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# Offshore Financial Centers: Parasites or Symbionts?

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# *Offshore Financial Centers: Parasites or Symbionts?*


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**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. Proximity to an OFC is associated with a more competitive domestic banking system and greater overall financial depth.



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## 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 multi-lateral 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; OFCs are designed to facilitate bad behavior 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 a 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. 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 but weaker effect on financial depth.

To summarize, we find that 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 cost of shifting assets offshore has 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. 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. 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. 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.

The CPIS data are freely available at the IMF's website at year-ends for 2001 and 2002.[5] 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. 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 for 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, all that is currently available. We drop a few insignificant areas because of data difficulties.[6] We are left with a bilateral data set with data from 69 source and 222 host countries.[7] (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 money launderers. For the former, we combine three indicators on tax havens, provided by the OECD, CIA, and Hines and Rice (1994).[8] For the latter, we use the June 2000 OECD Report from the Financial Action

Task Force on Money Laundering.[9] 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).[10] 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.[11]

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,
- $\beta$ is a vector of nuisance coefficients, and
- $\varepsilon_{ij}$ 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 observations for which the stock of cross-holdings is zero, we substitute a very small number for zero (and the occasional negative) values.[12] 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. Finally, 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. We gather this 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.[13] 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".[14] We further impose the requirement that the OFC host at least $10 million in total assets, and that it not be an OECD country.[15] This delivers our default set of forty OFCs, which are listed in Table A2.

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*.[16] The second is derived by aggregating (across source countries) the residuals from the default pooled model of Table 1.[17] We then combine the variables by using the first principal factor from the five underlying

variables.[18] This gives us a continuous version of our default binary variable. The two variables are highly correlated (the correlation coefficient is .84).[19]

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. 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)[20]; c) a dummy variable for the presence of capital controls taken from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*; d) the corporate tax rate, essentially taken from Ernst & Young[21]; e) the country's average Polity IV score[22]; f) average openness, the ratio of exports plus imports to GDP, taken from the *WDI*; g) the UNDP's human development index[23]; and lastly h) measures of political rights, civil rights, and freedom, all provided by Freedom House.[24] 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.

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.

**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.

### 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 $\tau$ represents the nominal domestic tax rate and $\theta$ 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

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

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 $\theta$, $r_O$, 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. His final wealth earns a return of $(1-\tau)r_H$. Thus depositors prefer the home bank if $r_H \ge r^*$. 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 inequality, depositor $i$ also prefers to take his assets offshore rather than 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. 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

$$R\left(L_H + L_O\right) = r_O\left(L_O\right) \tag{4}$$

where the right hand side of (4) represents the equilibrium value of $r_O$, i.e. that value for which (2) is just binding. It can be seen by inspection that the left hand side of (4) is increasing in $i^*$, as increases in $i^*$ result in decreases in $L_O$. It is less obvious that $r_O$ is increasing in $L_O$. By (2) and (3)

$$\frac{\partial r_O}{\partial L_O} = \frac{r^* + ax}{\theta\left[w\left(i^*\right)\right]^3}\frac{\partial w}{\partial i^*} \geq 0 \tag{5}$$

The intuition behind (5) is that 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.

It follows that there will be a unique equilibrium solution for $i^*$, and therefore $R$, given domestic lending $L_H$. By (4) the response of the offshore bank to a change in $L_H$ satisfies

$$\frac{dL_O}{dL_H} = \left\{ \frac{r^* + ax}{\theta R' \left[ w\left(i^*\right) \right]^3} \frac{\partial w}{\partial i^*} - 1 \right\}^{-1} < 0 . \tag{6}$$

Also, note that $\left| dL_O / dL_H \right| < 1$; lending by the domestic bank crowds out offshore lending, but less than one for one.

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 $D_H$, which results in an end-of-period liability of $r_H D_H$. The home bank lends $D_H$ to domestic borrowers at the equilibrium rate of interest, $R$. Domestic profits are equal to

$$\pi = \left[ R - r_H \right] L_H . \tag{7}$$

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 $L_H$. The first-order condition of the home country bank satisfies

$$R' \left( 1 + \frac{\partial L_O}{\partial L_H} \right) L_H + R - r^* = 0 . \tag{8}$$

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, $\theta$, increases offshore

lending, $L_O$, and reduces home country bank lending, $L_H$, but less than one for one. 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.

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 (2) and (4), the home bank can limit-price by issuing an amount of loans that satisfies

$$R(L_H) \leq \frac{r^* + ax}{\theta w(m)} \tag{9}$$

Satisfaction of equation (9) with inequality implies that the OFC would lose money upon entry. The home bank would therefore switch from its interior competitive solution in (8) to a limit-pricing strategy. Note that as *x* (the distance between the OFC and the home country) grows, (9) implies that the domestic loans necessary to achieve limit-pricing becomes arbitrarily small. Indeed, it may fall below the monopoly solution for the home country bank in the absence of the OFC. By (8), the pure monopoly solution for the home country bank in the absence of foreign competition satisfies

$$R' L_H + R - r^* = 0 \tag{10}$$

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 (8), 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 (9). Finally, when the OFC is sufficiently distant, the limit pricing solution falls below the monopoly optimum, 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.[25] 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:

$$W = \int_0^L \left[ R(l) - r^* \right] dl - \left( m - i^* \right) ax \qquad (11)$$

Equation (11) 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

$$R = \overline{R} + R'L \qquad (12)$$

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

Given these assumptions, we derive the expressions for (4) and (8) 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 1.1. Initially we also set the tax advantage of the OFC, $\theta$, to 1.1, but we examine alternative values for this parameter below. We set the cost of moving assets offshore, $a$, to 0.6.[26] We set $w$ equal to 2.0 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 bank. Finally, we normalize local interest rates by setting $\overline{R}$ equal to 2.0 and $R'$ equal to -0.9, although we entertain other values of $R'$ below.

