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Subsidiary operations in offshore financial centers and bank risk-taking: International evidence

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Abstract
The last two decades have witnessed a growing trend of traditional onshore banks establishing affiliates and subsidiaries offshore, along with increased globalization and competition in international financial markets. We examine whether subsidiary operations in offshore financial centers (OFCs) facilitate bank risk-taking. We construct an international sample of banks with and without OFC operations during 2001–2018 and employ various proxies for bank risk-taking. Our results reveal that banks with OFC operations take more risks than banks without OFC operations. Focusing on banks with OFC operations, we find that those with more intensive operations in OFCs exhibit higher risk. Our results also indicate that more intensive operations in OFCs with more regulatory arbitrage opportunities are associated with higher bank risk, and that restrictive bank capital regulations in home countries foster banks' risk-taking via OFC operations. Our findings are consistent with the view that onshore banks exploit OFCs' loose regulations, poor transparency, and lack of oversight to pursue riskier activities. These findings have important implications for the international business literature and provide regulators around the world with useful insights into overseeing bank operations in OFCs.
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INTRODUCTION

Banks play a crucial role in promoting international business (IB) because they provide financing for the foreign investment of multinational companies, help allocate capital for productive use, and maintain the stability of the international financial system (Fang, Hasan, Leung, & Wang, 2019; Laeven, 2013). Along with increased globalization and competition in international financial markets, the last two decades have witnessed a growing trend of traditional onshore banks establishing affiliates and subsidiaries offshore to achieve higher returns (Morriss, 2010). The government provides the traditional banking system with a safety net to prevent

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bank runs; therefore, this banking system is heavily regulated. However, the financial intermediaries in the shadow banking system, such as special purpose vehicles (SPVs), structured investment vehicles (SIVs), etc., are mainly incorporated in offshore financial centers (OFCs) with weak regulatory control. As such, by setting up financial intermediaries in OFCs, traditional banks may engage in unrestricted risky investment activities. In 2007, 51% of the world's cross-border assets and liabilities were held in OFCs (Palan, Murphy, & Chavagneux, 2010). Moreover, many of the SPVs that failed during the financial crisis were incorporated offshore, but managed by traditional onshore banks[1] (Lane & Milesi-Ferretti, 2010). According to Moody's Asset-Backed Commercial Paper Program Index, the SPVs that issued the most toxic forms of asset-backed commercial paper were disproportionally concentrated in small offshore islands. Thus, the role that OFC operations play in banking stability has become a critical issue faced by regulators around the world. While a large body of IB research focuses on globalization, little attention has been paid to banking globalization in general and bank offshore operations in particular (Fang et al., 2019; Verbeke, Coeurderoy, & Matt, 2018). Given the significant influence of OFCs on the global financial system, this paper aims to provide large-sample, systematic evidence on whether banks' OFC operations are associated with bank risk-taking activities and the roles played by institutions of OFCs and home countries.

OFCs are jurisdictions in which a relatively large number of financial service companies engage primarily in business with nonresidents. They range from large financial centers (such as Hong Kong and Singapore) with well-developed financial markets and regulatory frameworks to small islands (such as Caribbean centers) that are either tax havens or financial regulatory havens. Proponents of OFCs argue that easy incorporation procedures, proximity to countries that attract more capital inflows, and lower transaction costs in OFCs provide development potential for companies in developing countries with weak institutions (Huang, 2008; Kleinfeld, 1994; Pei, 2008; Sharman, 2012). However, opponents are concerned about the potential risk that OFCs may pose to the international financial system due to the lack of effective regulatory and supervisory standards and the potential for financial abuse (Chernykh & Mityakov, 2017; Palan et al., 2010; Rixen, 2013; Young, 2013;). As the financial service sectors are fundamental to the operation of every aspect of the economic system (Dicken, 1992), understanding the implications of OFC operations for bank risk is not only crucially important to bank clients (or borrowers) engaging in international business activities but also vital to banking regulators around the world who engage in designing rules and implementing policies to regulate banks' international business activities.

Our study is grounded on insights from banking theory and comparative capitalism, a strand of institutional theory, in developing arguments about OFC operations and bank risk-taking. Banking theory (Bhattacharya & Thakor, 1993; Diamond & Dybvig, 1983, 1986; Merton, 1977) implies that the deposit insurance provided by the government to prevent bank runs creates strong incentives for banks to take more risk; however, the traditional onshore banks' ability to take risk is usually constrained by their home-country's strict bank capital regulations. As a result, the risk-taking needs of traditional onshore banks could be misaligned with their home-country's regulatory environment. The comparative capitalism literature points out that nations can derive comparative advantages in particular sectors from their institutional infrastructure, and companies can engage in institutional arbitrage by moving their operations to the country whose institutional environment best fits their needs (Hall & Soskice, 2001; Jackson & Deeg, 2008). As OFC countries normally have loose regulations on bank activities, offering banks a competitive advantage, we expect that banks with a high risk-taking appetite are likely to move to offshore locations to escape from the home-country's institutional constraints and to meet their risk-taking needs. Meanwhile, OFCs' unique regulatory environments, such as ineffective supervision, minimum governance, inadequate disclosure rules, and lack of information sharing with onshore regulators, can also aggravate banks' incentive and ability to take on more risk. In sum, we predict that a bank's OFC operations are positively associated with its level of risk-taking (Hypothesis 1). However, the reputations of OFCs vary, and not all OFCs have very low regulatory standards. The likelihood of banks using OFCs to avoid home-country regulations and engage in high-risk activities depends on the institutional environments of OFCs. We therefore predict that banks with more operations in OFCs where the institutional environment is friendlier for bank risk-taking tend to take more risk (Hypothesis 2). Last, home-country

bank capital regulations may cause variation in banks' motivation to pursue high risk-taking through OFC operations. We therefore hypothesize that the influence of OFC operations on bank risk-taking is conditional on the home-country's bank capital regulations (Hypothesis 3).

