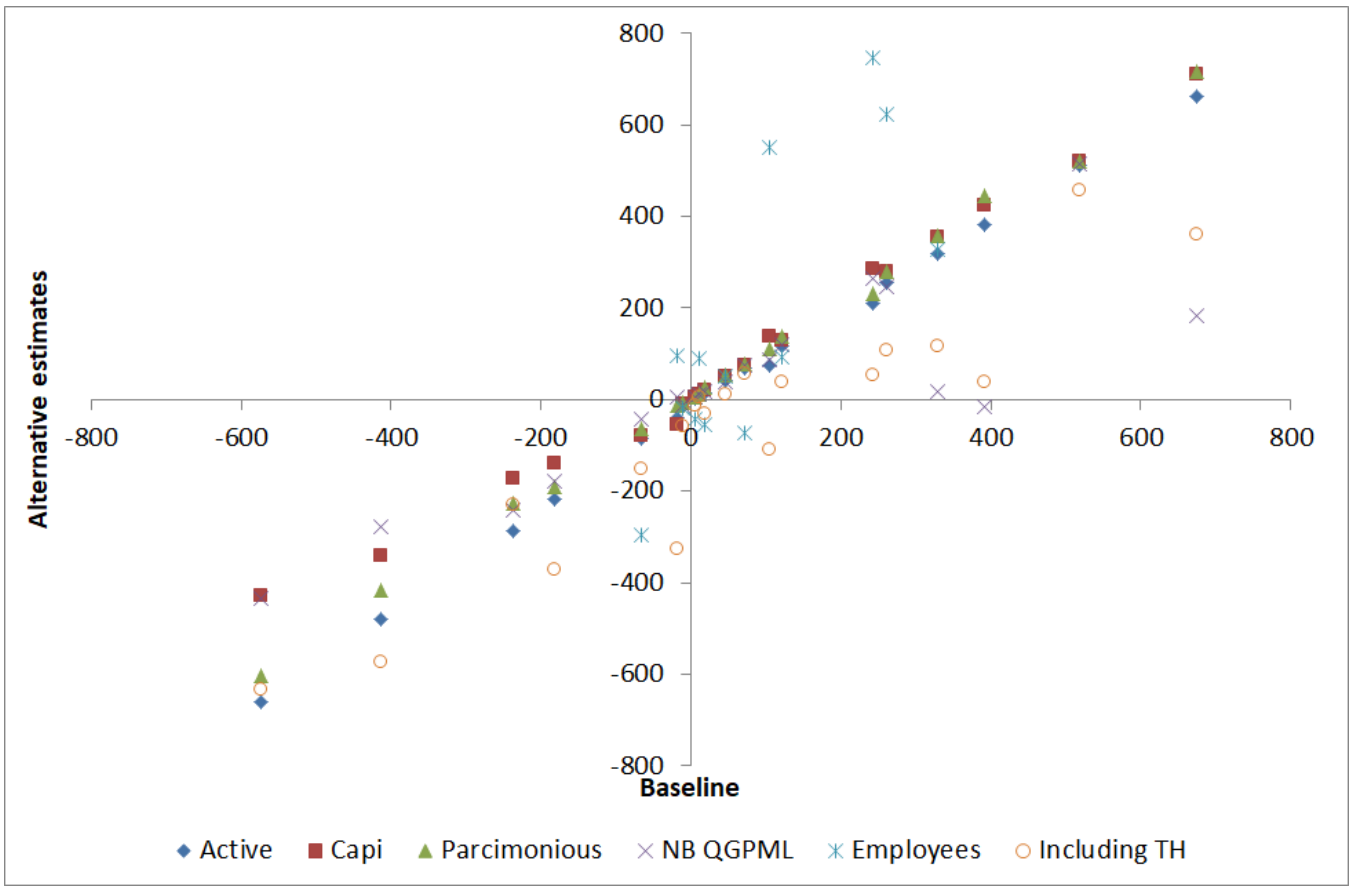
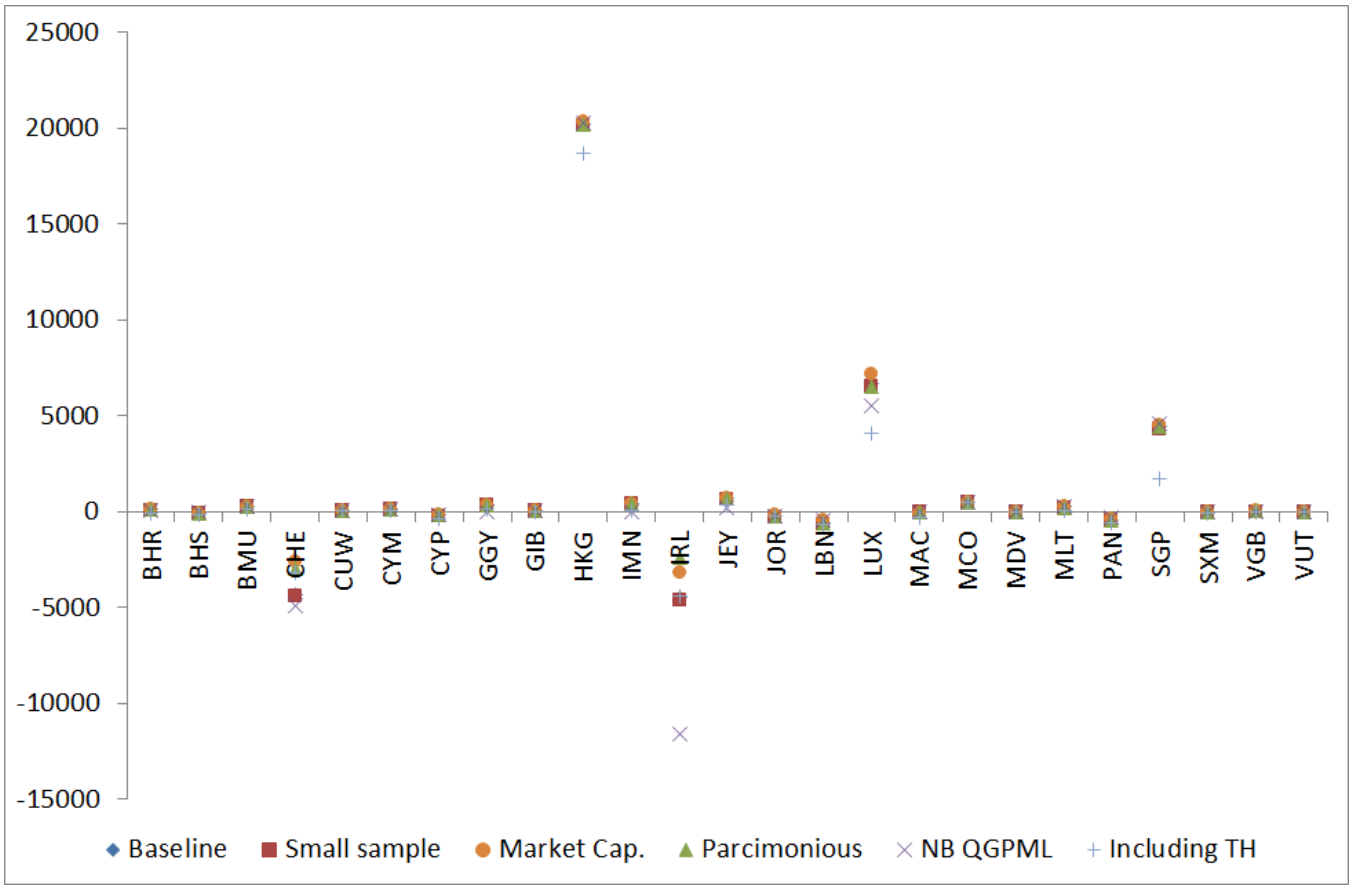