Numerical values are a necessary part of simulations, but we concentrate on their qualitative results. Figure 1 plots the relationship between home bank lending and 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. Beginning at $x=0$, as distance to the OFC increases, the home country bank expands its lending, taking advantage of the deterioration in competitiveness of the OFC. At a certain value of $x$ the home country bank switches to a limit-pricing strategy, lending the amount necessary to keep the OFC out of its market. Over this range, home country lending declines in distance to the OFC, as increased distance to the OFC reduces the amount of domestic lending necessary to achieve limit pricing. Finally, when $x$ is so large that the minimum level of lending to achieve limit pricing matches the pure monopoly solution, home country lending is invariant to further increases in $x$. That is, domestic lending is non-monotonic in $x$.

Figure 2 plots how this non-linear pattern affects local interest rates. It can be seen that the OFC unambiguously increases the intensity of competition in the local market, as local interest rates are monotonically decreasing in proximity to the OFC. There is a kink in the relationship, corresponding to the switch from an interior solution to the limit-pricing strategy by the domestic bank.

The impact on welfare is portrayed in Figure 3, relative to the benchmark of lending all deposits at the risk-free rate. As discussed above, the impact of OFC proximity on domestic welfare is ambiguous. For relatively close OFCs, welfare declines with distance. That is, the pro-competitive impact of the OFC dominates. This result is anticipated in Figure 2 where the relationship between local interest rates and proximity to the OFC is most sensitive when the OFC is closest. However, for more distant OFCs, welfare increases with distance. In this parameter range, the deadweight loss associated with moving assets offshore dominates. The home country bank does not vary behavior much with increased distance, but there are fewer deadweight losses borne by the wealthiest depositors taking assets offshore. This relationship holds for a range of $\theta$ values.

When the distance between the domestic country and the OFC becomes consistent with limit-pricing, welfare again decreases with distance. In this range, increases in distance to the OFC reduce the amount of lending by the home country bank required to achieve limit pricing, bringing the home country bank's solution closer to the pure monopoly solution and thereby reducing welfare. Finally, for distances greater than or equal to those consistent with the pure monopoly solution, welfare is invariant with respect to OFC distance.

## 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.[27] 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 includes 40 OFCs (tabulated in Table A2) among the 223 countries included (tabulated in Table A3). Our measure of OFC proximity is distance to the nearest OFC.[28] 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.[29] We also add a variable for openness, measured as total trade as a percentage of GDP. Our estimating equation thus takes the form:

$$y_i = \beta_0 + \beta_1 \ln(\min DistOFC)_i + \beta_2 OFC_i + \beta_3 \ln(Pop)_i + \beta_4 \ln(Y/Pop)_i + Controls + \varepsilon_i \quad (13)$$

where the notation follows that of equation (1). 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 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.[30] The coefficient of interest to us is $\beta_1$, 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 model with OLS, employing standard errors robust to heteroskedasticity.

Our results are shown in 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 1.49 and a 1.70 percent in the interest rate spread and an increase of 4.99 to 8.09 percent in the share of the banking industry controlled by the five largest commercial banks. These results are statistically significant at standard significance levels for all three specifications. 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) the ratio of credit to the private sector as a percentage of GDP, b) the ratio of quasi-liquid liabilities

to GDP, and c) the ratio of M2 to GDP.[31] We now expect the coefficient of interest, $\beta_1$, to be consistently negative, since OFC proximity should increase domestic financial intermediation.

Our results are shown in Table 4. The results for the coefficient of interest are somewhat mixed. The effect of distance to the closest OFC affects financial intermediation with a consistently negative sign. However, 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.[32] Again, these results are robust to a number of alternative specifications. The point estimates also indicate that proximity to an OFC is consistently of economically significance.

In summary, our empirical results confirm the prediction of the model. We find consistent evidence that distance from an OFC is robustly associated with indicators of lack of competitiveness in the local banking sector. Moreover, financial depth is positively associated with OFC proximity, although for one of our three measures this effect is not statistically significant.

