Offshore Financial Centers: Parasites or Symbionts?

Andrew K. Rose and Mark M. Spiegel*

Revised: April 4, 2006

Abstract

This paper analyzes the causes and consequences of offshore financial centers (OFCs). Since OFCs are likely to be tax havens and money launderers, they encourage bad behavior in source countries. Nevertheless, OFCs may also have unintended positive consequences for their neighbors, since they act as a competitive fringe for the domestic banking sector. We derive and simulate a model of a home country monopoly bank facing a representative competitive OFC which offers tax advantages attained by moving assets offshore at a cost that is increasing in distance between the OFC and the source. Our model predicts that proximity to an OFC is likely to have pro-competitive implications for the domestic banking sector, although the overall effect on welfare is ambiguous. We test and confirm the predictions empirically. OFC proximity is associated with a more competitive domestic banking system and greater overall financial depth.

Keywords: theory, empirical, data, cross-section, asset, tax, haven, money, competitive.

JEL Classification Numbers: F23, F36

Andrew K. Rose (correspondence)
Haas School of Business
University of California
Berkeley, CA USA 94720-1900
Tel: (510) 642-6609
Fax: (510) 642-4700
E-mail: arose@haas.berkeley.edu

Mark M. Spiegel
Federal Reserve Bank of San Francisco
101 Market St.
San Francisco CA 94105
Tel: (415) 974-3241
Fax: (415) 974-2168
E-mail: mark.spiegel@sf.frb.org

* Rose is B.T. Rocca Jr. Professor of International Trade and Economic Analysis and Policy in the Haas School of Business at the University of California, Berkeley, NBER research associate and CEPR Research Fellow. Spiegel is Vice President, Economic Research, Federal Reserve Bank of San Francisco.

We thank Gian-Maria Milesi-Ferretti for inspiration, conversations, and data. Jessica Wesley provided excellent research assistance. For comments, we thank: two anonymous referees, Joshua Aizenman, Sven Arndt, Michael Dooley, Pierre-Olivier Gourinchas, Galina Hale, Ann Harrison, Sebnem Kalemli-Ozcan, Andrew Scott and seminar participants at Berkeley, NBER, Santa Cruz, and Singapore. The views expressed below do not represent those of the Federal Reserve Bank of San Francisco or the Board of Governors of the Federal Reserve System, or their staffs. A current (PDF) version of this paper and the STATA data set used in the paper are available at http://faculty.haas.berkeley.edu/arose.

1. Introduction

Offshore financial centers (OFCs) are jurisdictions that oversee a disproportionate level of financial activity by non-residents. Financial activity in OFCs is usually dominated by the provision of intermediation services for larger neighboring countries. In this paper, we ask two distinct questions concerning the causes and consequences of OFCs. First, why do some countries become OFCs? Second, what are the consequences of OFCs for their neighbors?[1]

What makes a country likely to become an offshore financial center? We approach this question with both bilateral and multilateral data sets. Using bilateral data from over 200 countries in the *Coordinated Portfolio Investment Survey* (CPIS), we examine the determinants of cross-border asset holdings for 2001 and 2002 using a gravity model. We confirm these results using a probit model applied to a multilateral cross-section of over 200 countries for the same time period. Unsurprisingly, tax havens and money launderers host more assets and are more likely to be OFCs. These results are intuitive; one attraction of moving assets offshore is the ability to pursue activities that are prohibited in source countries.

Do OFCs make bad neighbors? One might expect proximity to an OFC to be bad for the neighborhood, since OFCs encourage tax evasion and other illegal activities. However, the presence of nearby offshore financial centers may also have beneficial effects. Most importantly, the presence of an OFC with an efficient financial sector may increase the competitiveness of a source country's banking sector, though this benefit is tempered by transactions costs. The tradeoff between the positive and negative externalities of OFCs lies at the heart of our paper.

To analyze this tradeoff, we develop a model where OFCs have this benign effect, even though shifting assets offshore is costly. In our model a home country monopoly bank faces a

competitive fringe of OFCs that survive by offering tax advantages, subject to a fixed cost of moving assets offshore. We use the model to examine the impact of OFC proximity on the distribution of assets between the home country bank and the OFC. In general, proximity to an OFC has ambiguous effects on welfare and asset distribution. When we simulate our model, we find that OFCs have strong pro-competitive effects on the domestic banking sector. We then take the predictions of the model to the data, and examine the impact of OFC proximity on banking-sector competitiveness and financial depth. We robustly confirm the prediction that OFCs have a pro-competitive impact on their neighbors. Proximity to an OFC also has a positive effect on financial depth.

To summarize, we find that countries identified as tax havens and money launderers are likely to be OFCs, encouraging tax evasion and nefarious activity in neighboring source countries. Nevertheless, OFCs still provide substantial offsetting benefits in the form of competitive stimulus for their neighbors' financial sectors. This benign impact on local banking conditions tends to mitigate the adverse effects of OFCs on tax evasion and illegal activity.

The next section analyzes OFC determination, using both bilateral and multilateral data sets. Section 3 develops a theoretical model of OFCs that compete with a domestic monopolist bank by providing tax benefits. Simulations of the model allow us to gauge the offsetting effects on assets and welfare; these predictions are tested in section 4. The paper concludes with a brief summary.

2. Determinants of Offshore Financial Centers

The costs of shifting assets offshore have fallen over time; but they remain non-trivial. Why do assets get shifted offshore? More generally, why do offshore financial centers exist?

We begin our study by showing that OFCs are created to facilitate bad behavior in source countries such as tax evasion and money laundering.

The small literature of relevance leaves little doubt that offshore financial centers encourage tax evasion. Indeed, in their survey of OFC activity Hampton and Christensen (2002) use the terms tax haven and OFC interchangeably; see also Coates and Rafferty (2006) and Masciandaro (forthcoming). Recently, steps have been taken to mitigate the opportunities for tax evasion afforded by OFCs. In 2000, the OECD identified over thirty countries as engaging in harmful tax evasion practices, including countries such as Andorra, Bahrain, Cook Islands, and Dominica. Countries on the list were given deadlines to change their policies and avoid sanctions.[2] Most nations complied with the OECD.[3] The G7 has also pursued initiatives against money laundering practices, including the creation of a Financial Action Task Force.[4] Hampton and Christensen (2002) predict that such initiatives will eventually erode OFCs' advantages and push capital back "onshore." Still, the facilitation of tax evasion remains one of the most obvious determinants of OFC status.

2a. A Bilateral Approach to Cross-Border Asset Holdings

We begin by taking advantage of the *Coordinated Portfolio Investment Survey* (CPIS) data set. This data set is useful for studying the generic behavior of cross-border asset holdings.[5] While there is no *special* place for offshore financial centers in the data set, all the conventional OFCs are included in the data set (more on this below). This data set has its flaws; for instance, certain areas (e.g., Aruba) have a large number of missing entries. There may also be under-reporting, especially of derivatives, and identifying the nationality of the true asset holder is not easy. Still, investigating these bilateral asset stocks seems a good place to begin identifying why

assets are held overseas, the essential feature of offshore financial centers. This data set has been used by a number of other scholars, including most prominently Lane and Milesi-Ferretti.[6]

The CPIS data are freely available at the IMFs website at year-ends for 2001 and 2002.[7] In particular, we use Table 8, which provides a geographic breakdown of total portfolio investment assets. These data form a bilateral matrix; they show stocks of cross-border holdings of assets, measured at market prices. Thus, one can determine that e.g., at the end of 2001, Argentine residents were reported to hold $29 million in total portfolio investment assets in Austria.

Since the CPIS data set is bilateral, it is natural to use the well-known "gravity model" of trade as a baseline. The gravity model explains activity between two countries as being a positive function of the economic masses of the countries, and a negative function of the distance between them. Variants of gravity models have been widely used in the literature by e.g., Alworth and Andresen (1992), Lane and Milesi-Ferretti (2004), and Portes and Rey (2005). In practice we use population and real GDP per capita to proxy economic mass, and great-circle distance and a few other measures to proxy economic distance. After controlling for these influences, we then investigate whether there is any additional role for institutional measures.

We use CPIS data for both 2001 and 2002. We drop a few insignificant areas because of data difficulties.[8] We are left with a bilateral data set with data from 69 source and 222 host countries.[9] (A list of the countries is provided in appendix table A1.) We then merge in a host of bilateral variables taken from the gravity literature in international trade. These include: source and host country population and real GDP per capita (both taken essentially from the World Bank's *World Development Indicators*). We also include colonial history, geographic features,

and measures of bilateral distance, common language, and common currency. The latter data are mostly taken from Glick and Rose (2002). Further details and the datasets are available online.