Figure 8: Robustness: Abnormal turnover across alternative specifications for each tax haven

This figure plots the values of abnormal turnover estimated from the baseline and five alternative estimates (y-axis) for each TH (x-axis). *Baseline* corresponds to spec. 4 in Table 3; *Small sample* is estimated on the sample of non-TH where banks report a non-null presence (115 countries); *Parsimonious* is estimated on a specification excluding non-significant coefficients; *Market Cap.* includes the market capitalization of country j as a proxy of agglomeration effect; *NB QGPML* is the baseline model estimated with the NB QGPML estimator; *Including TH* is estimated on a full sample including TH (spec. 1 in Table 3).



Appendix

Data

Country summary statistics

Table 5 displays country summary statistics. The small TH correspond to counties of less than 2 million people. The small TH represent 0.1% of our sample in terms of population and 0.3% in terms of GDP while big TH represent 0.7% of the population sample and 1.7% of the GDP. As stated by Dharmapala and Hines (2009), TH experienced high level of income per capita (more than twice that of the rest of the world). Unsurprisingly, the implicit tax rate is much lower in TH, 5% versus 17%, and the financial infrastructures are more developed (measured by the GFSI Index).

Table 5: Countries summary statistics

		Non-TH	Small TH	Large TH
Nb. countries		185	35	8
GDP (PPP, EUR bn)	Total	112,000	308	1,880
	Av.	605	9	235
	Percent.	98.1%	0.3%	1.6%
Pop. (thousand)	Total	7,260,000	6,942	48,500
	Av.	39,300	198	6,064
	Percent.	99.2%	0.1%	0.7%
GDP/capita (EUR)	Total	15,427	44,369	38,763
	Av.	17,786	36,643	38,763
Implicit Tax Rate		17%	5%	5%
Financial infrastructures		54	67	68

Source : CbCR. Sample : The 35 largest EU banks. The sample includes only countries where European banks declare subsidiaries. Effective tax rate is taken from the Bureau of Economic Analysis. Financial Infrastructure development is measured with the GFSI Index from Z/Yen Group.