## 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 they are designed to engage in activities detrimental to the well-being of their clients' 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 | -1.24 | -1.04 | -.49 | -1.23 | -1.13 |
| | (.08) | (.09) | (.09) | (.05) | (.08) | (.08) |
| Log Host Population | 1.22 | 1.23 | 1.21 | .49 | 1.26 | 1.25 |
| | (.04) | (.05) | (.05) | (.04) | (.04) | (.04) |
| Log Source Population | .57 | .50 | .67 | .68 | .61 | .55 |
| | (.05) | (.05) | (.05) | (.04) | (.05) | (.05) |
| Log Host Real GDP p/c | 3.44 | 3.35 | 3.53 | 1.92 | 2.01 | 1.92 |
| | (.05) | (.05) | (.05) | (.05) | (.09) | (.09) |
| Log Source Real GDP p/c | 2.84 | 2.88 | 2.80 | 3.13 | 1.84 | 1.82 |
| | (.10) | (.11) | (.11) | (.07) | (.17) | (.17) |
| Common Border | 1.10 | 1.06 | 1.14 | .94 | 1.31 | 1.32 |
| | (.37) | (.40) | (.39) | (.19) | (.38) | (.37) |
| Common Language | 1.67 | 1.49 | 1.87 | 1.13 | .95 | .96 |
| | (.16) | (.18) | (.17) | (.11) | (.16) | (.16) |
| Currency Union | 2.86 | 3.03 | 2.68 | 2.22 | 2.58 | 2.63 |
| | (.28) | (.29) | (.30) | (.14) | (.27) | (.28) |
| Common Colonizer | .78 | .40 | 1.23 | 1.09 | .39 | .56 |
| | (.36) | (.39) | (.40) | (.27) | (.35) | (.36) |
| Currently Colony | .65 | 1.69 | -.59 | 3.89 | .35 | .64 |
| | (3.53) | (3.46) | (3.74) | (.85) | (2.98) | (3.15) |
| Island Host | .66 | .75 | .56 | .52 | -.00 | .00 |
| | (.19) | (.20) | (.20) | (.14) | (.18) | (.19) |
| Island Source | .88 | .83 | .88 | 1.07 | .43 | .65 |
| | (.16) | (.18) | (.18) | (.11) | (.17) | (.18) |
| Tax Haven Host | | | | | 1.19 | 1.33 |
| | | | | | (.24) | (.25) |
| Tax Haven Source | | | | | .70 | 1.23 |
| | | | | | (.20) | (.22) |
| Money Laundering Host | | | | | 2.06 | 2.06 |
| | | | | | (.24) | (.24) |
| Money Laundering Source | | | | | .55 | .29 |
| | | | | | (.23) | (.23) |
| Rule Law, Host | | | | | -.27 | -.24 |
| | | | | | (.17) | (.17) |
| Rule Law, Source | | | | | 2.32 | 2.33 |
| | | | | | (.24) | (.24) |
| Political Stability, Host | | | | | -.14 | -.19 |
| | | | | | (.10) | (.10) |
| Political Stability, Source | | | | | -1.65 | -2.03 |
| | | | | | (.18) | (.18) |
| Regulatory Quality, Host | | | | | 2.19 | 2.21 |
| | | | | | (.15) | (.15) |
| Regulatory Quality, Source | | | | | -.50 | -.06 |
| | | | | | (.23) | (.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<br>(.04) | .11<br>(.06) | .01<br>(.09) | .01<br>(.10) |
| GDP p/c | .44<br>(.11) | .39<br>(.13) | .35<br>(.30) | .49<br>(.31) |
| Tax Haven | | 1.34<br>(.36) | 1.05<br>(.43) | .87<br>(.45) |
| Money Launderer | | 1.51<br>(.35) | 1.87<br>(.48) | 1.87<br>(.48) |
| Rule of Law | | | -.24<br>(.50) | -.39<br>(.52) |
| Political Stability | | | -.13<br>(.29) | -.07<br>(.31) |
| Regulatory Quality | | | .32<br>(.46) | .32<br>(.46) |
| Common Law | | | | -.05<br>(.50) |
| Civil Law | | | | -.94<br>(.60) |
| French Law | | | | .60<br>(.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<br>(.03) | .01<br>(.02) | -.01<br>(.02) | -.01<br>(.02) |
| GDP p/c | .23<br>(.04) | .11<br>(.03) | .01<br>(.04) | .04<br>(.05) |
| Tax Haven | | 1.12<br>(.25) | 1.08<br>(.31) | 1.02<br>(.30) |
| Money Launderer | | .91<br>(.29) | 100<br>(.36) | .96<br>(.36) |
| Rule of Law | | | -.11<br>(.14) | -.15<br>(.14) |
| Political Stability | | | .04<br>(.06) | .06<br>(.06) |
| Regulatory Quality | | | .18<br>(.12) | .18<br>(.13) |
| Common Law | | | | .11<br>(.14) |
| Civil Law | | | | -.11<br>(.13) |
| French Law | | | | .10<br>(.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. Probit estimation; standard errors recorded in parentheses