To all these conventional variables, we add three sets of additional variables. First, we add dummy variables for source/host countries that are tax havens and/or money launderers.[10] For the former, we combine three indicators on tax havens, provided by the OECD, CIA, and Hines and Rice (1994).[11] For the latter, we use the June 2000 OECD Report from the Financial Action Task Force on Money Laundering.[12] Second, we add variables (again, for both source and host countries) that measure the rule of law, political stability, and regulatory quality. These are continuous variables (where higher values better governance), and are taken from "Governance Matters III" by Kaufmann, Kraay, and Mastruzzi (2003).[13] Third, we add variables for the legal origins (of both source and host countries), focusing on countries with legal origins in common, civil, and French law.[14]

We estimate the following equation:

$$\begin{aligned}\ln\left(X_{ijt}\right) &= \beta_0 + \beta_1 \ln\left(D_{ij}\right) + \beta_2 \ln\left(Y_{it}\right) + \beta_3 \ln\left(Y_{ij}\right) + \beta_4 \ln\left(Pop_{it}\right) + \beta_5 \ln\left(Pop_{jt}\right) \\ &+ \beta_6 Cont_{ij} + \beta_7 Lang_{ij} + \beta_8 CU_{ijt} + \beta_9 ComCol_{ij} + \beta_{10} Col_{ijt} + \beta_{11} Island_i \\ &+ \beta_{12} Island_j + \beta_{13} Landl_i + \beta_{14} Landl_j + \beta_{15} \ln\left(Area_{ij}\right) + \beta_{16} \ln\left(Area_{it}\right) \\ &+ \gamma_1 Taxh_i + \gamma_2 Taxh_j + \gamma_3 Moneyl_i + \gamma_4 Moneyl_j + \gamma_5 Rule_i + \gamma_6 Rule_j + \gamma_7 Pol_i \\ &+ \gamma_8 Pol_j + \gamma_9 Reg_i + \gamma_{10} Reg_j + \gamma_{11} Common_i + \gamma_{12} Common_j + \gamma_{13} Civil_i \\ &+ \gamma_{14} Civil_j + \gamma_{15} French_i + \gamma_{16} French_j + \varepsilon_{ijt}\end{aligned} \tag{1}$$

where i denotes the source country, j denotes the host, t denotes time, ln(.) denotes the natural logarithm operator, and the variables are defined as:

- X_{ij} denotes cross-holdings from i held in j, measured in millions of dollars,
- D is the distance between i and j,
- Y is annual real GDP per capita in dollars,

- Pop is population,
- Cont is a binary variable which is unity if i and j share a land border,
- Lang is a binary "dummy" variable which is unity if i and j have a common language and zero otherwise,
- CU is a binary variable which is unity if i and j use the same currency at time t,
- ComCol is a binary variable which is unity if i and j were both colonized by the same country,
- Col is a binary variable which is unity if i and j are colonies at time t,
- Island is the number of island nations in the pair (0, 1, or 2),
- Landl is the number of landlocked countries in the country-pair (0, 1, or 2),
- Area is the area of the country (in square kilometers),
- Taxh is a binary variable which is unity for tax havens,
- Moneyl is a binary variable which is unity for money-launderers,
- Rule is a measure of the rule of law,
- Pol is a measure of political stability,
- Reg is a measure of regulatory quality,
- Common is a binary variable which is unity for common-law countries,
- Civil is a binary variable which is unity for civil-law countries,
- French is a binary variable which is unity for French-law countries,
- β is a vector of nuisance coefficients, and
- ε_{ij} represents the omitted other influences on bilateral exports, assumed to be well behaved.

We estimate this equation with conventional OLS, using a robust covariance estimator to handle heteroskedasticity, adding year-specific fixed effects. Rather than drop the many observations for which the stock of cross-holdings is zero, we substitute a very small number for zero (and the occasional negative) values.[15] The coefficients of interest to us are $\{\gamma\}$.

Our baseline results, excluding the institutional variables, are tabulated in the extreme left column of Table 1. The model delivers sensible estimates. For instance, higher population and GDP per capita in either the source or host countries encourage greater cross-holdings. Second,

geography matters, in the sense that more distance between the two countries lowers cross-holdings, while a shared land border, language, or money raises them. All these effects are sensible, economically large, and statistically significant at conventional significance levels. Further, the model fits the data well, accounting for over half the variation in an essentially cross-sectional data set. The results also seem robust to splitting the data into individual years, and to dropping the zero values of the regressand (these sensitivity checks are tabulated in successive columns).

We then add institutional details in the fifth column. The coefficients are collectively significant and have sensible interpretations. Host countries that are tax havens and/or money launderers are more likely to attract cross-holding; comparable source country effects are present but smaller. Neither the rule of law nor the political stability of host countries seems to be relevant. But politically unstable countries and those with a strong rule of law are both more likely to send funds overseas. While regulatory quality in the source country has little effect on cross-holdings, host countries with higher regulatory quality are much more likely to attract assets. All this make sense.

Finally, in the last column (on the extreme right) of Table 1 we add dummy variables for the legal origins of both source and host countries. These are of only minor relevance. Common- and civil-law countries are more likely to be the source of cross-holdings; countries with French law are less likely to be hosts.

We take two primary results from the bilateral sample: First, geography plays a significant role in the determination of cross-border flows, even after conditioning for other factors that may be correlated with distance that could affect cross-border flows. While a role for geography would be obvious in the case of flows of goods, the role of distance in asset flows

is less obvious, but appears to be important in the data. Second, identification as a tax haven or money launderer is associated with an increase in cross-border flows, suggesting that the desire to circumvent local taxes or other local laws plays a role in the decision to move assets offshore. Both of these considerations are addressed in the model introduced below.

2b. Multilateral Evidence on Offshore Financial Center Determination

We now corroborate our key findings from the bilateral CPIS data set with a multilateral approach. In particular, we test for the importance of e.g., being a tax haven, using the common law, or having political stability on the likelihood of being an offshore financial center.

Our multilateral approach is cross-sectional in nature. Since we are interested in determining which countries have chosen to become OFCs, it is important first to identify the OFCs themselves. Rather than develop our own methodology to identify OFCs, we gather these data from three basic sources (which have considerable overlap). We use the dummy variables indicating either "Financial Centre with Significant Offshore Activities" or "Major Financial Centre with onshore and offshore activity" from *Report of the Working Group on Offshore Centres* of the Financial Stability Forum.[16] We also include "Countries and Territories with Offshore Financial Centers" from Errico and Musalem (1999). Finally, we include "International and Offshore Financial Centers" from IMF (2004), whether "Contacted – Module 2 Assessment" or "Contacted under the FSAP".[17] We further impose the requirement that the OFC host at least $10 million in total assets, and that it not be an OECD country.[18] This delivers our default set of forty OFCs, which are listed in appendix Table A2. As can be seen from the table, OFCs are clustered regionally; notable groupings are in the Caribbean and Europe.

Consistent with our results, they tend to be clustered around places with high taxes and a high demand for nefarious financial activity.[19]

Our default set of OFCs is a 0/1 binary variable; a country either is or is not an offshore financial center. To check the robustness of our results, we also construct a continuous variable. This is derived by combining the three dummy variables above with two others. The first is a dummy that is one if and only if the CIA mentions that the country is an "offshore financial center" in its discussion of illicit drugs in the *World Factbook*.[20] The second is derived by aggregating (across source countries) the residuals from the default pooled model of Table 1.[21] We then combine the variables by using the first principal factor from the five underlying variables.[22] This gives us a continuous version of our default binary variable. The two variables are highly correlated (the correlation coefficient is .84).[23]

We gathered data on 223 countries (listed in appendix Table A3), including our default set of forty OFCs. We use data averaged from 2001 and 2002, both to smooth the data and to stick as close to our bilateral data set as closely as possible. We condition on the natural logarithms of both population and real GDP per capita throughout (again, taken mostly from the World Bank's *World Development Indicators*). We then sequentially add: a) dummy variables for tax havens and money launderers, b) the three institutional measures (rule of law, political stability, and regulatory quality), and c) the three legal regimes. In panel A of Table 2 we use our default dummy variable measure of OFCs, estimated using probit. Panel B is the analogue that uses OLS (with robust standard errors) on our continuous measure of OFC activity.

The most striking results in Table 2 are in column (2), where we consider the first two institutional features: tax haven and money laundering status. Being either a tax haven or a money launderer has an economically and statistically strong effect in raising the probability of

being an OFC.[24] This confirms our findings from the bilateral results that sinful countries are strongly associated with offshore financial centers. On the other hand, our other measures of institutional quality and the legal regime have no strong consistent effect on OFC determination. Conditioning on population and GDP per capita seems to have little consistent strong effect.

We have engaged in extensive sensitivity analysis with respect to the determination of OFCs; part of it is reflected in Table C. This shows the results of adding ten different variables to the specification of column (2), which includes tax haven and money laundering status. Two estimates are supplied: the middle column is the result of adding the variable to the probit estimation for the default binary measure of OFCs, while the right column tabulates the OLS coefficient from adding the variable to the continuous OFC specification.

We have successively added: a) a dummy variable that is unity if the country is English-speaking; b) the official supervisory power aggregate from Barth, Caprio and Levine (2001)[25]; c) a dummy variable for the presence of capital controls taken from the IMFs *Annual Report on Exchange Arrangements and Exchange Restrictions*; d) the corporate tax rate, essentially taken from Ernst & Young[26]; e) the country's average Polity IV score[27]; f) average openness, the ratio of exports plus imports to GDP, taken from the *WDI*; g) the UNDPs human development index[28]; and lastly h) measures of political rights, civil rights, and freedom, all provided by Freedom House.[29] None of these variables are consistently strongly tied to our measures of OFCs despite our best attempts. We also tabulate the p-values for the joint significance of two sets of dummy variables: a) a set of regional variables; and b) a set of variables for colonial history (so that the British variable is unity for all ex-British colonies, and so forth). We have also experimented with a large number of other variables with a similar lack of success.[30]

Our most robust results from our probit estimation mirror those of the bilateral sample above. The main characteristics of those countries identified as offshore financial centers are identification as either tax havens or money launderers. This corroborates the bilateral results from section 2a; a primary motivation for investors in moving assets offshore is circumvention of domestic tax laws or other illegal activities. None of this seems terribly surprising to us; OFCs seem to facilitate bad behavior. The more interesting question is whether they also provide positive externalities as well; we now turn to that issue.