The country-by-country reporting

Recital (52) of CRD clearly presents the motivations behind the CbCR[14]:

- "CBCR will help stakeholders to get a better understanding of groups' structures, their activities and geographical presence. In addition CBCR should help understanding of whether taxes

[14]See also http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014DC0676.

are being paid where the actual business activity takes place. Disclosure and transparency are seen as key regulatory tools which help to ensure that firms effectively implement their obligations and are accountable for the business strategies which they adopt."

- "The new CBCR obligations must be seen against the background of the recent financial crisis, in which unprecedented levels of public support were necessary in order to restore financial stability and the trust of citizens in the financial sector was heavily affected. This led to strong demands for banks to show greater accountability and increased transparency in their relations with the public."

- "Independently from the financial crisis, there are increasing calls on companies to take responsibility for their impact on society and the contribution that businesses make in the form of taxation is increasingly seen as part of corporate social responsibility. This has increased demand for more transparency in the tax affairs of large enterprises in particular where they have significant cross-border activities."

List of tax havens

The list of tax havens is derived from Hines and Rice (1994): Andorra, Anguilla, Antigua and Barbuda, Bahamas, Bahrain, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Channel Islands (Jersey, Guernsey), Cook Islands, Cyprus, Dominica, Gibraltar, Grenada, Hong Kong, Ireland, Isle of Man, Jordan, Lebanon, Liberia, Liechtenstein, Luxembourg, Macao, Maldives, Malta, Marshall Islands, Monaco, Montserrat, Netherlands Antilles (Aruba, Curaçao, Sint Maarten), Panama, Saint Kitts & Nevis, Saint Lucia, Saint Martin, Saint Vincent and the Grenadines, Singapore, Switzerland, Turks and Caicos Islands, Vanuatu.

Estimator

Our large sample includes 228 countries including a lot of null values of the dependent variable, turnover or number of employees. To address this statistical issue, we rely on the Poisson pseudo-maximum likelihood (PPML) estimator. In fact the PPML estimator has three main advantages to estimate a gravity model.

- First, the PPML estimator does not require a log-linear specification of the gravity model. Consequently, the PPML estimator is consistent in the presence of heteroskedasticity, while estimators requiring a log-linear specification, as the OLS estimator, can be biased and inconsistent (Santos Silva and Tenreyro (2006)). More specifically, heteroskedasticity might result from the log transformation of the original nonlinear gravity model. Consequently, this kind of heteroskedasticity does not only affect OLS standard errors but also OLS parameter estimates. Alternatively, the PPML estimator provides consistent estimates of the original nonlinear gravity model.

- Second, the PPML estimator provides a natural way to deal with zero values of the dependent variable. This is the case because it assumes that the zero and non-zero observations are produced by the same data generating process. Last, note that the PPML estimator is consistent, as a PML estimator, even if the data are not Poisson-distributed. In other words, no observation is dropped to estimate the model and PPML estimates are not exposed to a sample selection bias. Conversely, OLS estimates, using log transformation of the dependent variable, imply dropping the zero observations and are particularly exposed to a sample selection bias. A simple strategy to deal with the zero observations might be to arbitrarily add a small positive number (usually 0.5 or 1) to all observations but such ad-hoc approach might perform poorly.

- Last, interpretation of estimated coefficients is straightforward; estimated coefficients are interpreted as elasticities for covariates entered in logarithms and as semi-elasticities for covariates entered in levels. Note that estimated coefficients associated with dummy variables (as TH_j^{Hines} for instance) are not directly interpreted. The percentage change of the dependent variable when a dummy variable moves from 0 to 1 is given by $exp(\hat{\beta}) - 1$, where $\hat{\beta}$ is the estimated coefficients associated with dummy variable.

Robustness tests

- Small sample: only active destinations (A1)
- Alternative estimator: NB QGPML (A6)
- Alternative standard errors: alternative cluster definitions (A7)
- Employees: all destinations (A4) and only active destinations (A5)
- Parsimonious specification and agglomeration effects (A2 and A3)
- Annual estimates (A8)