**Table 2c: Potential Additional Determinants of OFC**

| | Binary OFC Measure | Continuous OFC Measure |
|---|---|---|
| **English Language** | .09<br>(.29) | -.04<br>(.09) |
| **Official Supervisory Power from Barth, Caprio and Levine** | .05<br>(.04) | .02<br>(.01) |
| **Capital Controls** | .23<br>(.34) | .14<br>(.15) |
| **Corporate Tax Rate** | -.01<br>(.01) | -.00<br>(.01) |
| **Polity** | -.06<br>(.03) | -.00<br>(.01) |
| **Openness** | .001<br>(.003) | .002<br>(.002) |
| **Human Development Index** | -1.66<br>(2.72) | -.47<br>(.37) |
| **Political Rights** | .12<br>(.08) | -.01<br>(.02) |
| **Civil Rights** | .21<br>(.10) | .00<br>(.03) |
| **Freedom** | .24<br>(.21) | -.02<br>(.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 3: OFC Proximity and Domestic Banking Competitiveness**

| | Interest Rate Spread | | | Bank Concentration | | | # Com. Banks/Log GDP | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) | (1) | (2) | (3) |
| **Closest OFC Dist.** | 1.45 | 1.41 | 1.61 | 4.67 | 7.56 | 6.94 | -2.22E-09 | -2.27E-09 | -5.85E-10 |
| | (0.69) | (0.70) | (0.79) | (1.38) | (1.79) | (1.99) | (1.09E-09) | (1.18E-09) | (1.88E-10) |
| **OFC** | 0.91 | 2.39 | 2.66 | -11.21 | -14.56 | -14.56 | 1.85E-09 | 1.27E-09 | 4.77E-10 |
| | (1.46) | (1.85) | (2.05) | (4.60) | (4.72) | (5.48) | (2.40E-09) | (2.58E-09) | (6.30E-10) |
| **Log Population** | -0.27 | -0.22 | -0.38 | -6.67 | -7.43 | -8.45 | -2.72E-09 | -2.61E-09 | -8.36E-10 |
| | (0.26) | (0.32) | (0.40) | (0.67) | (0.76) | (0.79) | (5.93E-10) | (5.67E-10) | (1.40E-10) |
| **Log GDP/capita** | -2.59 | -3.15 | -3.15 | -2.62 | 1.5 | 1.31 | -8.15E-10 | -2.80E-09 | -3.87E-10 |
| | (0.42) | (0.73) | (0.85) | (1.57) | (2.72) | (2.54) | (6.23E-10) | (9.62E-10) | (2.60E-10) |
| **Trade Remoteness** | | -0.003 | -0.002 | | -0.05 | -0.03 | | -4.13E-12 | -3.30E-12 |
| | | (0.01) | (0.01) | | (0.04) | (0.04) | | (1.34E-11) | (3.33E-12) |
| **Civil Law** | | 2.64 | 2.35 | | -0.75 | -3.45 | | -5.82E-09 | -1.23E-09 |
| | | (1.20) | (1.35) | | (5.19) | (5.15) | | (1.79E-09) | (5.40E-10) |
| **French Law** | | 0.52 | 0.27 | | 5.43 | 6.05 | | 2.73E-09 | -1.68E-10 |
| | | (1.31) | (1.41) | | (4.41) | (4.64) | | (1.22E-09) | (3.27E-10) |
| **Landlocked** | | 0.01 | -0.68 | | -1.22 | -1.97 | | -8.43E-10 | 3.71E-10 |
| | | (1.35) | (1.55) | | (4.49) | (4.41) | | (1.30E-09) | (4.00E-10) |
| **Latitude** | | -0.02 | -0.01 | | -0.24 | -0.15 | | 1.73E-10 | 1.34E-13 |
| | | (0.06) | (0.06) | | (0.15) | (0.15) | | (6.23E-11) | (1.47E-11) |
| **Christian** | | 0.02 | 0.03 | | -0.07 | -0.13 | | -4.94E-11 | 5.54E-12 |
| | | (.01) | (0.01) | | (0.05) | (0.05) | | (3.18E-11) | (6.18E-12) |
| **Muslim** | | -0.03 | -0.03 | | 0.05 | 0.01 | | -8.20E-11 | -7.07E-12 |
| | | (0.02) | (0.02) | | (0.05) | (0.05) | | (3.12E-11) | (6.80E-12) |
| **Trade** | | | -0.007 | | | -0.02 | | | -8.20E-12 |
| | | | (0.02) | | | (0.05) | | | (5.62E-12) |
| **Observations** | 142 | 142 | 127 | 135 | 135 | 122 | 144 | 144 | 127 |
| **$R^2$** | 0.24 | 0.32 | 0.31 | 0.39 | 0.44 | 0.49 | 0.45 | 0.54 | 0.59 |

Regressand is proxy for domestic banking sector competitiveness.
Constant included but not recorded.
OLS estimation; robust standard errors recorded in parentheses.