We construct a large international sample of publicly listed banks from 66 countries during 2001–2018, including banks with affiliates or subsidiaries in OFCs (labeled as *OFC banks*) and banks without OFC operations (labeled as *non-OFC banks*). We generate two market-based measures (i.e., total risk and idiosyncratic risk) and two accounting-based measures (i.e., the loan loss allowance ratio and natural logarithm of the Z-score) to proxy for bank-level risk-taking, and use a standard multivariate regression method, controlling for relevant bank- and country-specific characteristics, as well as bank and year fixed effect to test our hypotheses. However, the multivariate regression results may suffer potential endogeneity problems. To address this and to establish the relationship that OFC operations facilitate bank risk-taking, we also employ a difference-in-differences (DiD) research design in which we identify a group of non-OFC banks that began OFC operations during our sample period as treatment banks. Non-OFC banks without any status change are used as control banks. We then compare bank risk changes between the treatment and control banks before and after the treatment banks' status change. We also conduct a multi-period dynamic DiD analysis surrounding the years of the treatment banks' status change to validate the parallel trend assumption underlying our DiD research design.

Our results are broadly consistent with our hypotheses. We find a positive association between bank OFC operations and risk-taking, which supports the view that OFCs facilitate banks' risk-taking needs. We also find that risk-taking by OFC banks is higher when they have more operations in OFCs where the institutional environment is friendlier for bank risk-taking (e.g., low-quality supervision, unwillingness to cooperate with onshore regulators, and strict bank secrecy policy), and that the positive association between bank OFC operations and bank risk-taking is more pronounced for banks whose home countries have stricter bank capital regulations. Our DiD analysis shows that, after switching from non-OFC to OFC banks, there is a significant increase in the level of risk-taking for the treatment banks, compared to the control banks. Overall, our findings suggest that banks can take advantage of the weak legal environment of OFCs to engage in regulatory arbitrage and take on more risk. Last, in an additional test, we find no evidence that the positive association between OFC operations and bank risk-taking has weakened in the post-crisis period, consistent with the view that many post-crisis regulations toward OFCs are feeble and symbolic (Rixen, 2013; Sullivan, 2007; Turner, 2011).

Our study makes several important contributions to the literature. First, our focus on banks' OFC operations fills an important gap in the IB literature. While the globalization of nonfinancial companies has been a central issue in the IB literature, the economic consequences of banking globalization is an understudied area (Fang et al., 2019; Verbeke et al., 2018), potentially because the globalization of banks has fallen considerably behind the globalization of nonfinancial companies (Berger, Dai, Ongena, & Smith, 2003; Focarelli & Pozzolo, 2001; Levine, 1996). We add to this literature by providing a large-sample comprehensive investigation on how banks' OFC operations (an important form of bank internationalization) affect risk-taking activities. The integration of banking theory and institutional theory grounded in two different academic disciplines facilitates our understanding of how bank risk-taking is shaped by OFC operations. Our analysis shows that OFC operations are positively and significantly associated with bank risk-taking. We also provide initial evidence that institutional features of OFCs matter in shaping OFC banks' incentives and abilities to take more risk. We therefore shed new light on the economic consequences of globalization for banks.

Second, we contribute to the growing literature on bank risk-taking. While a few studies have examined the impact of geographic expansion on bank risk-taking (e.g., Buch, Koch, & Koetter, 2013; Crystal, Dages, & Goldberg, 2002; Goetz, Laeven, & Levine, 2016; Méon & Weill, 2005), they rely mostly on portfolio theory to explain banks' risk-taking behavior. Moreover, little research has been conducted on banks' involvement in OFC operations. We contribute to this area by extending institutional theory to the banking sector, and by testing whether and how OFC locations are used by banks to engage in institutional arbitrage and to pursue riskier activities. Our finding that the institutional environments of OFCs and bank home countries both play a crucial role in affecting banks' risk-taking through subsidiary operations in OFCs provides novel evidence on how bank risk-taking

can be shaped by the location choice of bank internationalization.

Last, we also contribute to the literature related to OFCs, which focuses mainly on nonfinancial companies (Ben Amar, He, Li, & Magnan, 2018; Bennedsen & Zeume, 2018; Blouin, Krull, & Robinson, 2012; Chernykh & Mityakov, 2017; Durnev, Li, & Magnan, 2017; Dyreng, Hanlon, & Maydew, 2012; Ge, Kim, Li, & Li, 2016, 2018; Taylor, Richardson, Al-Hadi,& Obaydin, 2018). We complement this literature by analyzing the effect of OFC operations in the banking industry, and by revealing that having operations in OFCs enables banks to engage in more risk-taking activities.

BACKGROUND

Often referred to as tax havens, OFCs are jurisdictions or countries where financial services provided to nonresidents are on a scale that is disproportional to the size of (and financing to) its domestic economy (IMF, 2000; Zoromé, 2007). Many OFCs are small island states or enclaves with small populations. OFCs have been quietly proliferating over the past three decades due to the continued globalization of financial services (Morriss, 2010).

Shadow banks, such as SPVs and asset-backed commercial paper conduits, essentially act in the same way as traditional banks. That is, they engage in credit intermediation and maturity transformation. There are two major differences between shadow banks and traditional banks. First, shadow banks fund their investment with money market instruments rather than money deposits. Second, shadow banks do not enjoy the privilege of a government-provided safety net (Pozsar, Adrian, Ashcraft, & Boesky, 2010). As a result, shadow banks are not under as tight regulatory control as traditional banks. One important reason for creating shadow banks is to circumvent bank regulations and allow for riskier activities (Financial Stability Forum, 2018; Rixen, 2013). As many OFCs intentionally design their regulatory system to circumvent the legislation of other jurisdictions, OFCs become the ideal place to incorporate shadow banks. Indeed, shadow banking is a key service line for OFCs. According to the Financial Stability Forum (2018) report, a large number of other financial intermediaries (OFIs), including SPVs, have been established in OFCs. For example, OFI assets represent 92% of total financial assets in Luxembourg; OFI assets were 2,118 times the GDP in the Cayman Islands; and SPVs had made Ireland the third largest shadow banking OFC. A recent IMF article by Damgaard, Elkjaer, and Johannesen (2018) reveals that almost 40 percent of all foreign direct investment positions globally are artificial, which pass through empty corporate shells with no real activity in well-known tax havens or OFCs.