Table A1: Robustness estimates: only active destinations

	(1)		(2)		(3)		(4)	
Endogenous variable:	Turnover		Turnover		Turnover		Turnover	
Destinations:	Active		Active		Active		No tax havens	
$\log(\text{GDPCAP}_{j,t})$	1.4064***	(0.1009)	1.3275***	(0.0942)	1.2824***	(0.1130)	1.2853***	(0.1108)
$\log(\text{Pop}_{j,t})$	0.6646***	(0.0630)	0.7473***	(0.0458)	0.8175***	(0.0564)	0.8182***	(0.0560)
$\log(\text{dist}_{i,j})$	-3.8191***	(0.6801)	-4.1552***	(0.7455)	-3.4651***	(0.7654)	-3.4014***	(0.7480)
$\log(\text{dist}_{i,j})^2$	0.2343***	(0.0447)	0.2560***	(0.0495)	0.2046***	(0.0509)	0.1996***	(0.0497)
$\text{Euro}_{i,j}$	0.3433	(0.2332)	0.4711*	(0.2608)	-0.1155	(0.2750)	-0.1628	(0.2744)
$\text{Contig}_{i,j}$	0.0844	(0.3181)	-0.0457	(0.3456)	0.4832	(0.3378)	0.5047	(0.3451)
$\text{L}_{i,j}$	0.6579***	(0.2312)	0.5896**	(0.2345)	0.5368**	(0.2670)	0.5694**	(0.2595)
$\text{Colony}_{i,j}$	1.3649***	(0.1833)	1.3725***	(0.1890)	1.4282***	(0.2460)	1.3996***	(0.2485)
$\text{RTA}_{i,j}$	0.6212**	(0.2414)	0.6595***	(0.2441)	1.0125***	(0.2711)	0.9943***	(0.2631)
$\text{Territory}_{i,j}$	0.2265	(0.5870)	0.3093	(0.5346)	0.3928	(0.6562)	0.4102	(0.6588)
TH_j			0.7540**	(0.3668)	-9.8113	(8.0175)		
$\log(\text{GDPCAP}_{j,t})\times \text{TH}_j$					-0.3819	(0.6825)		
$\log(\text{Pop}_{j,t})\times \text{TH}_j$					0.0445	(0.1920)		
$\log(\text{dist}_{i,j})\times \text{TH}_j$					4.2725*	(2.1877)		
$\log(\text{dist}_{i,j})^2\times \text{TH}_j$					-0.2815*	(0.1507)		
$\text{Euro}_{i,j}\times \text{TH}_j$					2.6809***	(0.9450)		
$\text{Contig}_{i,j}\times \text{TH}_j$					-0.5430	(0.7557)		
$\text{L}_{i,j}\times \text{TH}_j$					1.4976***	(0.5457)		
$\text{Colony}_{i,j}\times \text{TH}_j$					-0.6577	(0.4887)		
$\text{RTA}_{i,j}\times \text{TH}_j$					-3.5624**	(1.4121)		
$\text{Territory}_{i,j}\times \text{TH}_j$					-0.7351	(0.8528)		
No. obs.	19320		19320		19320		15368	
No. positive obs.	3192		3192		3192		2552	
No. banks	35		35		35		35	
No. partners	139		139		139		114	
No. Tax Havens	25		25		25			
Log Likelihood	-1240951		-1219299		-1105033		-927039	
R^2	0.2828		0.2886		0.4178		0.4265	
Pseudo-R^2	0.6180		0.6247		0.6598		0.6247	

Source: Authors' calculations; Note: All estimates include bank-fixed effects and year-fixed effects. Standard errors are clustered by bilateral pair (bank-destination). Robust standard errors in parenthesis: *** p<0.01, ** p<0.05, * p<0.10.

Table A2: Robustness estimates: parsimonious specification and agglomeration effects

	(1)		(2)		(3)		(4)	
Endogenous variable:	Turnover		Turnover		Turnover		Turnover	
Destinations:	No tax havens		No tax havens		No tax havens		No tax havens	
$\log(\text{GDPCAP}_{j,t})$	1.3635***	(0.1004)	1.4472***	(0.1114)	1.3540***	(0.1334)	1.3401***	(0.1260)
$\log(\text{Pop}_{j,t})$	0.8600***	(0.0537)	0.9279***	(0.0642)	0.8542***	(0.0744)	0.8456***	(0.0687)
$\log(\text{dist}_{i,j})$	-3.8629***	(0.7057)	-3.6985***	(0.7043)	-3.5072***	(0.8428)	-3.5582***	(0.8425)
$\log(\text{dist}_{i,j})^2$	0.2259***	(0.0474)	0.2238***	(0.0470)	0.2056***	(0.0534)	0.2077***	(0.0533)
$\text{Euro}_{i,j}$			-0.0430	(0.2787)	-0.1631	(0.2799)	-0.1549	(0.2780)
$\text{Contig}_{i,j}$			0.5941*	(0.3203)	0.4870	(0.3750)	0.4632	(0.3743)
$\text{L}_{i,j}$	0.6539***	(0.2320)	0.6241**	(0.2580)	0.5980**	(0.2579)	0.6017**	(0.2584)
$\text{Colony}_{i,j}$	1.4298***	(0.2332)	1.4095***	(0.2446)	1.3856***	(0.2466)	1.3783***	(0.2442)
$\text{RTA}_{i,j}$	1.0529***	(0.2528)	1.0783***	(0.2661)	1.0476***	(0.2627)	1.0415***	(0.2604)
$\text{Territory}_{i,j}$			0.3579	(0.6449)	0.5886	(0.6426)	0.6221	(0.6436)
$\log(\text{Capi}_{j,t})$			-0.0207***	(0.0079)				
$\log(\text{Turn}_{j,t})$					0.0052	(0.0684)		
$\log(\text{Trading}_{j,t})$							0.0036	(0.0102)
No. obs.	24888		24888		24888		24888	
No. positive obs.	2552		2552		2552		2552	
No. banks	35		35		35		35	
No. partners	184		184		184		184	
No. Tax Havens								
Log Likelihood	-952742		-931514		-946544		-946196	
R^2	0.4332		0.4474		0.4302		0.4293	
Pseudo-R^2	0.6846		0.6916		0.6867		0.6868	