## Table 4: OFC Proximity and Financial Depth

| | Private Domestic Credit | | | Quasi Liquid Liability | | | M2 | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) | (1) | (2) | (3) |
| **Closest OFC Dist.** | -1.77 | -2.97 | -4.01 | -8.88 | -11.33 | -11.59 | -9.7 | -11.05 | -11.43 |
| | (2.99) | (2.94) | (3.11) | (3.29) | (3.60) | (3.43) | (3.43) | (4.01) | (3.79) |
| **OFC** | 15.43 | 11.19 | 9.05 | 34.49 | 28.64 | 28 | 31.28 | 25.24 | 25.47 |
| | (7.64) | (7.99) | (8.60) | (9.44) | (10.51) | (12.11) | (8.91) | (10.30) | (11.64) |
| **Log Population** | 3.44 | 4.21 | 4.41 | 1.08 | 0.96 | 2.5 | 0.62 | 0.15 | 1.88 |
| | (1.44) | (25.85) | (1.51) | (1.34) | (1.19) | (1.33) | (1.59) | (1.48) | (1.62) |
| **Log GDP/capita** | 25.8 | 25.85 | 26.5 | 10.95 | 11.43 | 11.56 | 11.14 | 10.95 | 11.07 |
| | (2.69) | (3.59) | (3.97) | (2.48) | (3.50) | (3.79) | (2.35) | (3.61) | (3.83) |
| **Trade Remoteness** | | 0.02 | 0.04 | | 0.07 | 0.06 | | 0.04 | 0.02 |
| | | (0.05) | (0.05) | | (0.05) | (0.05) | | (0.06) | (0.06) |
| **Civil Law** | | -16.56 | -18.21 | | -17.81 | -20.09 | | -17.22 | -21.2 |
| | | (7.92) | (7.97) | | (6.68) | (7.05) | | (7.05) | (7.68) |
| **French Law** | | -0.87 | -2.19 | | 11.21 | 11.11 | | 9.11 | 9.69 |
| | | (7.33) | (7.61) | | (6.83) | (7.17) | | (6.99) | (7.33) |
| **Landlocked** | | 3.5 | 4.43 | | 5.58 | 6.9 | | -0.46 | 1.09 |
| | | (5.65) | (5.98) | | (4.64) | (4.60) | | (5.52) | (5.44) |
| **Latitude** | | -0.03 | -0.07 | | 0.14 | 0.07 | | 0.21 | 0.14 |
| | | (0.22) | (0.23) | | (0.22) | (0.23) | | (0.23) | (0.24) |
| **Christian** | | -0.003 | -0.01 | | -0.17 | -0.16 | | -0.19 | -0.17 |
| | | (0.07) | (0.08) | | (0.08) | (0.09) | | (0.09) | (0.09) |
| **Muslim** | | -0.12 | -0.1 | | -0.2 | -0.18 | | -0.17 | -0.14 |
| | | (0.07) | (0.07) | | (0.07) | (0.07) | | (0.09) | (0.09) |
| **Trade** | | | -0.008 | | | 0.1 | | | 0.11 |
| | | | (0.06) | | | (0.09) | | | (0.09) |
| **Observations** | 174 | 174 | 159 | 162 | 162 | 147 | 162 | 162 | 147 |
| **$R^2$** | 0.54 | 0.58 | 0.58 | 0.44 | 0.51 | 0.53 | 0.41 | 0.46 | 0.5 |

Regressand is proxy for domestic financial depth; all as percentages of GDP.
Constant included but not recorded.
OLS estimation; 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 |
| Faroe 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**

| | | | |
|---|---|---|---|
| Andorra | Aruba | Bahamas | Bahrain |
| Barbados | Belize | Bermuda | Brit. Virgin Islands |
| Cayman Islands | Costa Rica | Cyprus | Dominica |
| Gibraltar | Guernsey | Hong Kong | Isle of Man |
| Israel | Jersey | Kuwait | Lebanon |
| Liberia | Liechtenstein | Macau | Malaysia |
| Malta | Marshall Islands | Mauritius | Monaco |
| Morocco | Neth. Antilles | Oman | Panama |
| Philippines | Russia | Singapore | St. Kitts & Nevis |
| Thailand | Turks and Caicos Is. | United Arab Emir. | 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 | Faroe 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. Comparative static exercises*

We first examine the impact of changes in the tax advantage enjoyed by the OFC, which is proxied by changes in $\theta$. Differentiating (4) with respect to $L_O$ and $\theta$ given $L_H$ yields

$$\frac{dL_O}{d\theta} = -\left(\frac{r^* + ax}{\theta^2 w(i)}\right)\left(R' - \frac{\partial r_O}{\partial L_O}\right)^{-1} > 0 \qquad \text{(A.1)}$$

Differentiating (8) with respect to $L_H$ and $\theta$ then satisfies

$$\frac{dL_H}{d\theta} = -\frac{\left[R' + R''\left(1 + \frac{\partial L_O}{\partial L_H}\right)L_H\right]\frac{dL_O}{d\theta} + R'\left(\frac{\partial^2 L_O}{\partial L_H \partial \theta}\right)L_H}{\partial^2 \pi / \partial L_H^2} < 0 \qquad \text{(A.2)}$$

where the cross-partial term can be signed as positive by (6) and the denominator can be signed as negative by the home bank's second order condition.