To some extent, light regulations, opaque operating environments, and secrecy policies in OFCs have accelerated the growth of the shadow banking system. When traditional banks have more operations in OFCs, they are more likely to have strong interdependencies with the shadow banking sectors, raising the concern that traditional banks could engage in unrestricted leverage.

THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

Banking Theory

According to banking theory, the unique characteristic of banks is that they benefit from explicit deposit insurance guarantees and implicit guarantees from the government such as bailouts in times of crisis (Bhattacharya & Thakor, 1993; Diamond & Dybvig, 1983, 1986; Merton, 1977). Government deposit insurance can effectively prevent bank runs and market panics; however, it can also lead to moral hazard for excessive risk-taking since banks no longer bear the downside risk of their positions with deposit insurance in place (Diamond & Dybvig, 1986). In addition, deposit insurance can be viewed as a put option written by the government on banks' assets (Merton, 1977). Because the value of the put option increases with asset risk and leverage, banks have a strong incentive to take on more risk to maximize the value of the put option (Bebchuk & Spamann, 2009; Keeley, 1990). With guarantees from the government, depositors have little incentive to monitor bank risk or to demand interest payments commensurate with bank risk. Therefore, banking regulations or policies should be designed to counteract banks' incentives to take too much risk (Diamond & Dybvig, 1986).

Banks' ability to take risk depends on the strictness of capital regulation. Most onshore governments set up capital regulations and minimum capital requirements to control bank leverage and asset risk, and, as a result, to curb banks' risk appetite. However, there is no 'level playing field' when it comes to bank regulation across countries (Acharya, Wachtel, & Walter, 2009; Houston, Lin, & Ma, 2012; Karolyi & Taboada, 2015). Smaller

countries that fear the possibility of losing financial activities and international competitiveness will undercut their regulatory standards to compete with larger and more developed countries (Rixen, 2013). Large and developed countries are not able to sustain their economies with lax regulatory standards because low-quality regulatory standards are detrimental to their domestic economy; moreover, the damage to the domestic economy, including reputation loss, could be much larger than the benefit from attracting foreign financial activities. In contrast, for small offshore states, the benefits of undercutting regulatory standards outweigh the associated costs because the size of their domestic economy is small. This regulatory competition gives rise to more and more OFCs offering very loose regulations, light or moderate financial supervision, and banking secrecy (IMF, 2000).

Institutional Arbitrage and OFC Operations

Comparative capitalism, an important strand of institutional theory, developed a theory of comparative institutional advantage in which different institutional arrangements have distinct strengths and weaknesses for different kinds of economic activity (Aguilera & Grøgaard, 2019; Jackson & Deeg, 2008). One of the core arguments in the comparative capitalism literature is that nations can derive comparative advantages in particular sectors from their institutional infrastructure, and different types of institutions may favor different forms of economic activity and thereby give rise to industry-specific comparative advantages (Hall & Soskice, 2001). Therefore, multinational companies can seek competitive advantage through arbitrage between different institutional systems (Caves, 1996; Clausen, 2014; Ghemawat, 2007; Hall & Soskice, 2001; Jackson & Deeg, 2008; Schneider, Schulze-Bentrop, & Paunescu, 2010; Witt & Lewin, 2007). Using varieties-of-capitalism approach, which focuses on institutional diversity and institutional comparative advantage across national contexts, Hall and Soskice (2001) suggest that multinational companies will engage in *institutional arbitrage* by shifting some activities to those economies that offer a more favorable institutional environment. Consistent with the institutional arbitrage logic, Caves (1996) finds that a high tax rate in the home-country increases the amount of outward foreign direct investment. Clausen (2014) shows that to increase product innovation, companies would cross a national boundary to search for an environment that allows more access to resources and knowledge. Similarly, Schneider et al. (2010) find evidence that high-tech companies in countries with smaller economies would shift certain activities to countries with a more favorable institutional environment through cross-border mergers and acquisitions to improve their export performance.

The banking sector is a highly regulated industry in which banks' risk-taking ability depends on the home-country regulatory environment. The misalignment between banks' risk-taking needs and their home country's regulatory environment and the considerable heterogeneity among countries' bank regulation environments create institutional arbitrage opportunities. Banks under strict regulations in their home countries may shift some activities to jurisdictions that are less regulated to evade costly regulations and leverage institutional advantages, a behavior commonly referred to as regulatory arbitrage (i.e., a form of institutional arbitrage).[2] Acharya et al. (2009) and Barth, Caprio, and Levine (2006) both raise the concern that regulatory arbitrage may lead to a destructive "race to the bottom" in global bank regulations, which enables banks to seek the least regulated environment and take excessive risk. When a bank's need for risk-taking is misaligned with and constrained by its home country's strict capital regulations, it would choose to move risky financial activities out of the home country and into places with a more risk-tolerant institutional environment. OFCs, which are famous for their lenient regulations and lack of transparency, become ideal locations where banks can move to avoid the home country's institutional pressure. As such, a bank's desire for high risk-taking can lead to its choice of moving subsidiaries or affiliates to OFCs, and this choice, once made, reinforces itself with aggressive risk-taking. In other words, banks' OFC operations could reflect their need to escape from home countries and their desire to engage in high risk-taking.

OFC locations not only attract banks with high risk-taking desire but also aggravate banks' incentive and ability to take on more risk. Specifically, many OFCs have lax incorporation rules, light supervision on SPVs, and minimum governance on securitization activities, thereby allowing banks to easily set up numerous SPVs to engage in unrestricted or much less restricted leveraging (Financial Stability Forum, 2000b). For example, onshore regulators normally set restrictions on the credit quality of mortgages that could be securitized.