3. Consequences of Offshore Financial Centers

The evidence presented in section 2 indicates that tax havens and money launderers are likely to be offshore financial centers. OFCs offer the advantage of e.g., lower taxes to domestic investors that can bear the costs of shifting assets. That is, they compete with the domestic banking sector. While OFCs lower the costs of unsavory practices such as tax evasion, they also provide a benefit in the form of competition for the domestic financial sector. We now develop a model that focus on the tradeoffs that OFCs present for source countries.[31]

3a. A Simple Theoretical Model of OFC Activity

We assume that the domestic (source) country is populated by a continuum of depositors, indexed by i=1…m. Depositors are endowed with initial wealth, *w(i)*. We number the depositors such that the initial wealth of depositor i is less than or equal to the initial wealth of depositor i+1. Depositors allocate their wealth to maximize their after-tax income. They can hold three assets: onshore deposits; offshore deposits; and an outside alternative. All the assets we consider below are risk-free.

We assume that the alternative asset (perhaps a government bond) yields an exogenous rate of interest; r^* is defined as one plus the interest rate on this asset. We define r_H as one plus the contractual rate of interest paid by the domestic bank on deposits and r_O as one plus the offshore contractual rate of interest on deposits. Since depositors allocate their savings to maximize disposable wealth, each faces two arbitrage conditions, one for offshore deposits and one for home deposits.

We assume that there is a fixed cost, denoted ax, of making an offshore deposit, where a is a constant and x represents the "distance" from the home country to the offshore country. This is modeled as an "iceberg" cost that melts away with offshore financial activity. This cost can be offset by the tax advantage of offshore deposits, since we assume that offshore deposits are taxed at a lower rate than the true tax rate. Onshore deposits, by way of contrast, are less costly but are taxed at a higher rate.

If a representative depositor i places his deposits in the offshore bank, his final after-tax wealth satisfies $(1-\tau)\left[\theta r_O w(i) - ax\right]$, where τ represents the nominal domestic tax rate and θ is a parameter representing the tax advantage of the offshore nation, $1 \le \theta \le 1/(1-\tau)$. It follows that depositor i will prefer to place his funds in the offshore bank relative to the risk free asset if and only if

$$r_O \ge \frac{r^* w(i^*) + ax}{\theta w(i^*)} \qquad (2)$$

The smaller are a, x, and r^*, the more likely that depositor i is to take his assets offshore rather than place them in the risk-free asset; ditto the larger are θ, r_O, and $w(i)$. We define i^* as the depositor that satisfies (2) with equality, i.e. as the depositor who is indifferent between taking

assets offshore and placing them in the risk-free asset. Since *w(i)* is positively monotonic in *i,* (2) shows that all depositors $i > i^*$ will also take their assets offshore.

Alternatively, suppose that depositor i places his deposits in the *domestic* bank. We model this as a monopoly; an extreme assumption to be sure, but one that allows us to focus on the competitive effects easily (an alternative derivation using the assumption of a monopolistically competitive domestic banking sector is provided in the appendix). The depositor's final wealth earns a return of $(1-\tau)r_H$. Thus depositors prefer the home bank if $r_H \geq r^*$. We demonstrate below that the profit-maximizing deposit rate for the home monopolist bank is when this condition just binds, i.e. $r_H = r^*$. It follows that when condition (2) holds with equality, depositor i is indifferent between taking his assets offshore and holding them in the home country bank. The offshore bank then lends out all its deposits, L_O, which equal

$$L_O = \int_{i^*}^{m} w(i)\,di \tag{3}$$

Borrowers in the model are assumed to obtain funds from banks under standard debt contracts, taking the home-country demand for loans as given. Borrowers are indifferent between bank sources, so a single lending rate will prevail in the home country. Let *R* represent one plus the contractual interest rate on lending. We assume that *R* is decreasing in aggregate lending, *L*, which is the sum of home bank lending, L_H and offshore bank lending, L_O, where $R' < 0$, and $R'' < 0$.

The offshore bank acts as a competitor and a Stackelberg follower. The offshore bank faces diseconomies of scale in lending because of the fixed cost of moving assets offshore. The minimum interest rate consistent with any value of i^* is that which induces all depositors i^* and greater to take their assets offshore. Having exhausted this segment of the population, however,

the offshore bank can only further increase its deposits by attracting depositors that are less wealthy. The fixed cost of moving assets offshore bites these poorer depositors more intensely, as the fixed cost is spread over a smaller deposit. As a result, the offshore bank must offer a greater premium over the domestic risk free rate to increase its deposits. This effectively results in an upward-sloping supply of funds facing the offshore bank.

Taking domestic lending as given, the offshore bank raises deposits at rates where (2) is binding and issues loans until it satisfies its zero profit condition

$$\theta w\left(i^*\right) R = r^* w\left(i^*\right) + ax \,. \tag{4}$$

Totally differentiating (4), the comparative static relationship between L_O and L_H satisfies

$$\frac{\partial L_O}{\partial L_H} = \frac{\theta w\left(i^*\right)^2 R'}{\left(\theta R - r^*\right) w' - \theta w\left(i^*\right)^2 R'} < 0 \tag{5}$$

Equation (4) demonstrates that lending by the domestic bank crowds out lending by the OFC. However, note that $\left|dL_O / dL_H\right| < 1$, which implies that crowding out is less than one for one, so that an increase in L_H increases overall lending levels.

We next turn to the lending decision of the home country bank. The domestic bank acts as a profit-maximizing Stackelberg leader. It takes in deposits equal to L_H , which results in an end-of-period liability of $r_H L_H$. Domestic profits are equal to

$$\pi = \left[R - r_H\right] L_H \tag{6}$$

As profits are decreasing in r_H, it follows that the profit-maximizing decision of the home country bank entails setting $r_H = r^*$ and maximizing with respect to the choice of L_H. By the envelope theorem, the first-order condition of the home country bank satisfies

$$R - r^* + R' L_H = 0 \tag{7}$$

Equations (4) and (7) form a system of equations in two unknowns, L_H and i^*. In the appendix, we conduct some comparative static exercises to evaluate the properties of the model. We demonstrate that an increase in the OFC tax advantage, θ, increases offshore lending, L_O, and reduces home country bank lending, L_H, but less than one for one, resulting in an increase in overall lending. We also demonstrate that OFC lending is decreasing in distance to the home country, x. We again find a crowding out effect, as decreased OFC distance reduces home country lending, but again by less than the primary effect of increasing lending by the OFC. Effectively, proximity to the OFC increases the competitiveness of the domestic banking market. We take the latter result to the data below.

An alternative strategy for the home country bank to the interior solution above is to "limit-price" by issuing sufficient loans that the OFC can not compete in the home market. By (4), the home bank can limit-price by issuing an amount of loans that satisfies

$$R\left(L_H\right) \leq \frac{r^* w\left(i^*\right) + ax}{\theta w\left(i^*\right)} \tag{8}$$

Satisfaction of equation (8) with inequality implies that the OFC would lose money upon entry. Note that as *x* (the distance between the OFC and the home country) grows, (8) implies that the domestic loans necessary to achieve limit-pricing becomes arbitrarily small. Indeed, it may fall below the pure monopoly solution for the home country bank in the absence of the OFC, which is the solution to (7) given $L_O = 0$.

It follows that as *x* increases from 0, the solution for the home country bank passes through three distinct ranges: First, it follows the interior solution to (7), competing head-to-head with the OFC. As distance between the OFC and the home country grows further, the home bank switches to the limit pricing strategy in (8). Finally, when the OFC is sufficiently distant, the limit pricing solution falls below the monopoly optimum, which is the level of L_H that satisfies (7) conditional on $L_O = 0$, and the domestic bank switches to the pure monopoly solution. These transitions are illustrated in our simulations below.

Finally, we turn to the question of the impact of the OFC on home country welfare. We assume that taxes are redistributed lump sum, so that home-country welfare is invariant to the level of government revenues.[32] Home country welfare can therefore be measured in terms of the net gains from intermediation relative to placing all deposits in the alternative asset. This is the sum of borrower consumer surplus, home bank profitability and depositor revenues, net of taxes and the cost of moving funds offshore. Adding these together and simplifying yields:

$$W = \int_0^L \left(R - r^*\right) dl - \left(m - i^*\right) ax \tag{9}$$

Equation (9) demonstrates the welfare tradeoff associated with proximity to an OFC. On one hand, the OFC induces the home country bank to behave more competitively, increasing lending and overall welfare. On the other hand, depositors are partially motivated to take their funds offshore for purely redistributive reasons, in particular to lower their taxes. While the redistribution does not affect welfare, the resource cost of moving those assets offshore is a deadweight loss. As a result, the overall impact on domestic welfare of OFC-proximity is ambiguous.

3b. Simulations

To gauge the impact of the OFCs' proximity and tax advantage on overall activity in the home country, we now simulate the model. For simplicity, we model *w(i)* as a linear function, setting *w* to an exogenous constant. We also assume that the domestic interest rate is a (negative) linear function of domestic lending, *L* that satisfies

$$R = \overline{R} + R'L \qquad (10)$$

where $\overline{R}$ and R' are constants $\overline{R} > 0$, $R' < 0$.

Given these assumptions, we derive the expressions for (4) and (7) in the appendix. This yields a system of two equations in two unknowns, L_H and i^*. The solution allows us to determine both the equilibrium loan rate and aggregate welfare.