We next examine the impact of changes in distance, $x$. Differentiating (4) with respect to $L_O$ and $x$ yields

$$\frac{dL_O}{dx} = \frac{a}{\theta w(i)\left(R' dL_O - \frac{\partial r_O}{\partial L_O}\right)} \leq 0 \qquad \text{(A.3)}$$

By (8), the impact on home bank lending of an increase in $x$ satisfies

$$\frac{dL_H}{dx} = -\frac{\left[R' + R''\left(1 + \frac{\partial L_O}{\partial L_H}\right)L_H\right]\frac{\partial L_O}{\partial x} + R'\left(\frac{\partial^2 L_O}{\partial L_H \partial x}\right)L_H}{\partial^2 \pi / \partial L_H^2} \geq 0 \qquad \text{(A.4)}$$

where the cross-partial term can be signed as negative by (6) and the denominator can be signed as negative by the home bank's second order condition.

*2. Simulation solution*

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

$$r_O = \frac{r^* + ax}{\theta w i} \tag{A.5}$$

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

$$L_O = \frac{w}{2}\left(m^2 - i^{*2}\right) \tag{A.6}$$

so that overall lending satisfies

$$L = L_H + \frac{w}{2}\left(m^2 - i^{*2}\right) \tag{A.7}$$

Given the functional form for $R$ in (12), the equilibrium condition for OFC lending given $L_H$ in (4) satisfies

$$\theta w i^* \left(\overline{R} + R'L\right) - r^* - ax = 0 \tag{A.8}$$

or

$$i^*\left[\overline{R} + R'\left(L_H + \frac{w}{2}\left(m^2 - i^{*2}\right)\right)\right] = \frac{r^* + ax}{\theta w} \tag{A.9}$$

so that $\partial i^* / \partial L_H$ satisfies

$$\frac{di^*}{dL_H} = -\frac{i^* R'}{\overline{R} + R'\left(L_H + \frac{1}{2}wm^2 - \frac{3}{2}wi^{*2}\right)} \geq 0 \tag{A.10}$$

By (3)

$$\frac{\partial L_O}{\partial i^*} = -wi^* \tag{A.11}$$

so that $\partial L_O / \partial L_H$ satisfies

$$\frac{dL_O}{dL_H} = \frac{wi^{*2}R'}{\overline{R} + R'\left(L_H + \frac{1}{2}wm^2 - \frac{3}{2}wi^{*2}\right)} \leq 0 \qquad \text{(A.12)}$$

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

$$R'\left(1 + \frac{wi^{*2}R'}{\overline{R} + R'\left(L_H + \frac{1}{2}wm^2 - \frac{3}{2}wi^{*2}\right)}\right)L_H + \frac{r^*\left(1 - \theta wi^*\right) + ax}{\theta wi^*} = 0 \qquad \text{(A.13)}$$

Equations (A.8) and (A.13) then form a system of two equations in two unknowns, $L_H$ and $i^*$.

Finally, our welfare measure satisfies

$$W = \left(\overline{R} - r^*\right)L - \frac{1}{2}R'L^2 - \left(m - i^*\right)ax \qquad \text{(A.14)}$$

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**Figure 1**
$L_H$ over Distance