However, those restrictions can be largely avoided in OFCs (OECD, 2009). Thus, by using SPVs in OFCs, banks are able to issue and securitize very low quality mortgage loans. Furthermore, compared to banks' home countries, OFCs usually have lax oversight and light reporting requirements. Some OFCs even intentionally refuse to (or make empty promises to) cooperate with onshore jurisdictions on information sharing or investigating abnormal activities (Hudson & Cabra, 2013; IMF, 2000; OECD, 2000; Sullivan, 2007). These unique institutional environments largely hinder supervision in onshore centers and impair the detection of excessive risk exposure (Financial Stability Forum, 2000b). This may, in turn, enable banks to engage more in high-risk activities with little fear of being detected by onshore regulators or investors. For example, Chernykh and Mityakov (2017) find that offshore-active Russian banks are more likely to be involved in a variety of illegal activities, such as tax evasion, money laundering, and accounting fraud; as a result, they faced more criminal investigations and charges.[3] Drawing on the above arguments, we predict that banks' operations in OFCs are likely to be associated with higher bank risk-taking. To provide systematic evidence on this under-explored issue, we test our first hypothesis below, stated in the alternative form:

Hypothesis 1: Ceteris paribus, there is a positive association between a bank's OFC operations and its risk-taking.

Nonetheless, there are reasons why OFC operations may not necessarily be associated with higher bank risk-taking. First, OFCs can be used for legitimate reasons such as taking advantage of lower explicit taxation, easy incorporation procedures, or opportunities to attract more foreign capital (IMF, 2000). Also, based on portfolio theory, geographic expansion introduces diversification benefits that lead to lower risk (Kim, Hwang, & Burgers, 1993; Rugman, 1976; Shapiro, 1978). Méon and Weill (2005) find potential gains in risk diversification from cross-border mergers in Europe. Goetz et al. (2016) find that geographic expansion materially reduces bank risk. Second, the regulation on OFC supervision has improved continuously over the last two decades. The Basel Committee of Banking Supervision has also been making efforts to promote more centralized bank regulations across countries (Financial Stability Board, 2012; G20, 2009). All these regulatory efforts, in turn, could curb banks' ability to engage in high risk-taking activities through OFC operations. However, we do not expect these reasons to dominate because regulatory arbitrage is a strong reason for banks to operate offshore, and regulations on OFCs largely lack strong enforcement (e.g., Rixen, 2013; Sullivan, 2007; Turner, 2011).

OFC Institutional Environment

The reputations of OFCs vary, and not all OFCs provide an institutional environment that offers banks a competitive advantage in risk-taking. It has been argued that OFC reputation is place-specific as well as institution-specific (Cobb, 1998). Some OFCs aim to become highly reputable international financial centers by developing strong regulatory frameworks. For example, Switzerland upholds global transparency and cooperation standards that enable the market to be efficient and competitive (Financial Stability Forum, 2000a). Other OFCs, such as the Bahamas and Cayman Islands, are criticized for their weak legal environment and information opacity (Chiesa, 2013; Financial Stability Forum, 2000a; IMF, 2000). Thus, within the realm of OFCs, there is variation in the degree of regulation prudence.

As argued above, banks with the greatest risk appetite would choose to operate in OFCs where the institutional environment is most friendly for bank risk-taking. The institutional features of OFCs that induce regulatory arbitrage can directly increase banks' ability to take more risk. OFCs that allow more regulatory arbitrage are those whose regulatory standards are significantly below international standards, such as light supervisory regimes, flexible use of trusts and special corporate vehicles, few restrictions on securitization, and few requirements on disclosures or information sharing with onshore regulators (Financial Stability Forum, 2000b; Rixen, 2013). Those features are designed to circumvent onshore regulations and impede effective monitoring and detection of excessive risk exposure from banks' domestic regulators. We therefore expect that banks with more subsidiary operations in OFCs whose institutional features allow more opportunities for regulatory arbitrage are associated with higher risk-taking. We propose and test our second hypothesis below, stated in the alternative form:

Hypothesis 2: Ceteris paribus, there is a positive association between the magnitude of a bank's

subsidiary operations in OFCs with more regulatory arbitrage opportunities and its risk-taking.

Home Country Institutional Environment

Although banks' subsidiaries abroad are subject to host country regulation and supervision, their headquarters in home countries are subject to domestic bank regulations. The IB literature on institutional theory has recognized the 'institutional duality' of foreign subsidiaries, suggesting that the subsidiaries of multinational companies face dual pressure from the host and home countries (Hillman & Wan, 2005; Kostova & Roth, 2002; Kostova & Zaheer, 1999; Luo, Chung, & Sobczak, 2009). Therefore, it is vital to consider whether banks' OFC operations are influenced by their home country's institutional environment. We are especially interested in the strictness of the home country's bank capital regulations because it directly affects banks' risk-taking abilities.

There are conflicting views on how bank capital regulations at home affect bank risk-taking abroad. On the one hand, tighter home-country bank capital regulations and supervision could lead banks to develop a more conservative business model, and thus act "as if at home" and engage less in risk-taking activities abroad. Consistent with this view, Crystal et al. (2002) find that foreign-owned banks operating in emerging markets are more prudent than domestic banks. On the other hand, banks may adopt a risk-taking strategy abroad to compensate for the loss of utility from more stringent capital requirements at home (Goldberg, 2009). Consistent with this view, Ongena, Popov, and Udell (2013) find that stricter capital requirements at home are associated with lower lending standards abroad. To the extent that stricter bank capital regulations at home could aggravate the degree of misalignment between the home country's institutional environment and banks' goals, we predict that more stringent bank capital regulations at home would incentivize banks to engage more in risk-taking activities through OFCs to "make up" for the inability to take more risk domestically. The above arguments lead us to propose and test the following hypothesis, stated in the alternative form:

Hypothesis 3: Ceteris paribus, the association between a bank's OFC operations and its risk-taking is stronger when its home country's bank capital regulations are stricter.

DATA, SAMPLE, AND RESEARCH DESIGN

Data and Sample

We start with the Bankscope database, which includes all annual financial data on a consolidated basis for banks, including balance sheets, income statements, and detailed supporting schedules in different countries around the world. To construct the market measures of bank risk-taking, we collect stock returns and market index returns from the Datastream International database (Datastream). We then obtain the data of bank affiliates and subsidiaries from the Osiris International database (Osiris), maintained by Bureau van Dijk Electronic Publishing. Osiris provides a comprehensive dataset of over 60,000 companies from more than 130 countries. We identify 27 OFCs where bank affiliates and subsidiaries are located, according to the IMF survey (2000) and Zoromé's (2007) study. "Appendix A" provides a list of OFCs in our sample.