We parameterize the model by setting the return on the alternative asset r^* equal to 1.2. We set the tax advantage of the OFC, θ, to 1.2 (though we have also examined alternative values without any large change in results). We set the cost of moving assets offshore, *a,* to 1.[33] We set *w* equal to 2 and *m* equal to 1. This normalization implies that the equilibrium value of i^* represents the share of depositors who do not take their assets offshore, as depositors 0 through

*i** leave their assets in the home country. Finally, we normalize local interest rates by setting $\overline{R}$ equal to 2 and *R'* equal to -0.85, although we entertain other values of R' below.

While numerical values are a necessary part of our simulations, we concentrate on their qualitative results. Figure 1 plots home-bank lending (L_H), total lending (L), interest rates (R), and welfare as a function of distance to the OFC (x), for different values of R'. It can be seen that proximity to the OFC has the pro-competitive impact that we anticipated. It can also be seen that there are three distinct ranges, with discrete jumps in all values when the home bank switches from competing head-to-head to a limit pricing strategy.

It is useful to consider the impacts on all of the endogenous variables as x increases. Beginning at *x=0*, we are first in the range where the monopoly bank competes with the OFC head to head. As distance to the OFC increases, the home country bank expands its lending, taking advantage of the deterioration in competitiveness of the OFC. Nevertheless, the increase in L_H is more than offset by a decline in L_O, so that overall lending is declining. It can be seen that over this range R increases with distance, so that increased proximity to the OFC has the expected impact of increasing the competitiveness of the domestic banking sector.

Note that welfare falls dramatically with increased distance within this range, even relative to the pure monopoly solution. Welfare losses with increased distance come from two sources: the decreased competitiveness of the banking sector , and the increased cost of moving assets offshore. Of course, the latter eventually reduces the amount of offshore activity taking place.

As x increases beyond x_{LP}, the home country bank switches to a limit-pricing strategy, lending the amount necessary to keep the OFC out of its market. It can be seen that there is a discrete increase in both home and overall lending at this point, resulting in a discrete decline in

R, as well as a discrete increase in overall welfare. As x increases within the limit pricing range, overall lending and welfare decline, as the amount of home bank lending necessary to preclude entry by the OFC decreases.

Finally, when x reaches x_M the minimum level of lending to achieve limit pricing matches the pure monopoly solution. At this point, home country lending, as well as the other variables, are invariant to further increases in x.

4. Evidence on the Impact of OFCs on their Neighbors

We now take the theoretical predictions of the previous section to the data. Our model suggests that home country bank profits are declining in proximity to the OFC, while overall local lending is increasing in OFC proximity.[34] Accordingly, we use our multilateral data set to address two questions. First, is OFC proximity actually associated with increased domestic banking competitiveness? Second, is OFC proximity also associated with greater financial intermediation? We use different measures of both banking competitiveness and financial intermediation that are common in the literature, and control for a number of auxiliary explanatory variables.

We use the multilateral data set that we developed and employed in section 2b above. This is a cross-section from 2001-02 that includes 40 OFCs (tabulated in Table A2) among the 223 countries in our sample (tabulated in Table A3). Our measure of OFC proximity is (the natural logarithm of the) distance to the nearest OFC.[35] This serves as the regressor for our coefficient of interest.

Our base specification conditions on the natural logarithms of both population and real GDP per capita, as well as a dummy variable for countries that are OFCs themselves. In

subsequent specifications, we add a number of additional conditioning variables to check the sensitivity of our results. These controls include dummy variables for legal regimes based on Civil or French Law, hours of latitude, a landlocked nation dummy variable, and the percentage of population that is Christian or Muslim. Remoteness for country i is defined traditionally, as the average (log) distance between i and (log) GDP in the rest of the world; this variable is intended to serve as an indicator of overall remoteness, rather than the remoteness associated with distance from an OFC.[36] We also add a variable for openness, measured as total trade as a percentage of GDP. We also tabulate simple bivarate regression results, without any controls at all (except a constant). Finally, we provide instrumental variable results, motivated by the results of Table 2. As instrumental variables for distance to the closest OFC, we use: 1) OFC remoteness; 2) distance to the closest tax haven; and 3) distance to the closest money launderer.

Our estimating equation takes the form:

$$y_i = \beta \ln(\min DistOFC)_i + \gamma_0 + \gamma_1 OFC_i + \gamma_2 \ln(Pop)_i + \gamma_3 \ln(Y / Pop)_i + Controls + \varepsilon_i \quad (11)$$

where the notation follows that of equation (1), and the coefficient of interest is β.

We first test the effect of OFC proximity on domestic banking competitiveness. Thus for the regressand, *y*, we use three measures of the degree of competitiveness of the local banking sector: a) the interest rate spread (loan-deposit) charged by commercial banks, b) the concentration ratio of the domestic banking industry, measured as the industry share accounted for by the top five commercial banks, and c) the number of commercial banks in a country divided by the log of domestic GDP.[37] The coefficient of interest to us is β_1, the effect of OFC

proximity on domestic banking competitiveness; we expect this to be positive for the first two regressands (interest spread and concentration ratio) and negative for the last (banks/GDP). We estimate our models with OLS/IV, employing standard errors robust to heteroskedasticity.

Our results are shown in Panel A of Table 3. All of our estimates suggest that OFC remoteness is associated with an increase in monopoly power at statistically and economically significant levels. The standard deviation of the *minimum distance from OFC* variable is 1.07, so our point estimates suggest that a one standard deviation increase in distance to an OFC is associated with, e.g., between an increase of 1.41 and a 2.21 percent in the interest rate spread and an increase of 1.77 to 8.22 percent in the share of the banking industry controlled by the five largest commercial banks. The results for interest rate spreads and bank concentration are statistically significant at standard significance levels when controls are included (only the second is clearly significant with IV). The effect of OFC proximity on the number of banks (scaled by log GDP) is more marginally significant, but improves with the number of controls. It seems that OFC proximity is in fact associated with more competitive domestic banking.

We next turn to the impact of distance from an OFC on the depth of domestic financial intermediation. We use three measures of intermediation commonly used in the literature: a) credit to the private sector, b) quasi-liquid liabilities, and c) M2, all three measures normalized by GDP.[38] We now expect the coefficient of interest, β, to be consistently negative, since OFC proximity should increase domestic financial intermediation.

Our results are shown in Panel B of Table 3. The effect of distance to the closest OFC on financial intermediation is consistently negative. Moreover, it is significantly different from zero at conventional statistical levels for two of our three proxies, the ratios of quasi-liquid liabilities to GDP and M2 to GDP. Distance from OFC has a negative but insignificant effect on credit to

the private sector as a percentage of GDP, except for the (less interesting) bivariate regression.[39] Again, these results are robust to a number of alternative specifications. The point estimates also indicate that proximity to an OFC is consistently of economic significance.[40]

In summary, we find evidence that distance from an OFC is associated with a lack of competitiveness in the local banking sector as indicated by our theory. Moreover, financial depth is positively associated with OFC proximity. While the results are not always of strong statistical significance, we interpret them as broadly confirming the prediction of the model.[41]

5. Conclusion

This paper examines both the determinants of offshore financial centers and the consequences of OFCs for their neighbors. Using both bilateral and multilateral samples, we find empirically that successful offshore financial centers encourage bad behavior in source countries, since they facilitate tax evasion and money laundering. At first blush, it thus appears that OFCs are best characterized as "parasites," since their attraction stems in part from allowing their source-country clients to engage in activities detrimental to the well-being of their homes.

Nevertheless, offshore financial centers created to facilitate undesirable activities can still have unintended positive consequences. In particular, the presence of OFCs enhances the competitiveness of the local banking sector. Using a model of a domestic monopoly bank facing a competitive fringe of OFCs, we demonstrate that OFC proximity enhances the competitive behavior of the monopoly bank and may increase overall welfare. This is true despite the fact that deadweight losses are borne when funds are transferred offshore to an OFC. We test these predictions using a multilateral data set, and show that proximity to an OFC is indeed associated

with a more competitive domestic banking sector, and greater financial intermediation. We tentatively conclude that OFCs are better characterized as "symbionts."