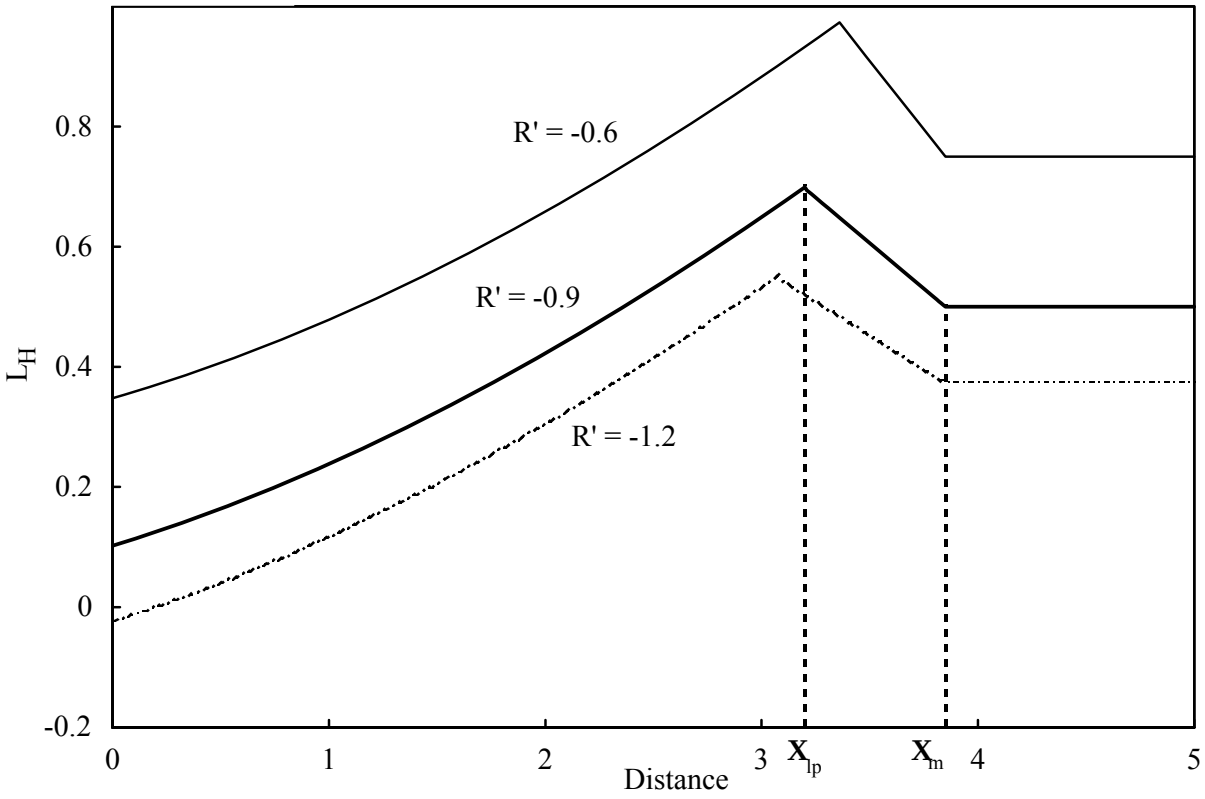


Figure 1 plots home bank lending, $L_H$, as function of distance to the OFC, $x$. $x_{lp}$ represents that minimum value of $x$ for which the home country bank chooses to limit price rather than pursue the Stackelberg leader solution. $x_m$ represents the minimum value of $x$ consistent with the pure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

**Figure 2**
R over Distance

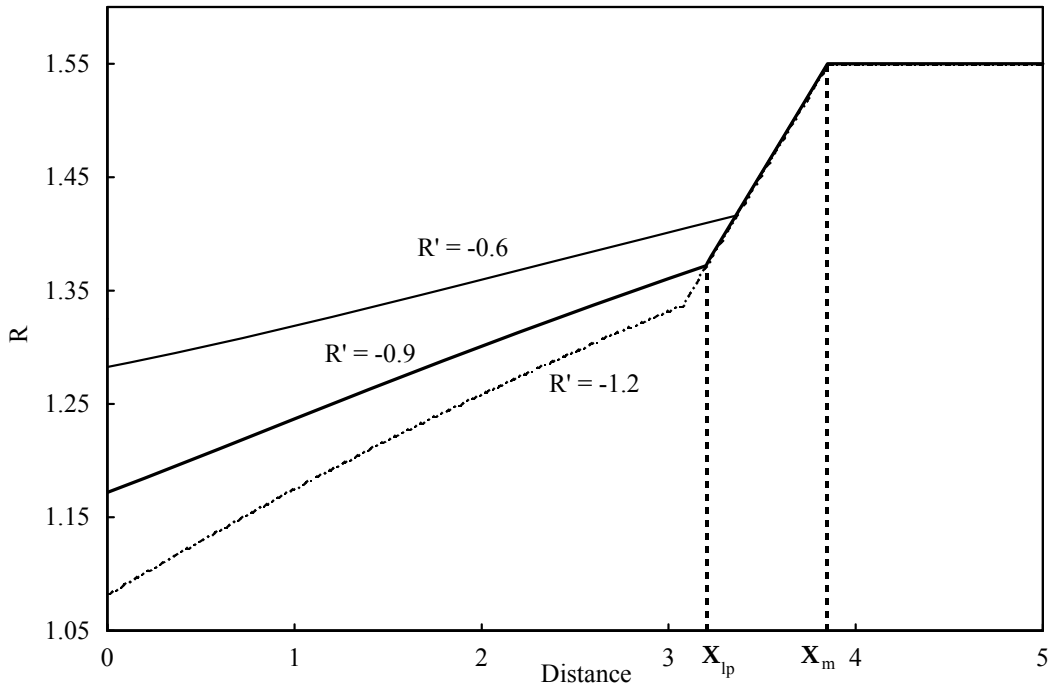


Figure 2 plots the domestic interest rate, $R$, as function of distance to the OFC, $x$. $x_{lp}$ represents that minimum value of $x$ for which the home country bank chooses to limit price rather than pursue the Stackelberg leader solution. $x_m$ represents the minimum value of $x$ consistent with the pure monopoly solution.