We use International Securities Identification Number (ISIN) to merge the data collected from the three sources. Our sample begins with 72,844 bank-year observations with ISIN code from Bankscope between 2001 and 2018. We exclude banks headquartered in OFCs, which reduces the sample by 14,795. We also exclude observations that cannot be merged with Datastream or Osiris, observations that have missing market return or subsidiary information, and observations with missing control variables. The final dataset contains 8156 bank-year observations for 956 publicly listed banks in 66 countries with affiliates or subsidiaries from 2001 to 2018.[4] Panel A of Table 1 presents the sample selection process. To obtain a sample of OFC banks, we keep banks that are headquartered in non-OFC countries and have at least one affiliate or subsidiary located in an OFC. This procedure yields 4,777 observations from 417 OFC banks. To construct a control sample of non-OFC banks, we require that the headquarters and affiliates or subsidiaries of banks be registered in non-OFC countries, which results in 3,379 observations from 539 non-OFC banks. Panels B and C of Table 1 describe the country and year distributions of the combined sample of both OFC and non-OFC banks across 66 countries from 2001 to 2018. Because we delete banks with missing variables during the process of merging different datasets, the bank distribution across different countries is uneven and is not proportional to the number of banks in different countries.[5] Also, banks in our sample must

have available ISIN and must voluntarily disclose their subsidiary information. Therefore, our sample includes mostly large banks.[6] The average bank size in our sample is US$103.620 billion, while the average bank size of all banks from Bankscope is $48.430 billion. This means that our sample does not cover the universe of banks. Instead, we cover mainly large publicly listed banks. As shown in Panel B of Table 1, among the 66 countries, US observations account for the largest portion (3,237 out of 8,156 of bank-year observations, which is about 39.69% of all observations), followed by Japan (10.75%) and India (5.87%). The yearly distribution is presented in Panel C of Table 1.

Research Design

As there is little consensus on what is the most appropriate proxy for bank risk-taking, following prior research, we use four proxies for the level of bank risk-taking. The first two are obtained from the market model:

$$R_j = \alpha + \beta_{mj}(R_m) + \mu_j \quad (1)$$

where R_j is the daily return on bank j, R_m is the daily value-weighted market return, and μ is a random error term. Similar to Chen, Liu, and Ryan, (2006), we use (1) total risk (*TotalRisk*) measured by the standard deviation of the stock return R_j over the fiscal year, and (2) idiosyncratic risk (*IdioRisk*)

Table 1 Sample distribution

Panel A. Sample selection		
All bank-year observations with ISIN from Bankscope between 2001 to 2018		72,844
Less: observations headquartered in OFCs		(14,795)
Less: observations that cannot be merged with Datastream		(7,517)
Less: observations with missing market return data		(32,942)
Less: observations that cannot be merged with Osiris		(748)
Less: observations with missing subsidiary information		(5,166)
Less: observations with missing control variables		(3,520)
Final sample		8,156
Country	Number of observations	Percentage (%)
Panel B. Distribution of observations by home country		
Australia	18	0.22
Austria	52	0.64
Bangladesh	281	3.45
Belgium	10	0.12
Botswana	8	0.10
Brazil	63	0.77
Bulgaria	13	0.16
Canada	133	1.63
Chile	50	0.61
China	154	1.89
Colombia	18	0.22
Croatia	36	0.44
Czech republic	13	0.16
Denmark	259	3.18
Ecuador	2	0.02
Egypt	54	0.66
Finland	7	0.09
France	20	0.25
Germany	74	0.91
Ghana	28	0.34
Greece	42	0.51
Hungary	8	0.10
India	479	5.87
Indonesia	110	1.35
Italy	239	2.93
Jamaica	5	0.06
Japan	877	10.75
Jordan	145	1.78

Table 1 (*Continued*)

Country	Number of observations	Percentage (%)
Kazakhstan	18	0.22
Kenya	54	0.66
Korea, Republic of	39	0.48
Kuwait	87	1.07
Lithuania	6	0.07
Macedonia	6	0.07
Malawi	10	0.12
Malaysia	69	0.85
Mexico	7	0.09
Morocco	21	0.26
Namibia	10	0.12
Nigeria	40	0.49
Norway	170	2.08
Pakistan	151	1.85
Peru	8	0.10
Poland	72	0.88
Portugal	17	0.21
Qatar	81	0.99
Romania	14	0.17
Russian Federation	31	0.38
Saudi Arabia	130	1.59
Serbia	2	0.02
Slovakia	19	0.23
South Africa	49	0.60
Spain	47	0.58
Sri Lanka	109	1.34
Sweden	52	0.64
Thailand	128	1.57
Tunisia	53	0.65
Turkey	106	1.30
Uganda	10	0.12
Ukraine	43	0.53
United Kingdom	29	0.36
United Republic of Tanzania	12	0.15
United States of America	3,237	39.69
Vietnam	13	0.16
Zambia	5	0.06
Zimbabwe	3	0.04
Total	8,156	100.00

Fiscal year	Number of observations	Percentage (%)
Panel C. Distribution by year		
2001	289	3.54
2002	301	3.69
2003	324	3.97
2004	352	4.32
2005	369	4.52
2006	452	5.54
2007	486	5.96
2008	523	6.41
2009	542	6.65
2010	563	6.90
2011	577	7.07
2012	585	7.17
2013	438	5.37

Table 1 (*Continued*)

Fiscal year	Number of observations	Percentage (%)
2014	441	5.41
2015	504	6.18
2016	501	6.14
2017	453	5.55
2018	456	5.59
Total	8,156	100.00

This table reports the sample construction process and the country and yearly distributions of observations of the full sample, including OFC and non-OFC banks. Banks that are headquartered in non-OFC countries but establish at least one affiliate or subsidiary in an OFC are labeled as OFC banks, while non-OFC banks refer to those without any OFC affiliates or subsidiaries

measured by the standard deviation of the residual from the above market model (i.e., ex post estimate of μ) over the fiscal year to capture the extent of bank risk. The higher values of these two measures indicate higher risk. Both risk measures are calculated with at least 60 days of returns data.