Table 1: Bilateral Determinants of Cross-Border Asset Holdings

	Pooled	2001	2002	Pooled, without 0 values	Pooled, with institutions	Pooled, with institutions, legal regime
Log Distance	-1.14 (.08)	-1.24 (.09)	-1.04 (.09)	-.49 (.05)	-1.23 (.08)	-1.13 (.08)
Log Host Population	1.22 (.04)	1.23 (.05)	1.21 (.05)	.49 (.04)	1.26 (.04)	1.25 (.04)
Log Source Population	.57 (.05)	.50 (.05)	.67 (.05)	.68 (.04)	.61 (.05)	.55 (.05)
Log Host Real GDP p/c	3.44 (.05)	3.35 (.05)	3.53 (.05)	1.92 (.05)	2.01 (.09)	1.92 (.09)
Log Source Real GDP p/c	2.84 (.10)	2.88 (.11)	2.80 (.11)	3.13 (.07)	1.84 (.17)	1.82 (.17)
Common Border	1.10 (.37)	1.06 (.40)	1.14 (.39)	.94 (.19)	1.31 (.38)	1.32 (.37)
Common Language	1.67 (.16)	1.49 (.18)	1.87 (.17)	1.13 (.11)	.95 (.16)	.96 (.16)
Currency Union	2.86 (.28)	3.03 (.29)	2.68 (.30)	2.22 (.14)	2.58 (.27)	2.63 (.28)
Common Colonizer	.78 (.36)	.40 (.39)	1.23 (.40)	1.09 (.27)	.39 (.35)	.56 (.36)
Currently Colony	.65 (3.53)	1.69 (3.46)	-.59 (3.74)	3.89 (.85)	.35 (2.98)	.64 (3.15)
Island Host	.66 (.19)	.75 (.20)	.56 (.20)	.52 (.14)	-.00 (.18)	.00 (.19)
Island Source	.88 (.16)	.83 (.18)	.88 (.18)	1.07 (.11)	.43 (.17)	.65 (.18)
Tax Haven Host					1.19 (.24)	1.33 (.25)
Tax Haven Source					.70 (.20)	1.23 (.22)
Money Laundering Host					2.06 (.24)	2.06 (.24)
Money Laundering Source					.55 (.23)	.29 (.23)
Rule Law, Host					-.27 (.17)	-.24 (.17)
Rule Law, Source					2.32 (.24)	2.33 (.24)
Political Stability, Host					-.14 (.10)	-.19 (.10)
Political Stability, Source					-1.65 (.18)	-2.03 (.18)
Regulatory Quality, Host					2.19 (.15)	2.21 (.15)
Regulatory Quality, Source					-.50 (.23)	-.06 (.24)
Common Law Host						.13 (.18)
Common Law Source						2.48 (.34)
Civil Law Host						.64 (.20)
Civil Law Source						2.95 (.36)
French law Host						-.48 (.13)
French law Source						.42 (.14)
Observations	12,220	6,364	5,856	6,063	12,220	12,220
R^2	.56	.54	.57	.54	.60	.60
Root MSE	4.572	4.646	4.486	2.442	4.362	4.337

Regressand is log of asset stocks, with 0 replaced by .0001 (except in fourth column, where 0 values dropped).
OLS. Fixed year intercepts included but not recorded. Also included but not recorded: log area source, log area host, landlocked source dummy, landlocked host dummy.
Robust standard errors (clustered by country-pairs) in parentheses.

Table 2: Multilateral Determinants of Cross-Border Asset Holdings

Table 2a: Dummy Variable for OFC

	(1)	(2)	(3)	(4)
Population	-.11	.11	.01	.01
	(.04)	(.06)	(.09)	(.10)
GDP p/c	.44	.39	.35	.49
	(.11)	(.13)	(.30)	(.31)
Tax Haven		1.34	1.05	.87
		(.36)	(.43)	(.45)
Money Launderer		1.51	1.87	1.87
		(.35)	(.48)	(.48)
Rule of Law			-.24	-.39
			(.50)	(.52)
Political Stability			-.13	-.07
			(.29)	(.31)
Regulatory Quality			.32	.32
			(.46)	(.46)
Common Law				-.05
				(.50)
Civil Law				-.94
				(.60)
French Law				.60
				(.44)
Observations	223	223	184	184
Pseudo-R^2	.16	.42	.41	.44

Regressand is dummy variable for offshore financial center.
Constants included but not recorded. Probit estimation; standard errors recorded in parentheses

Table 2b: Continuous Variable for OFC activity

	(1)	(2)	(3)	(4)
Population	-.12	.01	-.01	-.01
	(.03)	(.02)	(.02)	(.02)
GDP p/c	.23	.11	.01	.04
	(.04)	(.03)	(.04)	(.05)
Tax Haven		1.12	1.08	1.02
		(.25)	(.31)	(.30)
Money Launderer		.91	100	.96
		(.29)	(.36)	(.36)
Rule of Law			-.11	-.15
			(.14)	(.14)
Political Stability			.04	.06
			(.06)	(.06)
Regulatory Quality			.18	.18
			(.12)	(.13)
Common Law				.11
				(.14)
Civil Law				-.11
				(.13)
French Law				.10
				(.08)
Observations	221	221	184	184
R^2	.23	.58	.59	.59

Regressand is continuous measure of offshore financial center activity.
Constants included but not recorded. OLS estimation; standard errors recorded in parentheses.

Table 2c: Potential Additional Determinants of OFC

	Binary OFC Measure	Continuous OFC Measure
English Language	.09 (.29)	-.04 (.09)
Official Supervisory Power from Barth, Caprio and Levine	.05 (.04)	.02 (.01)
Capital Controls	.23 (.34)	.14 (.15)
Corporate Tax Rate	-.01 (.01)	-.00 (.01)
Polity	-.06 (.03)	-.00 (.01)
Openness	.001 (.003)	.002 (.002)
Human Development Index	-1.66 (2.72)	-.47 (.37)
Political Rights	.12 (.08)	-.01 (.02)
Civil Rights	.21 (.10)	.00 (.03)
Freedom	.24 (.21)	-.02 (.05)
Regional Dummies (p-value)	.54	.08
Colonial Dummies (p-value)	1.00	.00

Regressors included but not recorded: log(population); log(real GDP per capita); tax haven dummy; money laundering dummy; intercept.
Binary OFC measure regressand: probit estimation. Continuous OFC measure regressand: OLS estimation with robust standard errors.

Table 3a: OFC Proximity and Domestic Banking Competitiveness

Measure	Bivariate	Controls #1	Controls #2	Controls #3	IV
Loan-Deposit Interest rate Spread	2.21 (.62)	1.45 (.69)	1.41 (.70)	1.63 (.79)	1.44 (.92)
5-Bank Concentration Ratio	1.77 (1.75)	4.66 (1.38)	7.53 (1.79)	6.91 (1.98)	8.22 (2.86)
# Commercial Banks (ratio to Log GDP)	-.67 (.68)	-.99 (.78)	-1.16 (.65)	-1.52 (.81)	-1.49 (.89)

Table 3b: OFC Proximity and Financial Depth

Measure (% GDP)	Bivariate	Controls #1	Controls #2	Controls #3	IV
Domestic Private Sector Credit	-13.7 (3.6)	-1.9 (3.0)	-3.1 (2.9)	-4.1 (3.1)	-3.4 (3.4)
Quasi-Liquid Liability	-16.3 (4.2)	-8.9 (3.3)	-11.4 (3.6)	-11.6 (3.4)	-7.8 (3.2)
M2	-17.1 (4.1)	-9.7 (3.4)	-11.1 (4.0)	-11.5 (3.8)	-5.3 (3.7)

Coefficients recorded are for log distance to closest OFC.
Controls #1: OFC dummy; log (2001-02 average) population; log (2001-02 average) real GDP per capita; intercept.
Controls #2: controls #1 plus trade remoteness; civil law dummy; French law dummy; landlocked dummy; latitude in hours; % Christian; % Muslim.
Controls #3: controls #2 plus (2001-02 average) trade as a percentage of GDP.
IV: controls #3. IVs for log minimum distance to OFC include: 1) log minimum distance to tax haven; 2) log minimum distance to money launderer; 3) remoteness from OFCs.
OLS estimation unless labeled; robust standard errors recorded in parentheses.

Table A1: Host Countries in CPIS

Afghanistan	Albania	Algeria	American Samoa	Andorra
Angola	Anguilla	Antigua and Barbuda	Argentina*	Armenia
Aruba*	Australia*	Austria*	Azerbaijan	Bahamas*
Bahrain*	Bangladesh	Barbados	Belarus	Belgium*
Belize	Benin	Bermuda*	Bhutan	Bolivia
Bosnia and Herzegovina	Botswana	Brazil*	British Virgin Islands	Brunei Darussalam
Bulgaria*	Burkina Faso	Burundi	Cambodia	Cameroon
Canada*	Cape Verde	Cayman Islands*	Central African Rep.	Chad
Chile*	China	Colombia*	Comoros	Congo (Zaire/Kinshasa)
Congo (Brazzaville)	Cook Islands	Costa Rica*	Côte d'Ivoire	Croatia
Cuba	Cyprus*	Czech Republic*	Denmark*	Djibouti
Dominica	Dominican Republic	Ecuador	Egypt*	El Salvador
Equatorial Guinea	Eritrea	Estonia*	Ethiopia	Falkland Islands
Faeroe Islands	Fiji	Finland*	France*	French Guiana
French Polynesia	Gabon	Gambia	Georgia	Germany*
Ghana	Gibraltar	Greece*	Greenland	Grenada
Guadeloupe	Guam	Guatemala	Guernsey*	Guinea
Guinea-Bissau	Guyana	Haiti	Honduras	Hong Kong*
Hungary*	Iceland*	India	Indonesia*	Iran
Iraq	Ireland*	Isle of Man*	Israel*	Italy*
Jamaica	Japan*	Jersey*	Jordan	Kazakhstan*
Kenya	Kiribati	Korea*	Kuwait	Kyrgyz Republic
Laos	Latvia	Lebanon*	Lesotho	Liberia
Libya	Liechtenstein	Lithuania	Luxembourg*	Macau*
Macedonia	Madagascar	Malawi	Malaysia*	Maldives
Mali	Malta*	Marshall Islands	Martinique	Mauritania
Mauritius*	Mexico	Micronesia	Moldova	Monaco
Mongolia	Montserrat	Morocco	Mozambique	Myanmar
Namibia	Nauru	Nepal	Netherlands*	Netherlands Antilles*
New Caledonia	New Zealand*	Nicaragua	Niger	Nigeria
North Korea	Norway*	Oman	Pakistan*	Palau
Panama*	Papua New Guinea	Paraguay	Peru	Philippines*
Poland*	Portugal*	Puerto Rico	Qatar	Réunion
Romania*`	Russian Federation*	Rwanda	St. Helena	St. Kitts and Nevis
St. Lucia	St. Pierre & Miquelon	St. Vincent & Gren.	Samoa	San Marino
São Tomé and Príncipe	Saudi Arabia	Senegal	Serbia and Montenegro	Seychelles
Sierra Leone	Singapore*	Slovak Republic*	Slovenia	Solomon Islands
Somalia	South Africa*	Spain*	Sri Lanka	Sudan
Suriname	Swaziland	Sweden*	Switzerland*	Syrian Arab Republic
Taiwan	Tajikistan	Tanzania	Thailand*	Togo
Tonga	Trinidad and Tobago	Tunisia	Turkey*	Turks & Caicos Islands
Turkmenistan	Tuvalu	Uganda	Ukraine*	United Arab Emirates
United Kingdom*	United States*	Uruguay*	Uzbekistan	Vanuatu*
Venezuela*	Vietnam	Virgin Islands	Yemen	Zambia
Zimbabwe				

Note: Source countries also marked with an asterisk.