Source: Authors' calculations; Note: All estimates include bank-fixed effects and year-fixed effects. Standard errors are clustered by bilateral pair (bank-destination). Robust standard errors in parenthesis: *** p<0.01, ** p<0.05, * p<0.10.

Table A3: Robustness estimates: agglomeration effects (continued)

	(1)		(2)		(3)	
Endogenous variable:	Turnover		Turnover		Turnover	
Destinations:	No tax havens		No tax havens		No tax havens	
$\log(\text{GDPCAP}_{j,t})$	1.4121***	(0.1066)	1.5143***	(0.1155)	1.4619***	(0.1243)
$\log(\text{Pop}_{j,t})$	0.9108***	(0.0615)	0.9217***	(0.0601)	0.9368***	(0.0707)
$\log(\text{dist}_{i,j})$	-3.6448***	(0.7102)	-3.5442***	(0.7342)	-3.6467***	(0.7482)
$\log(\text{dist}_{i,j})^2$	0.2197***	(0.0474)	0.2067***	(0.0488)	0.2139***	(0.0496)
$\text{Euro}_{i,j}$	-0.0603	(0.2782)	-0.1554	(0.2728)	-0.1700	(0.2737)
$\text{Contig}_{i,j}$	0.5832*	(0.3208)	0.4435	(0.3307)	0.4553	(0.3428)
$\text{L}_{i,j}$	0.6311**	(0.2595)	0.5766**	(0.2569)	0.5823**	(0.2570)
$\text{Colony}_{i,j}$	1.3994***	(0.2445)	1.4227***	(0.2518)	1.3797***	(0.2517)
$\text{RTA}_{i,j}$	1.0950***	(0.2678)	1.0452***	(0.2489)	0.9834***	(0.2383)
$\text{Territory}_{i,j}$	0.3137	(0.6438)	0.8239	(0.6360)	0.9321	(0.6446)
FinancialMarket_j	-0.5247**	(0.2052)				
$\text{GFC}_{t,j}$			-0.3528*	(0.2058)		
$\text{TopBank}_{t,j}$					-0.0278	(0.0187)
No. obs.	24888		24888		24888	
No. positive obs.	2552		2552		2552	
No. banks	35		35		35	
No. partners	184		184		184	
No. Tax Havens						
Log Likelihood	-932405		-941291		-942312	
R^2	0.4463		0.4362		0.4351	
Pseudo-R^2	0.6913		0.6884		0.6881	

Source: Authors' calculations; Note: All estimates include bank-fixed effects and year-fixed effects. Standard errors are clustered by bilateral pair (bank-destination). Robust standard errors in parenthesis: *** p<0.01, ** p<0.05, * p<0.10.