The other two proxies are internal measures of bank risk-taking, including the loan loss allowance ratio (*LoanLossAllow*) and the Z-score. First, *LoanLossAllow* is the ratio of the loan and lease loss allowance to total loans; it captures the riskiness of the bank's loan portfolio, with a higher value indicating higher risk. Second, the Z-score, calculated as the sum of the ROA and capital to assets ratio, divided by the standard deviation of the ROA (Laeven & Levine, 2009), measures the distance to solvency. A smaller Z-score value implies less stability and higher risk. Since the Z-score is highly skewed, following prior literature (e.g., Houston, Lin, Lin, & Ma, 2010; Laeven & Levine, 2009), we use the natural logarithm of the Z-score as our risk measure (labeled as *Zscore*). Although *LoanLossAllow* and *Zscore* are both based on on-the-balance-sheet numbers, they also capture the bank risk taken off the balance sheet (Casu, Clare, Sarkisyan, & Thomas, 2011; Le, Narayanan, & Van Vo, 2016). This is because banks normally provide either explicit recourse (such as retained interest) or implicit recourse to support their SPVs in OFCs when SPVs underperform or bear losses (Gorton & Pennacchi, 1989; Gorton & Souleles, 2007; Higgins & Mason, 2004; Vermilyea, Webb, & Kish, 2008). For example, Vermilyea et al. (2008) find that banks frequently brought back the credit losses of their SPVs to their balance sheets. In other words, the poorly performing loans and losses in the off-balance-sheet entities are usually brought back onto banks' balance sheets.[7]

To test Hypothesis 1, we estimate the following baseline model using the OLS regression procedure:

$$\begin{aligned} BankRisk_{it+1} = {} & \beta_0 + \beta_1 OFCOperations_{it} + \beta_2 Liquidity_{it} \\ & + \beta_3 Size_{it} + \beta_4 TotalLoan_{it} \\ & + \beta_5 Equity_{it} + \beta_6 Leverage_{it} + \beta_7 ROA_{it} \\ & + \beta_8 LoanGrowth_{it} + \beta_9 NonInterestIncome_{it} \\ & + \beta_{10} TierRatio_{it} + \beta_{11} \#Shareholder_{it} \\ & + \beta_{12} \#Subsidiary_{it} + \beta_{13} Independence_{it} \\ & + \beta_{14} IFRS_{it} + \beta_{15} USGAAP_{it} \\ & + BankFE + YearFE + \varepsilon \end{aligned} \tag{2}$$

In the above, the subscripts *I* and *t* denote bank and year, respectively. The dependent variable is one of the four bank risk measures: *TotalRisk*, *IdioRisk*, *LoanLossAllow*, and *Zscore*. The key variable of interest, *OFCOperations*, refers to our proxies for OFC operations. Its operational definitions are provided in the next paragraph. Hypothesis 1 predicts that, all else being equal, banks with OFC operations or more intense OFC operations are associated with higher levels of risk-taking, compared to those with no OFC operations or less intense OFC operations. The prediction in Hypothesis 1 is supported if we observe that β_1 in Eq. (2) is positive when the dependent variable is *TotalRisk*, *IdioRisk*, or *LoanLossAllow* and negative when *Zscore* is the dependent variable. In all models, bank fixed effects and year fixed effects are included to control for bank-level unobservable characteristics and time series trends.

When we test Hypothesis 1, *OFCOperations* refers to one of the following three measures (Ge et al., 2016, 2018): (1) an indicator variable, *OFC*, that equals 1 for banks with at least one affiliate or subsidiary in an OFC, and 0 otherwise; (2) *OFCSubr*,

the ratio of the number of affiliates or subsidiaries of a bank located in OFCs to the total number of its affiliates or subsidiaries (located in both OFCs and non-OFCs); and (3) *OFCIndex*, the weighted average of the offshore attitude index of OFCs where a bank's affiliates or subsidiaries are located. Masciandaro (2008) constructs the offshore attitude index (OAI) for 222 countries and jurisdictions based on multiple factors such as potential national benefits, political stability, regulation enforcement, economic crime rates, and inclusion on one of the OFC blacklists (i.e., the Financial Stability Forum's list, the Financial Action Task Force's list of non-cooperative countries or territories, and the OECD's list of tax havens). The OAI ranges from 0 (the lowest degree of OFC characteristics) to 5 (the highest degree of OFC characteristics).[8] We use the following formula to compute *OFCIndex*:

$$OFCIndex_{it} = \sum_{c} OAI^{c} \times \left(Subsidiary_{it}^{c} / Total\,number\,of\,subsidiaries_{it}\right) \quad (3)$$

where $Subsidiary_{it}^{c}$ is the number of affiliates or subsidiaries of bank *I* in year *t* in country or jurisdiction *c*, OAI^{c} is the offshore attitude index of country or jurisdiction *c*, and $Total\ number\ of\ subsidiaries_{it}$ is the total number of affiliates or subsidiaries of bank *I* in year *t*. OAI is equal to 0 for non-OFC countries or jurisdictions. A larger value of *OFCIndex* indicates that a bank has more intensive operations in countries or jurisdictions with more OFC attributes. Both *OFCSubr* and *OFCIndex* capture the intensity of a bank's OFC operations.

Following prior literature (e.g., De Jonghe, Diepstraten, & Schepens, 2015; Demsetz & Strahan, 1997; Laeven & Levine, 2009), we include one-year lagged bank-level variables in Eq. (2) to control for their potential effect on bank risk-taking. Specifically, we control for the bank liquidity (*Liquidity*), size (*Size*), total loan (*TotalLoan*), equity-to-assets ratio (*Equity*), leverage ratio (*Leverage*), profitability ratio (*ROA*), loan growth (*LoanGrowth*), non-interest net income (*NonInterestIncome*), and the ratio of tier 1 and 2 capital to total risk-weighted assets (*TierRatio*). As for corporate governance factors, we control for the number of recorded shareholders (*#Shareholder*), number of affiliates or subsidiaries (*#Subsidiary*), and degree of independence of minority shareholders from controlling shareholders (*Independence*). We also include *IFRS* and *USGAAP* indicators to control for accounting standards in home countries.