Table A2: Offshore Financial Centers: Default Definition

Caribbean

Aruba	Bahamas	Barbados	Belize
Bermuda	Brit. Virgin Islands	Cayman Islands	Costa Rica
Dominica	Neth. Antilles	St. Kitts & Nevis	Turks and Caicos Is.

Europe

Andorra	Cyprus	Gibraltar	Guernsey
Isle of Man	Jersey	Liechtenstein	Malta
Monaco			

East Asia

Hong Kong	Macau	Malaysia	Marshall Islands
Philippines	Singapore	Thailand	

Middle East

Bahrain	Israel	Kuwait	Lebanon
Oman	United Arab Emir.		

Other

Liberia	Mauritius	Morocco	Panama
Russia	Uruguay		

Table A3: Countries in Multilateral Data Sample

Afghanistan	Albania	Algeria	American Samoa	Andorra
Angola	Anguilla	Antigua & Barbuda	Argentina	Armenia
Aruba	Australia	Austria	Azerbaijan	Bahamas
Bahrain	Bangladesh	Barbados	Belarus	Belgium
Belize	Benin	Bermuda	Bhutan	Bolivia
Bosnia & Herzegovina	Botswana	Brazil	British Virgin Islands	Brunei Darussalam
Bulgaria	Burkina Faso	Burundi	Cambodia	Cameroon
Canada	Cape Verde	Cayman Islands	Central African Rep.	Chad
Chile	China	Colombia	Comoros	Congo
Cook Islands	Costa Rica	Cote d'Ivoire	Croatia	Cuba
Cyprus	Czech Rep	Denmark	Djibouti	Dominica
Dominican Rep	Ecuador	Egypt	El Salvador	Eq. Guinea
Eritrea	Estonia	Ethiopia	Falkland Islands	Faeroe Islands
Fiji	Finland	France	French Guiana	French Polynesia
Gabon	Gambia	Georgia	Germany, West	Ghana
Gibraltar	Greece	Greenland	Grenada	Guadeloupe
Guam	Guatemala	Guernsey	Guinea	Guinea-Bissau
Guyana	Haiti	Honduras	Hong Kong	Hungary
Iceland	India	Indonesia	Iran	Iraq
Ireland	Isle of Man	Israel	Italy	Jamaica
Japan	Jersey	Jordan	Kazakhstan	Kenya
Kiribati	Korea	Kuwait	Kyrgyz Republic	Laos
Latvia	Lebanon	Lesotho	Liberia	Libya
Liechtenstein	Lithuania	Luxembourg	Macau	Macedonia (FYR)
Madagascar	Malawi	Malaysia	Maldives	Mali
Malta	Marshall Islands	Martinique	Mauritania	Mauritius
Mexico	Micronesia	Moldova	Monaco	Mongolia
Montserrat	Morocco	Mozambique	Myanmar (Burma)	Namibia
Nauru	Nepal	Netherlands	Netherlands Antilles	New Caledonia
New Zealand	Nicaragua	Niger	Nigeria	Niue
North Korea	Northern Mariana Islands	Norway	Oman	Pakistan
Palau	Panama	Papua New Guinea	Paraguay	Peru
Philippines	Poland	Portugal	Puerto Rico	Qatar
Reunion	Romania	Russia	Rwanda	San Marino
Sao Tome and Principe	Saudi Arabia	Senegal	Serbia/Ex-Yugoslavia	Seychelles
Sierra Leone	Singapore	Slovakia	Slovenia	Solomon Islands
Somalia	South Africa	Spain	Sri Lanka	St. Helena
St. Kitts & Nevis	St. Pierre & Miquelon	St. Lucia	St. Vincent & Grens.	Sudan
Suriname	Swaziland	Sweden	Switzerland	Syria
Taiwan	Tajikistan	Tanzania	Thailand	Togo
Tonga	Trinidad & Tobago	Tunisia	Turkey	Turkmenistan
Turks and Caicos Islands	Tuvalu	UK	US Virgin Islands	Uganda
Ukraine	United Arab Emirates	United States	Uruguay	Uzbekistan
Vanuatu	Venezuela	Vietnam	Western Samoa	Yemen
Zaire	Zambia	Zimbabwe		

Appendix 1: A Monopolistically-Competitive Model

In this appendix, we examine a monopolistically-competitive domestic banking sector. We make the same assumptions concerning domestic depositors and the offshore bank, so that equation (4) still represents the zero-profit condition for the offshore bank.

To introduce monopolistic competition, we assume that there are a large number n of homogeneous monopolistically-competitive banks who paid a fixed entry cost, c. The representative domestic bank takes n, l_k $(k \neq j)$, and L_O as given and faces an individual downward-sloping demand curve $\tilde{R}$, which is assumed to be more elastic than the overall demand curve faced by the offshore bank, i.e. $|R'| > |\tilde{R}'|$. Moreover, the elasticity of demand faced by the representative domestic bank is assumed to be an increasing function of n; the greater is n, the greater is the capacity to improve market share from local rivals. Representative bank profits satisfy

$$\pi_j = \left[\tilde{R}\left(n, l_j + (n-1)l_j + L_O\right) - r^*\right] l_j$$

The representative bank maximizes its profits with respect to its choice of l_j. The first-order condition of the representative domestic bank satisfies

$$\left[\tilde{R}\left(l_j + (n-1)l_k + L_O\right) - r^*\right] + \tilde{R}' l_j = 0$$

In equilibrium, all domestic banks are assumed to be identical, and the overall demand curve is assumed to be the same as that faced by the offshore bank, so that the first order condition becomes

$$R\left(\int_{i^*}^{m} w(i)\,di + nl\right) - r^* + \tilde{R}' l = 0$$

It is convenient to rewrite the zero profit condition for the offshore bank in terms of individual domestic bank lending levels and n:

$$\theta w\left(i^*\right) R\left(\int_{i^*}^{m} w(i)\, di + nl\right) - r^* w\left(i^*\right) - ax = 0$$

Finally, banks will enter until their zero profit condition is satisfied:

$$\left[R\left(\int_{i^*}^{m} w(i)\, di + nl\right) - r^*\right] l = c$$

The last three equations form a system in three unknowns, i^*, n, and l:

$$\begin{bmatrix} w'\left(\theta R - r^*\right) - \theta w\left(i^*\right)^2 R' & \theta w\left(i^*\right) R' n & \theta w\left(i^*\right) R' l \\ -w\left(i^*\right) R' & R' n + \tilde{R}' & R' l + \partial \tilde{R}' / \partial n \\ -w\left(i^*\right) R' l & R - r^* + R' nl & R' l^2 \end{bmatrix} \begin{bmatrix} di^* \\ dl \\ dn \end{bmatrix} = \begin{bmatrix} w\left(i^*\right) R & -a \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} d\theta \\ dx \end{bmatrix}$$

The determinant of the system satisfies:

$$D = w'\left(\theta R - r^*\right)\left(R' l\right)\left[\tilde{R}' l - \left(R - r^*\right)\right]$$
$$-\partial \tilde{R}' / \partial n\left[w'\left(\theta R - r^*\right)\left[\left(R - r^*\right) + R' nl\right] - \theta w\left(i^*\right)^2 R'\left(R - r^*\right)\right]$$

Since $\left|R'\right| > \left|\tilde{R}'\right|$ by assumption, $\left(R - r^*\right) + R' nl < 0$ by the domestic bank's first order condition. A sufficient (but not necessary) condition for signing the determinant is then that $\partial \tilde{R}' / \partial n$ is not too large.

The comparative statics for a change in x then satisfy:

$$\frac{di^*}{dx} = \frac{1}{D} a\left[\left[\tilde{R}' l - \left(R - r^*\right)\right]\left(R' l\right) - \left(R - r^* + R' nl\right)\partial \tilde{R}' / \partial n\right] > 0$$

$$\frac{dl}{dx} = \frac{1}{D} a\left[\left(w\left(i^*\right) R' l\right)\left(\partial \tilde{R}' / \partial n\right)\right] < 0$$

$$\frac{dn}{dx} = \frac{1}{D} aw\left(i^*\right) R'\left[\bar{R}' l - \left(R - r^*\right)\right] > 0$$

Note that l and n move in opposite directions with a change in x. For example, with closer proximity to an OFC, n declines as there is exit from the domestic banking sector in the face of heightened competition from the OFC. However, the declines in domestic lending is partially offset by the increase in l, lending per bank. The change in overall lending satisfies:

$$\frac{dL}{dx} = -\frac{1}{D} aw\left(i^*\right) \frac{\partial \bar{R}'}{\partial n}\left(R - r^*\right) < 0 .$$

Since overall lending increases as x declines, it is easy to show that domestic interest rates fall as well.