Table A4: Robustness estimates: employees - all destinations

	(1)		(2)		(3)		(4)	
Endogenous variable:	Employees		Employees		Employees		Employees	
Destinations:	All		All		All		No tax havens	
$\log(\text{GDPCAP}_{j,t})$	0.6679***	(0.0850)	0.6454***	(0.0761)	0.5626***	(0.0725)	0.5613***	(0.0718)
$\log(\text{Pop}_{j,t})$	0.7852***	(0.0576)	0.8112***	(0.0507)	0.8671***	(0.0554)	0.8677***	(0.0555)
$\log(\text{dist}_{i,j})$	-3.1799***	(0.7656)	-3.3080***	(0.8125)	-2.5459***	(0.8772)	-2.5321***	(0.8707)
$\log(\text{dist}_{i,j})^2$	0.1798***	(0.0518)	0.1880***	(0.0550)	0.1333**	(0.0593)	0.1320**	(0.0588)
$\text{Euro}_{i,j}$	0.1089	(0.2473)	0.1839	(0.2655)	-0.2556	(0.3050)	-0.2741	(0.3054)
$\text{Contig}_{i,j}$	0.1049	(0.2962)	0.0097	(0.3225)	0.5017	(0.3338)	0.5217	(0.3367)
$\text{L}_{i,j}$	0.5890***	(0.2180)	0.5553***	(0.2145)	0.5387**	(0.2341)	0.5401**	(0.2340)
$\text{Colony}_{i,j}$	1.3839***	(0.2073)	1.3998***	(0.2076)	1.4012***	(0.2367)	1.4058***	(0.2380)
$\text{RTA}_{i,j}$	0.7897***	(0.2489)	0.8116***	(0.2465)	1.0608***	(0.2588)	1.0551***	(0.2560)
$\text{Territory}_{i,j}$	0.7612	(0.5232)	0.6842	(0.5544)	1.1375*	(0.6514)	1.1686*	(0.6502)
TH_j			0.3879	(0.3841)	-7.3311	(7.4330)		
$\log(\text{GDPCAP}_{j,t})\times\ \text{TH}_j$					0.3333	(0.2870)		
$\log(\text{Pop}_{j,t})\times\ \text{TH}_j$					0.0460	(0.1658)		
$\log(\text{dist}_{i,j})\times\ \text{TH}_j$					1.5428	(2.1753)		
$\log(\text{dist}_{i,j})^2\times\ \text{TH}_j$					-0.1007	(0.1470)		
$\text{Euro}_{i,j}\times\ \text{TH}_j$					2.4642***	(0.6973)		
$\text{Contig}_{i,j}\times\ \text{TH}_j$					-0.3925	(0.6489)		
$\text{L}_{i,j}\times\ \text{TH}_j$					1.1886**	(0.5450)		
$\text{Colony}_{i,j}\times\ \text{TH}_j$					-0.5536	(0.5019)		
$\text{RTA}_{i,j}\times\ \text{TH}_j$					-3.9056***	(1.0142)		
$\text{Territory}_{i,j}\times\ \text{TH}_j$					-1.6381*	(0.8451)		
No. obs.	31640		31640		31640		24888	
No. positive obs.	3278		3278		3278		2657	
No. banks	35		35		35		35	
No. partners	227		227		227		184	
No. Tax Havens	43		43		43			
Log Likelihood	-6530148		-6513791		-6074523		-5729807	
R^2	0.2879		0.2923		0.3560		0.3424	
Pseudo-R^2	0.6041		0.6051		0.6317		0.6051	

Source: Authors' calculations; Note: All estimates include bank-fixed effects and year-fixed effects. Standard errors are clustered by bilateral pair (bank-destination). Robust standard errors in parenthesis: *** p<0.01, ** p<0.05, * p<0.10.

Table A5: Robustness estimates: employees - only active destinations

	(1)		(2)		(3)		(4)	
Endogenous variable:	Employees		Employees		Employees		Employees	
Destinations:	Active		Active		Active		No tax havens	
$\log(\text{GDPCAP}_{j,t})$	0.5648***	(0.0829)	0.5482***	(0.0751)	0.4694***	(0.0720)	0.4681***	(0.0713)
$\log(\text{Pop}_{j,t})$	0.7237***	(0.0567)	0.7439***	(0.0506)	0.7984***	(0.0553)	0.7990***	(0.0554)
$\log(\text{dist}_{i,j})$	-3.1013***	(0.7465)	-3.1987***	(0.7857)	-2.5346***	(0.8444)	-2.5187***	(0.8384)
$\log(\text{dist}_{i,j})^2$	0.1763***	(0.0506)	0.1824***	(0.0533)	0.1344**	(0.0573)	0.1329**	(0.0569)
$\text{Euro}_{i,j}$	0.1034	(0.2428)	0.1584	(0.2592)	-0.2404	(0.2977)	-0.2598	(0.2981)
$\text{Contig}_{i,j}$	0.1464	(0.2958)	0.0752	(0.3193)	0.5321	(0.3304)	0.5522*	(0.3334)
$\text{L}_{i,j}$	0.5254**	(0.2184)	0.5002**	(0.2141)	0.4660*	(0.2385)	0.4688**	(0.2384)
$\text{Colony}_{i,j}$	1.3908***	(0.2075)	1.4022***	(0.2075)	1.4143***	(0.2406)	1.4186***	(0.2420)
$\text{RTA}_{i,j}$	0.7233***	(0.2555)	0.7394***	(0.2529)	0.9767***	(0.2683)	0.9711***	(0.2652)
$\text{Territory}_{i,j}$	0.5237	(0.5171)	0.4717	(0.5464)	0.8269	(0.6718)	0.8571	(0.6701)
TH_j			0.2923	(0.3740)	-5.8653	(7.2419)		
$\log(\text{GDPCAP}_{j,t})\times \text{TH}_j$					0.2022	(0.4924)		
$\log(\text{Pop}_{j,t})\times \text{TH}_j$					0.1034	(0.2049)		
$\log(\text{dist}_{i,j})\times \text{TH}_j$					1.4504	(2.3061)		
$\log(\text{dist}_{i,j})^2\times \text{TH}_j$					-0.0948	(0.1580)		
$\text{Euro}_{i,j}\times \text{TH}_j$					2.5304***	(0.8604)		
$\text{Contig}_{i,j}\times \text{TH}_j$					-0.3405	(0.7093)		
$\text{L}_{i,j}\times \text{TH}_j$					1.2890**	(0.5678)		
$\text{Colony}_{i,j}\times \text{TH}_j$					-0.6131	(0.5197)		
$\text{RTA}_{i,j}\times \text{TH}_j$					-3.8746***	(1.3269)		
$\text{Territory}_{i,j}\times \text{TH}_j$					-1.3123	(0.8640)		
No. obs.	19320		19320		19320		15368	
No. positive obs.	3278		3278		3278		2657	
No. banks	35		35		35		35	
No. partners	139		139		139		114	
No. Tax Havens	25		25		25			
Log Likelihood	-6273912		-6264347		-5849722		-5508290	
R^2	0.2974		0.3001		0.3629		0.3467	
Pseudo-R^2	0.5615		0.5622		0.5912		0.5622	