Hypothesis 2 predicts that banks having more affiliates or subsidiaries located in OFCs with institutional features that offer greater opportunities for regulatory arbitrage take more risk. To test this hypothesis, we re-estimate Eq. (2) after replacing *OFCOperations* in Eq. (2) with our two measures of OFC regulatory arbitrage opportunities.

The first measure, which mainly captures OFCs' quality of supervision and willingness to cooperate with onshore regulators, is the weighted average of the IMF group index of the OFCs where a bank's affiliates or subsidiaries are located (*IMFindex*). The Financial Stability Forum (2000a) categorizes OFCs into three groups. Countries or jurisdictions listed in Group I are generally viewed as cooperative. They have a high quality of supervision and largely adhere to international standards. Countries or jurisdictions in Group II are generally seen as having procedures for supervision and cooperation in place, but the actual performance falls below international standards, with substantial room for improvement. Countries or jurisdictions in Group III are generally seen as having low-quality supervision and/or being non-cooperative with onshore supervisors, with little or no attempt being made to adhere to international standards.[9] We use Eq. (4) to calculate *IMFindex*:

$$IMFindex_{it} = \sum_{c} Grouping\ number^{c} \times \left(Subsidiary_{it}^{c} / Total\ number\ of\ subsidiaries_{it}\right) \quad (4)$$

where $Subsidiary_{it}^{c}$ is the number of subsidiaries of bank *I* in year *t* in country or jurisdiction *c*, and $Grouping\ number^{c}$ equals 1 if country or jurisdiction *c* is listed in Group I, 2 if listed in Group II, and 3 if listed in Group III. We assign 0 to countries that do not appear on the IMF OFC group list. A higher value of *IMFindex* indicates more intensive operations in uncooperative OFCs, suggesting greater opportunities for regulator arbitrage.

The second measure, which mainly captures the opaqueness of OFCs, is the weighted average of the secrecy indicator of OFCs where a bank's affiliates or subsidiaries are located (*Secrecy*). If an OFC is on the U.S. Internal Revenue Service's list of secrecy jurisdictions,[10] the secrecy indicator is coded 1, and 0 otherwise. Secrecy jurisdictions have corporate, business, bank, or tax secrecy rules and practices that offer an escape from disclosure, allow banking

secrecy and anonymity, and inhibit access of onshore law enforcement and tax administration authorities to beneficial ownership and other financial information. We use Eq. (5) to calculate *Secrecy*.

$$Secrecy_{it} = \sum_{c} Secrecy\ Indicator^{c} \times \left(Subsidiary_{it}^{c} / Total\ number\ of\ subsidiaries_{it}\right) \quad (5)$$

where *Secrecy Indicator*^{c} is the IRS' secrecy indicator of country or jurisdiction *c*, $Subsidiary_{it}^{c}$ is the number of subsidiaries that bank *I* in year *t* has in country *c*. Because a lack of transparency facilitates regulatory arbitrage, a higher value of *Secrecy* indicates more intensive operations in OFCs that offer more regulatory arbitrage opportunities.

Hypothesis 3 predicts that the association between OFC operations and bank risk-taking is conditional on the strictness of the home country's bank capital regulations. To test this hypothesis, we obtain the country-level bank capital regulation index (ranging from 0 to 10; higher values indicate greater stringency) from the World Bank surveys on bank regulation (Barth, Caprio, & Levine, 2013)[11] and generate an indicator variable, *HighCapReg*, that equals 1 if a country's bank capital regulation index is larger than five, and 0 otherwise. We add to model (2) *HighCapReg* and its interactions with each of five OFC features, including (1) three proxies for OFC operations (*OFC, OFCSub, and OFCIndex*) and (2) two proxies for OFC regulatory arbitrage opportunities (*IMFIndex* and *Secrecy*). "Appendix B" provides the definitions of all variables used in this study.

RESULTS

Descriptive Statistics

Table 2 reports the mean and median values of the main variables for the full sample (including both OFC and non-OFC banks), OFC bank sample, and non-OFC bank sample. All continuous variables are winsorized at the 1st and 99th percentiles. The last two columns report the *t*- and *z*-statistics to test the mean and median differences, respectively, between the OFC and non-OFC samples. We find that both the mean and median of *TotalRisk*, *IdioRisk*, and *LoanLossAllow* are significantly larger, while those of *Zscore* are significantly smaller for OFC banks than for non-OFC banks. These univariate test results suggest that, on average, OFC banks are riskier than non-OFC banks.

Table 2 also shows that OFC and non-OFC banks have different characteristics in various dimensions. For example, compared with non-OFC banks, OFC banks tend to be larger, less liquid, and less profitable; they also have lower loan growth and a lower equity ratio. OFC banks tend to have more shareholders and have more complex structures with more affiliates or subsidiaries. These differences highlight the importance of controlling for the confounding factors in our analyses. In addition, we find that about 21.6% (39.7%) of banks in our full sample adopted IFRS (US GAAP) for their financial reporting.

Table 3 presents the Pearson pairwise correlations among the main variables for the full sample. We find that *TotalRisk*, *IdioRisk*, and *LoanLossAllow* are all positively correlated with the five test variables, *OFC*, *OFCSubr, OFCIndex*, *IMFIndex*, and *Secrecy*, while *Zscore* is negatively correlated with them. Although only suggestive of the underlying relationships, these correlation statistics are consistent with our prediction that OFC banks and banks with more intensive operations in OFCs whose institutional features provide more regulatory arbitrage opportunities tend to engage more in risk-taking. We do not find high pairwise correlations among bank-level control variables, indicating that multicollinearity would not be a major issue in our analyses.