**Figure 3**
Welfare over Distance

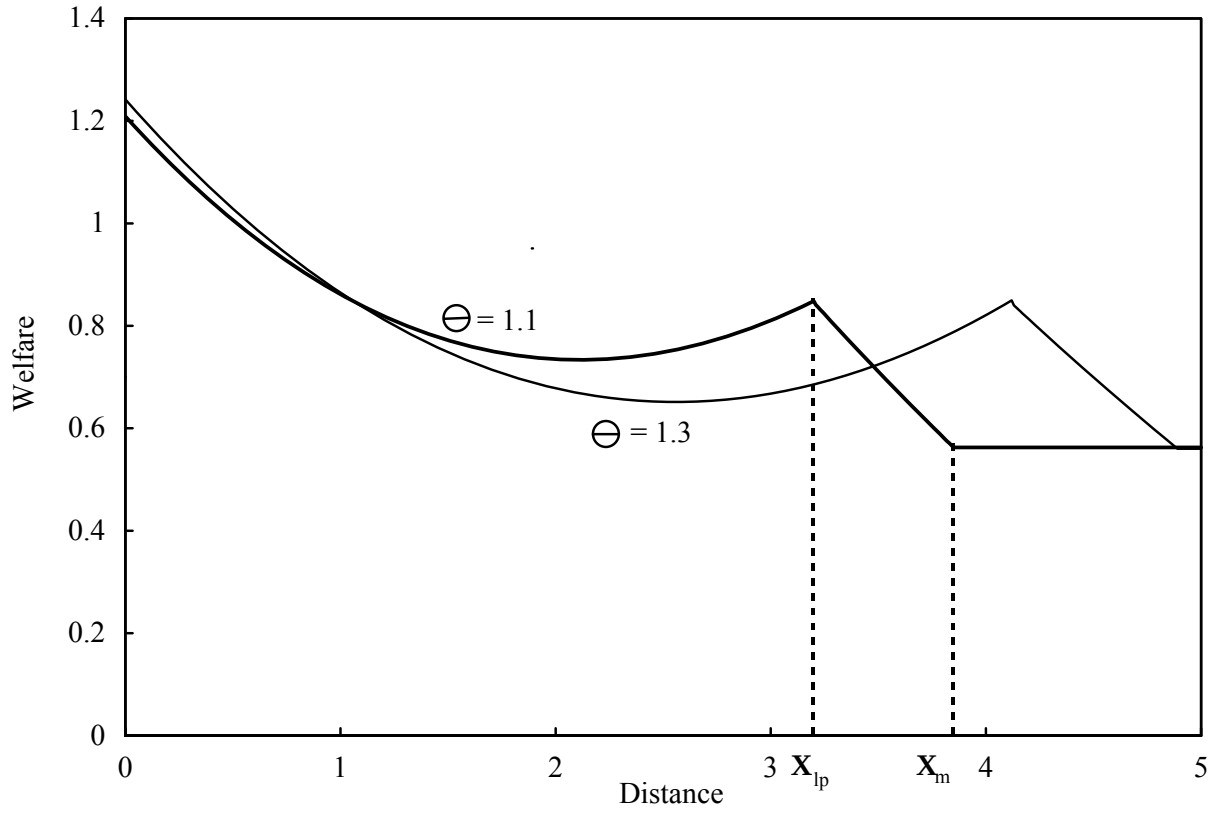


Figure 3 plots the domestic interest rate, $R$, as function of distance to the OFC, $x$. $x_{lp}$ represents that minimum value of $x$ for which the home country bank chooses to limit price rather than pursue the Stackelberg leader solution. $x_m$ represents the minimum value of $x$ consistent with the 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/.
[5] 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.
[6] 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.
[7] 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.
[8] The OECD provides its data online; see e.g., http://www.oecd.org/document/19/0,2340,en_2649_37427_1903251_1_1_1_37427,00.html. Ditto the CIA; see http://www.cia.gov/cia/publications/factbook/fields/2116.html.
[9] Available at http://www1.oecd.org/fatf/pdf/AR2000_en.pdf
[10] http://www.worldbank.org/wbi/governance/pubs/govmatters3.html
[11] 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.
[12] We use $100 in place of 0 or negative values.
[13] Available at http://www.fsforum.org/publications/publication_23_31.html.
[14] Available at http://www.imf.org/external/np/mfd/2004/eng/031204.pdf
[15] The "offshore financial centers" that are caught by the latter requirement since they are OECD countries are: USA; UK; Austria; Luxembourg; Netherlands; Switzerland; Japan; Ireland; Australia; and Hungary. Of these, we consider only Luxembourg to be a potentially serious issue.
[16] Available at http://www.cia.gov/cia/publications/factbook/fields/2086.html.
[17] The aggregated residual has at the top: Cayman Islands; British Virgin Islands; Netherlands Antilles; Liberia; and Tuvalu. While this – and the set of countries ranked slightly lower down – makes sense, the countries at the other end are more suspicious. They include: Faroe Islands; French Polynesia; Greenland; Puerto Rico; and Isle of Man. The last entry and a few others towards the bottom (e.g., Macau, Malta, UAE, and Aruba) make us take this measure with a grain of salt.
[18] Each of the five has positive factor loadings and scoring coefficients; the first factor explains essentially all of the variance of the five variables.
[19] The continuous variable has at the top: Cayman Islands; British Virgin Islands; Panama; Bahamas; and Singapore. The countries at the other end include: Faroe Islands; French Polynesia; Greenland; Martinique; and Syria.
[20] The data set is available at http://www.worldbank.org/research/interest/2003_bank_survey/wb_banking_survey_032904.xls
[21] Available at http://www.ey.com/global/download.nsf/Argentina/WorldwCorporateTaxGuide/$file/WHOLE_FILE.pdf
[22] Available at http://www.cidcm.umd.edu/inscr/polity/.
[23] Available at http://hdr.undp.org/docs/statistics/indices/index_tables.pdf
[24] Available at http://www.freedomhouse.org/research/freeworld/2004/tables.htm
[25] 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.
[26] 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 $a$.

[27] Our model predicted this behavior within the range where the home country bank was not engaged in limit-pricing, which we perceive to be the norm.
[28] 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 and are available upon request from the authors.
[29] 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.
[30] Data for local bank concentration and the number of commercial banks come from Demirguc-Kunt and Levine (2001).
[31] 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).
[32] 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)].