Source: Authors' calculations; Note: All estimates include bank-fixed effects and year-fixed effects. Standard errors are clustered by bilateral pair (bank-destination). Robust standard errors in parenthesis: *** p<0.01, ** p<0.05, * p<0.10.

Table A6: Robustness estimates: NB QGPML estimator

	(1)		(2)		(3)		(4)	
Endogenous variable:	Turnover		Turnover		Turnover		Turnover	
Destinations:	All		All		All		No tax havens	
$\log(\text{GDPCAP}_{j,t})$	1.6377***	(0.0844)	1.5154***	(0.0748)	1.3790***	(0.0797)	1.3936***	(0.0799)
$\log(\text{Pop}_{j,t})$	0.7697***	(0.0305)	0.8505***	(0.0356)	0.8782***	(0.0412)	0.8881***	(0.0416)
$\log(\text{dist}_{i,j})$	-5.4141***	(0.9095)	-5.6391***	(0.9310)	-5.0184***	(0.9563)	-5.1617***	(1.0104)
$\log(\text{dist}_{i,j})^2$	0.3151***	(0.0576)	0.3276***	(0.0592)	0.2873***	(0.0608)	0.2947***	(0.0640)
$\text{Euro}_{i,j}$	0.0438	(0.1971)	-0.0208	(0.1967)	-0.3276	(0.2239)	-0.3707*	(0.2253)
$\text{Contig}_{i,j}$	0.2018	(0.2739)	0.2473	(0.2830)	0.5031	(0.3254)	0.5148	(0.3301)
$\text{L}_{i,j}$	0.5758***	(0.2016)	0.3478*	(0.1957)	0.1386	(0.2101)	0.1403	(0.2146)
$\text{Colony}_{i,j}$	1.6831***	(0.1829)	1.7665***	(0.1857)	1.8612***	(0.1980)	1.8749***	(0.2006)
$\text{RTA}_{i,j}$	0.5138***	(0.1485)	0.6075***	(0.1471)	0.8951***	(0.1749)	0.8754***	(0.1734)
$\text{Territory}_{i,j}$	0.3734	(0.4171)	0.4242	(0.4191)	1.0492*	(0.6183)	1.1239*	(0.6275)
TH_j			0.9161***	(0.1858)	-27.9137***	(9.0099)		
$\log(\text{GDPCAP}_{j,t})\times\ \text{TH}_j$					1.0359***	(0.3464)		
$\log(\text{Pop}_{j,t})\times\ \text{TH}_j$					-0.0607	(0.0804)		
$\log(\text{dist}_{i,j})\times\ \text{TH}_j$					4.6421**	(2.0149)		
$\log(\text{dist}_{i,j})^2\times\ \text{TH}_j$					-0.2849**	(0.1315)		
$\text{Euro}_{i,j}\times\ \text{TH}_j$					1.7864***	(0.4698)		
$\text{Contig}_{i,j}\times\ \text{TH}_j$					-0.6344	(0.6720)		
$\text{L}_{i,j}\times\ \text{TH}_j$					1.2528**	(0.5165)		
$\text{Colony}_{i,j}\times\ \text{TH}_j$					-0.8696*	(0.5036)		
$\text{RTA}_{i,j}\times\ \text{TH}_j$					-1.9054***	(0.4961)		
$\text{Territory}_{i,j}\times\ \text{TH}_j$					-0.7713	(0.8033)		
No. obs.	31640		31640		31640		25620	
No. positive obs.	3192		3192		3192		2552	
No. banks	35		35		35		35	
No. partners	227		227		227		184	
No. Tax Havens	43		43		43			
Log Likelihood	-499282		-483392		-545386		-451791	

Source: Authors' calculations; Note: All estimates include bank-fixed effects and year-fixed effects. Standard errors are clustered by bilateral pair (bank-destination). Robust standard errors in parenthesis: *** p<0.01, ** p<0.05, * p<0.10.