Appendix 2: Comparative Statics and Simulation Details for the Monopolistic Model

1. Comparative static exercises

We first examine the impact of changes in the tax advantage enjoyed by the OFC, which is proxied by changes in θ. By equations (4) and (7), the system of equations satisfies:

$$\begin{bmatrix} w'\left(\theta R - r^*\right) - \theta w\left(i^*\right)^2 R' & \theta w\left(i^*\right) R' \\ -w\left(i^*\right)\left(R' + R'' L_H\right) & 2R' + R'' L_H \end{bmatrix} \begin{bmatrix} di^* \\ dL_H \end{bmatrix} = \begin{bmatrix} w\left(i^*\right) R & -a \\ 0 & 0 \end{bmatrix} \begin{bmatrix} d\theta \\ dx \end{bmatrix}$$

The determinant of the matrix of the system satisfies:

$$D = w'\left(\theta R - r^*\right)\left(2R' + R'' L_H\right) - \theta w\left(i^*\right)^2 \left(R'\right)^2 < 0$$

The comparative statics for a change in θ satisfy:

$$\frac{di^*}{d\theta} = -\frac{1}{D}\left(w\left(i^*\right) R\right)\left(2R' + R'' L_H\right) < 0$$

$$\frac{dL_H}{d\theta} = -\frac{1}{D} w\left(i^*\right)^2 R\left(R' + R'' L_H\right) < 0$$

which implies that

$$\frac{dL}{d\theta} = \frac{1}{D} R w\left(i^*\right)^2 R' > 0$$

The comparative statics for a change in x satisfy

$$\frac{di^*}{dx} = \frac{1}{D} a\left(2R' + R'' L_H\right) > 0$$

$$\frac{dL_H}{dx} = \frac{1}{D} a w\left(i^*\right)\left(R' + R'' L_H\right) > 0$$

which implies that

$$\frac{dL}{dx} = -\frac{1}{D} a w\left(i^*\right) R' < 0 .$$

2. Simulation solution

Given the assumption that $w(i) = wi$, the deposit rate paid by the OFC satisfies

$$r_O = \frac{r^* wi + ax}{\theta wi}$$

and by (3) OFC lending given i^* satisfies

$$L_O = \frac{w}{2}\left(m^2 - i^{*2}\right)$$

so that overall lending satisfies

$$L = L_H + \frac{w}{2}\left(m^2 - i^{*2}\right)$$

Given the functional form for R in (10), the equilibrium condition for OFC lending given L_H in (4) satisfies:

$$\theta wi^* \left(\overline{R} + R'L\right) - r^* wi^* - ax = 0$$

By (8) the first-order condition of the home country monopoly bank satisfies

$$\left(\overline{R} + R'L\right) - r^* + R'L_H = 0$$

The above two equations form a system of two equations in two unknowns, L_H and i^*.

Finally, our welfare measure satisfies

$$W = \left(\overline{R} - r^*\right)L + \frac{1}{2}R'L^2 - \left(m - i^*\right)ax$$

References

Alworth, Julian S. and S. Andresen (1992) "The Determinants of Cross-Border Non-Bank Deposits and the Competitiveness of Financial Market Centres" *Money Affairs* V-2, 105-133.

Barth, James R. Gerard Caprio Jr., and Ross Levine (2001) "Bank Regulation and Supervision: What Works Best" available at http://econ.worldbank.org/files/2733_wps2725.pdf

Claessens, Stijn and Luc Laeven (2004) "What Drives Bank Competition? Some International Evidence" *Journal of Money, Credit, and Banking* 36-3, 563-583.

Coates, Nick and Mike Rafferty (2006) "Offshore Financial Centres, Hot Money and Hedge Funds: A Network Analysis of International Capital Flows" in D. Wigan et.al. (eds) *Global Finance After Bretton Woods* (Palgrave MacMillan, Basingstoke).

Demirgüç-Kunt, Asli and Ross Levine (2001) *Financial Structure and Economic Growth* (Cambridge, MIT Press).

Errico, Luca and Alberto Musalem (1999)"Offshore Banking: An Analysis of Micro- and Macro-Prudential Issues" *IMF Working Paper 99/5*.

Glick, Reuven and Andrew K. Rose (2002) "Does a Currency Union Affect Trade?" *European Economic Review* 46-6, 1111-1123.

Hampton, Mark P. and John Christensen (2002) "Offshore Pariahs? Small Island Economies, Tax Havens, and the Reconfiguration of Global Finance, *World Development,* 30(9), 1657-1673.

Hines, James R., and Eric M. Rice (1994) "Fiscal Paradise: Foreign Tax Havens and American Business" *Quarterly Journal of Economics* 109-1, 149-182.

Huizinga, Harry and Søren Bo Nielsen (2002) "Withholding Taxes or Information Exchange: the Taxation of International Interest Flows" *Journal of Public Economics* 87, 39-72.

Kaufmann, D., A. Kraay, and M. Mastruzzi (2003) "Governance Matters III" *World Bank Policy Research Working Paper* No. 3106.

Lane, Philip R. and Gian Maria Milesi-Ferretti (2004) "International Investment Patterns" *IMF Working Paper WP/04/134*.

Levine, Ross, Norman Loayza, and Thorsten Beck (2000) "Financial Intermediation and Growth: Causality and Causes" *Journal of Monetary Economics,* 46(1), 31-77.

Masciandaro, Donato (forthcoming) "False and Reluctant Friends? National Money Laundering Regulation, International Compliance and Non-Cooperative Countries" *European Journal of Law & Economics.*

Organization for Economic Cooperation and Development (2000) *Improving Access to Bank Information for Tax Purposes* (Paris: OECD).

Organization for Economic Cooperation and Development (2004) *The OECD's Project on Harmful Tax Practices: The 2004 Progress Report* (Paris: OECD)

Portes, Richard and Hélène Rey (2005) "The Determinants of Cross-Border Equity Flows" *Journal of International Economics* 65, 269-296.

Figure 1
Simulation results over distance

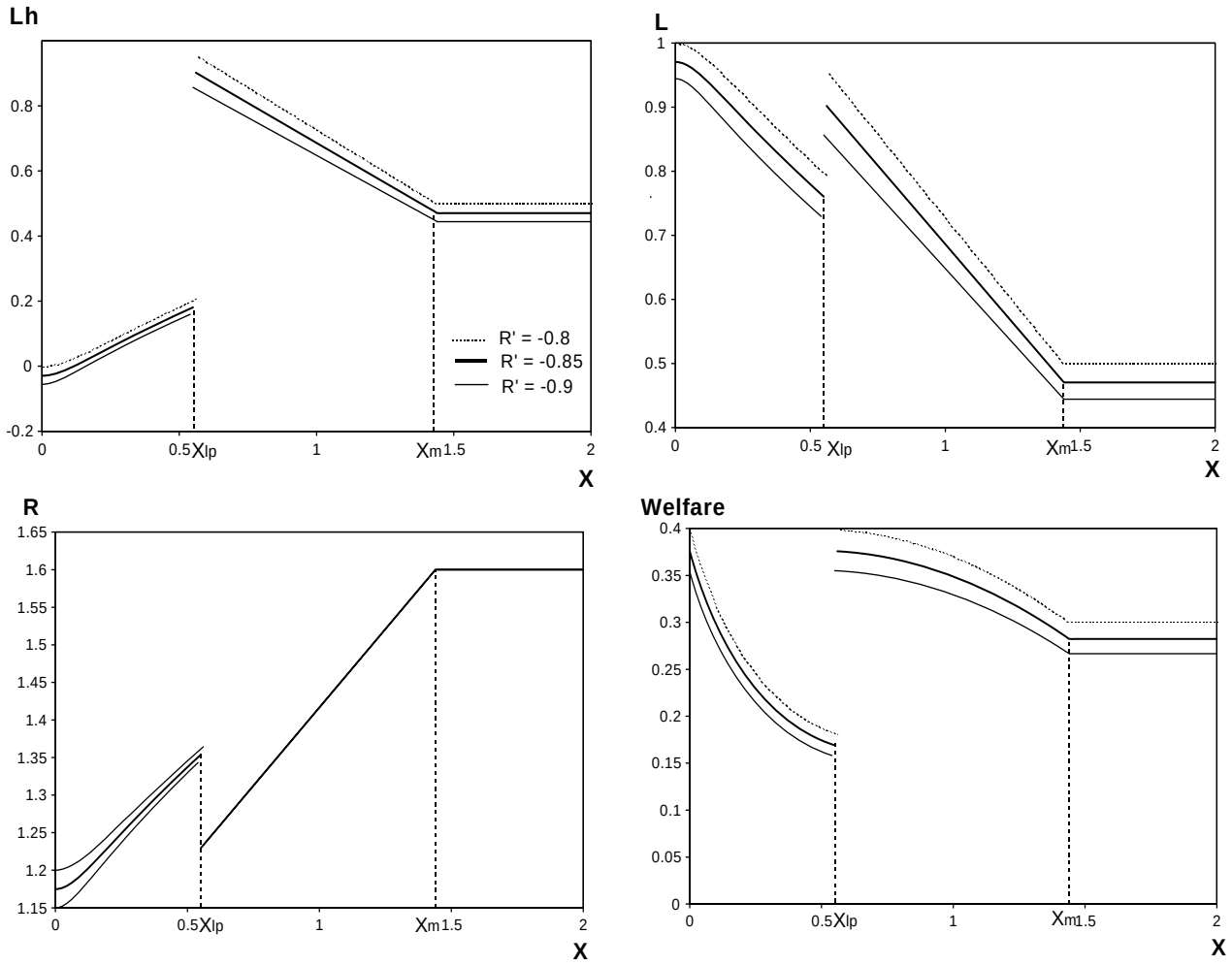

Figure 1 plots home bank lending, L_H, overall lending, L, interest rate levels, R, and welfare as function of distance to the OFC, x. x_{lp} represents the minimum value of x for which the home country bank chooses to limit price rather than pursue the Stackelberg leader solution. x_m represents the minimum value of x consistent with the pure monopoly solution.