Table A7: Robustness estimates with alternative cluster definitions

	(1) Coef.	(2) S.E.	(3) S.E.	(4) S.E.	(5) S.E.	(6) S.E.
Clusters:		Bilateral pair	None	Bank	Destination	Bank & destination
$\log(\text{GDPCAP}_{j,t})$	1.3589	(0.1066)***	(0.0617)***	(0.1620)***	(0.1071)***	(0.1621)***
$\log(\text{Pop}_{j,t})$	0.8575	(0.0548)***	(0.0285)***	(0.0727)***	(0.0558)***	(0.0734)***
$\log(\text{dist}_{i,j})$	-3.4909	(0.7563)***	(0.4001)***	(0.7849)***	(0.7662)***	(0.7928)***
$\log(\text{dist}_{i,j})^2$	0.2049	(0.0503)***	(0.0268)***	(0.0552)***	(0.0495)***	(0.0543)***
$\text{Euro}_{i,j}$	-0.1658	(0.2782)	(0.1491)	(0.2996)	(0.3291)	(0.3520)
$\text{Contig}_{i,j}$	0.4945	(0.3449)	(0.1769)***	(0.4452)	(0.4006)	(0.4928)
$\text{L}_{i,j}$	0.5970	(0.2580)**	(0.1371)***	(0.3738)	(0.2832)**	(0.3947)
$\text{Colony}_{i,j}$	1.3859	(0.2472)***	(0.1472)***	(0.2967)***	(0.3253)***	(0.3681)***
$\text{RTA}_{i,j}$	1.0497	(0.2581)***	(0.1515)***	(0.3077)***	(0.2186)***	(0.2744)***
$\text{Territory}_{i,j}$	0.5852	(0.6421)	(0.3461)*	(0.7570)	(0.3881)	(0.5760)
No. obs.	24888					
No. positive obs.	2552					
No. banks	35					
No. partners	184					
Log Likelihood	-946563					
R^2	0.4306					
Pseudo-R^2	0.6675					

Source: Authors' calculations; Note: All estimates include bank-fixed effects and year-fixed effects. Standard errors are clustered except when "None" is indicated (column (3)). "None" corresponds to Huber–White-type robust standard errors without clustering. Robust standard errors in parenthesis: *** p<0.01, ** p<0.05, * p<0.10.

Table A8: Robustness estimates: annual estimates

	(1)		(2)		(3)		(4)	
Endo.variable:	Turnover		Turnover		Turnover		Turnover	
Year:	2015		2016		2017		2018	
$\log(\text{GDPCAP}_j)$	1.25***	(0.10)	1.36***	(0.13)	1.42***	(0.12)	1.43***	(0.12)
$\log(Pop_j)$	0.83***	(0.06)	0.89***	(0.05)	0.85***	(0.06)	0.86***	(0.06)
$\log(dist_{i,j})$	-3.86***	(0.73)	-3.47***	(0.80)	-3.37***	(0.81)	-3.25***	(0.82)
$\log(dist_{i,j})^2$	0.23***	(0.05)	0.20***	(0.05)	0.20***	(0.05)	0.19***	(0.05)
$Euro_{i,j}$	-0.05	(0.27)	-0.37	(0.31)	-0.10	(0.29)	-0.10	(0.30)
$Contig_{i,j}$	0.43	(0.36)	0.51	(0.36)	0.46	(0.35)	0.57	(0.35)
$L_{i,j}$	0.53**	(0.26)	0.73***	(0.24)	0.59**	(0.28)	0.54*	(0.29)
$Colony_{i,j}$	1.53***	(0.23)	1.18***	(0.32)	1.43***	(0.26)	1.44***	(0.26)
$RTA_{i,j}$	1.16***	(0.28)	0.96***	(0.30)	1.06***	(0.27)	1.06***	(0.30)
$Territory_{i,j}$	0.05	(0.65)	0.67	(0.69)	0.82	(0.66)	0.95	(0.67)
No. obs.	6222		6222		6222		6222	
No. positive obs.	632		650		639		631	
No. banks	35		35		35		35	
No. partners	184		184		184		184	
Log Likelihood	-2177944		-263218		-215689		-213843	
R^2	0.48		0.45		0.47		0.45	
Pseudo-R^2	0.68		0.68		0.68		0.68	