Endnotes

[1] We use "country" below to refer to nations, territories, colonies, and so forth.
[2] http://www.oecd.org/dataoecd/9/61/2090192.pdf
[3] There were some notable holdouts; as of 2004, Andorra, Liberia, Liechtenstein, the Marshall Islands, and Monaco were still listed by the OECD as pursuing harmful tax practices (OECD, 2004).
[4] More details on the FATF are available at: http://www.fatf-gafi.org/; see also Masciandaro (forthcoming) and references therein.
[5] Alworth and Andresen (1992) is an antecedent of our work that estimates the determinants of cross-country bank deposits using BIS data between 17 source and 23 host countries for 1983, 1986, and 1990. They find a significant role for bank secrecy in attracting deposits, presumably to facilitate tax evasion and/or money-laundering. Portes and Rey (2005) focus instead on equity using a bilateral panel of data between 14 rich countries (including Hong Kong and Singapore) from 1989 through 1996; they find a strong role for information in explaining asset flows.
[6] For instance, Lane and Milesi-Ferretti (2004) conduct an analysis that is complementary to ours. While we both use gravity models, our analysis includes all assets for 2001-02 and focuses on the role of OFCs. In contrast, they analyze portfolio equity for 2001 using the CPIS data set and exclude OFCs.
[7] http://www.imf.org/external/np/sta/pi/geo.htm. Further details are available at http://www.imf.org/external/np/sta/pi/cpis.htm.
[8] In particular, the CPIS data show no cross-border holdings for e.g., the British Indian Ocean Territory (Diego Garcia), Christmas Island, and others; we drop them from our sample. We also drop areas with small holdings but other data problems, such as the French Southern Territories (Iles Crozet, Iles Kerguelen, Ile Amsterdam, and Ile Saint-Paul), and Niue.
[9] We use the word "country" to denote any territory or area for which we have data (of relevance); these need not be e.g., diplomatically recognized sovereign states with UN seats. Thus we include: territories (e.g., American Samoa); physical disparate parts of countries (e.g., Aruba); self-governing areas (e.g., Cook Islands); special administrative areas (e.g., Hong Kong); dependencies (e.g., Guernsey); commonwealths in political unions (e.g., Northern Mariana Islands); disputed areas (e.g., Taiwan) and so forth.
[10] Huizinga and Nielsen (2002) provide a related theoretical analysis of the differences between information provision and withholding taxes in the context of taxing interest across national boundaries. See also OECD (2000). In future work it would be interesting to treat tax havens and money launderers endogenously.
[11] Further details and the underlying data themselves are available at the sources. The OECD identifies tax havens on the basis of underlying policies. For instance, pp 9-10 of the OECDs's 2000 Report to the Ministerial Council Meeting *Towards Global Tax Co-operation* lists the four main factors that are used to 47 tax havens identified by the OECD: 1) low or no nominal taxes on the relevant income; 2) a regime that is ring-fenced from the domestic economy; 3) low transparency about the regime's disclosure, regulatory supervision, tax details and/or application, and 4) no effective exchange of information. More details are available at www.oecd.org/dataoecd/9/61/2090192.pdf. The CIA also provides (a little) more information on its data, at http://www.cia.gov/cia/publications/factbook/fields/2116.html.
[12] We use the 2000 data since it was the first review by the FATF, and use jurisdictions either reviewed or reviewed and deemed non-cooperative countries or territories. More details are available at http://www1.oecd.org/fatf/pdf/AR2000_en.pdf. For an analysis that treats money laundering as a choice variable determined by the national authorities, see Masciandaro (forthcoming).
[13] http://www.worldbank.org/wbi/governance/pubs/govmatters3.html
[14] For legal origins, we start with the well-known LaPorta, López-de-Silanes, Shliefer and Vishny data set available at http://mba.tuck.dartmouth.edu/pages/faculty/rafael.laporta/publications/LaPorta%20PDF%20Papers-ALL/Law%20and%20Finance-All/Law_fin.xls and fill in gaps with data from the CIA, available at: http://www.cia.gov/cia/publications/factbook/fields/2100.html.
[15] We use $100 in place of 0 or negative values. Alternative estimation strategies might be: a) averaging the data across years; b) using Tobit or c) weighting countries in some way and using GLS; we leave such issues to future research.
[16] Available at http://www.fsforum.org/publications/publication_23_31.html.
[17] Available at http://www.imf.org/external/np/mfd/2004/eng/031204.pdf
[18] The "offshore financial centers" that are caught by the latter requirement since they are OECD countries are: USA; UK; Austria; Luxembourg; Netherlands; Switzerland; Japan; Ireland; Australia; and Hungary. In our analysis,

we label these as non-OFCs, but retain them in the sample. Of the potential OECD OFCs, we consider only Luxembourg to be a potentially serious issue.

[19] OFCs also tend to be largely absent from places with poor banking systems (such as Africa and Central Asia), consistent with the results we present below.

[20] Available at http://www.cia.gov/cia/publications/factbook/fields/2086.html.

[21] The aggregated residual has at the top: Cayman Islands; British Virgin Islands; Netherlands Antilles; Liberia; and Tuvalu. While this – and the set of countries ranked slightly lower down – makes sense, the countries at the other end are more suspicious. They include: Faroe Islands; French Polynesia; Greenland; Puerto Rico; and Isle of Man. The last entry and a few others towards the bottom (e.g., Macau, Malta, UAE, and Aruba) make us take this measure with a grain of salt.

[22] Each of the five has positive factor loadings and scoring coefficients; the first factor explains essentially all of the variance of the five variables.

[23] The continuous variable has at the top: Cayman Islands; British Virgin Islands; Panama; Bahamas; and Singapore. The countries at the other end include: Faroe Islands; French Polynesia; Greenland; Martinique; and Syria.

[24] This result is consistent with the approach of Huizinga and Nielsen (2002) who treat policies like withholding taxes and information provision as substitute policies.

[25] The data set is available at http://www.worldbank.org/research/interest/2003_bank_survey/wb_banking_survey_032904.xls

[26] Available at http://www.ey.com/global/download.nsf/Argentina/WorldwCorporateTaxGuide/$file/WHOLE_FILE.pdf

[27] Available at http://www.cidcm.umd.edu/inscr/polity/.

[28] Available at http://hdr.undp.org/docs/statistics/indices/index_tables.pdf

[29] Available at http://www.freedomhouse.org/research/freeworld/2004/tables.htm

[30] We have also a) redefined our OFC dummy to include the ten OECD countries sometimes as identified as OFCs; and b) dropped these same ten countries from our analysis. Nothing of substance changes when we do this sensitivity analysis.

[31] The logic of our approach is similar to that of Claessens and Laeven (2004).

[32] One could easily imagine an extension of the model where taxes had a distortionary impact and the loss of revenues to the home country government resulted in higher tax rates and therefore welfare-reducing increases in domestic distortions.

[33] Note that the value of a effectively only determines the normalization for x (the distance parameter) as x only enters into the cost function in conjunction with a.

[34] Our model predicts this behavior within the range where the home country bank was not engaged in limit-pricing, which we perceive to be the norm.

[35] Our concentration on the nearest individual OFC is in the spirit of constant returns to scale in the banking technology of the OFC in our theoretical model. We also examined the sum of distances in miles to all of the OFCs as a robustness check. These results were very similar to those reported below.

[36] Thus the most remote countries are the Cook Islands, New Zealand, Niue, and French Polynesia, while the least remote countries are Croatia, Slovenia, Italy, and Austria.

[37] Data for local bank concentration and the number of commercial banks come from Demirguc-Kunt and Levine (2001).

[38] The first measure is obtained from Levine, Loayza, and Beck (2000) and is the average over 1980-1995. The latter are obtained from Barth, Caprio, and Levine (2001).

[39] The *distance from OFC* variable does robustly enter significantly as a determinant of credit to the private sector when the GDP per capita variable is omitted from the specification. However, this yields a rather uninteresting specification because it is well-documented that GDP per capita is highly correlated with measures of financial depth, e.g. Demirgüç-Kunt and Levine (2001).

[40] We have searched for a scale effect by interacting our measure of OFC proximity with the natural logarithms of either real GDP or the population. However, the coefficients on these terms are consistently economically and statistically small and insignificant. We have also attempt to link the Claessens and Laeven (2004) measure of bank competitiveness to our determinants without success. This is almost surely a result of the much smaller sample size; while their Table 3 provides estimates of H-statistics for fifty countries, that is still less than a third the size of the sample in our Tables 3 and 4.

[41] It is possible that channels other than the pro-competitive impact stressed in our model are also at work generating this result. In particular, it is possible that proximity to OFCs changes government policies towards its financial system, which may alter the cost of conducting intermediation for domestic banks.