Main Results

To test Hypothesis 1, we estimate our baseline regression in Eq. (2) with bank and year fixed effects. The OLS regression results are reported in Table 4. All reported *p* values are on an adjusted basis using standard errors corrected for bank-year clustering. As shown in Columns 1–3, we find that *OFC* has a significantly *positive* association with *TotalRisk* (0.0016; $p < 0.000$), *IdioRisk* (0.0017; $p < 0.000$), and *LoanLossAllow* (0.0022; $p = 0.006$). As shown in Column 4, we also find that the coefficient on *OFC* is significantly *negative* (−0.1099; $p = 0.000$) when *Zscore* is the dependent variable. The above findings are in line with the prediction of Hypothesis 1, suggesting that OFC banks are, on average, associated with higher risk-taking than non-OFC banks.

To assess the economic significance of the results, recall that the mean values of *TotalRisk*, *IdioRisk*, and *LoanLossAllow* are 0.0188, 0.0178, and 0.0278, respectively, for the non-OFC sample (Table 2). The

Table 2 Descriptive statistics and univariate tests

Variable	Full sample			OFC bank sample			Non-OFC bank sample			Difference in means	Difference in medians
	n	Mean	Median	*n*	Mean	Median	*n*	Mean	Median	*t* test	Wilcoxon *Z* test
$TotalRisk_{t+1}$	8156	0.020	0.018	4777	0.021	0.018	3,379	0.019	0.017	11.61 (0.000)	7.58 (0.000)
$IdioRisk_{t+1}$	8156	0.019	0.017	4777	0.020	0.017	3,379	0.018	0.016	9.91 (0.000)	7.12 (0.000)
$LoanLossAllow_{t+!}$	8156	0.029	0.018	4777	0.030	0.019	3,379	0.028	0.018	2.61 (0.009)	2.17 (0.030)
$Zscore_{t+1}$	8156	3.636	3.674	4777	3.533	3.558	3379	3.781	3.858	−10.42 (0.000)	−10.87 (0.000)
$OFCSubr_t$	4777	0.174	0.109	4777	0.174	0.109	3379	NA	NA	NA	NA
$OFCIndex_t$	4777	0.381	0.100	4777	0.381	0.100	3379	NA	NA	NA	NA
$IMFIndex_t$	4777	0.677	0.249	4777	0.677	0.249	3379	NA	NA	NA	NA
$Secrecy_t$	4777	0.431	0.101	4777	0.431	0.101	3379	NA	NA	NA	NA
$Liquidity_t$	8156	0.801	0.832	4777	0.794	0.826	3379	0.812	0.839	−6.99 (0.000)	−5.38 (0.000)
$Size_t$	8,156	8.667	8.637	4777	9.098	9.019	3379	8.057	8.196	21.21 (0.000)	18.40 (0.000)
$TotalLoan_t$	8,156	0.607	0.633	4777	0.601	0.626	3379	0.615	0.643	−4.06 (0.000)	−4.98 (0.000)
$Equity_t$	8,156	0.095	0.092	4777	0.095	0.090	3379	0.097	0.094	−1.96 (0.050)	−4.64 (0.000)
$Leverage_t$	8,156	0.902	0.906	4777	0.902	0.908	3379	0.902	0.904	0.25 (0.802)	3.46 (0.000)
ROA_t	8,156	0.010	0.010	4777	0.009	0.009	3379	0.010	0.010	−1.92 (0.055)	−6.05 (0.000)
$LoanGrowth_t$	8,156	0.116	0.075	4777	0.098	0.057	3379	0.141	0.097	−11.18 (0.000)	−14.63 (0.000)
$NonInterestIncome_t$	8,156	−0.020	−0.019	4777	−0.019	−0.019	3379	−0.021	−0.019	5.15 (0.000)	−4.51 (0.000)
$TierRatio_t$	8,156	12.639	11.880	4777	12.723	12.000	3379	12.521	11.720	1.86 (0.063)	2.56 (0.005)
$\#Shareholder_t$	8,156	3.251	3.434	4777	3.307	3.497	3379	3.171	3.401	5.49 (0.000)	4.79 (0.000)
$\#Subsidiary_t$	8,156	2.946	2.639	4777	3.082	2.640	3379	2.753	2.639	8.66 (0.000)	4.47 (0.000)
$Independence_t$	8,156	3.658	2.398	4777	2.713	2.398	3379	4.995	2.398	−30.48 (0.000)	17.54 (0.000)
$IFRS_t$	8,156	0.216	0.000	4777	0.220	0.000	3379	0.212	0.000	0.83 (0.405)	0.83 (0.203)
$USGAAP_t$	8,156	0.397	0.000	4777	0.409	0.000	3379	0.380	0.000	16.44 (0.000)	32.41(0.000)
$HighCapReg_t$	7,628	0.668	1.000	4448	0.652	1.000	3180	0.806	1.000	−14.73 (0.000)	−14.12 (0.000)

This table reports the mean and median values of the main variables for the full sample, OFC sample, and non-OFC sample, respectively. *TotalRisk* and *IdioRisk* are measures of banks' market risk. *TotalRisk* is the standard deviation of the daily stock return, and *IdioRisk* is the standard deviation of residual μ obtained from the market model $R_j = \alpha + \beta_{mj}(R_m) + \mu_j$. *LoanLossAllow* and *Zscore* are measures of banks' financial risk. *LoanLossAllow* is the ratio of the loan and lease loss allowance to bank total loans. *Zscore* is the likelihood of insolvency, which equals the natural logarithm of the sum of *ROA* and the equity-to-assets ratio divided by the standard deviation of *ROA*. *OFC* equals 1 if a bank has at least one affiliate or subsidiary in an OFC in a given year, and 0 otherwise. *OFCSubr* is the number of OFC affiliates or subsidiaries of a bank scaled by its total number of affiliates or subsidiaries. *OFCIndex* is the subsidiary-weighted Masciandaro (2008)'s Offshore Attitude Index of the country or jurisdiction where a bank's affiliates or subsidiaries are located. *IMFIndex* is a subsidiary-weighted IMF group index of the country or jurisdiction where a bank's affiliates or subsidiaries are located. *Secrecy* is a subsidiary-weighted secrecy index of the country or jurisdiction where a bank's affiliates or subsidiaries are located. Secrecy index is based on the U.S. Internal Revenue Service's list of secrecy jurisdictions. See "Appendix B" for definitions of all other variables. The last two columns report the univariate test of the differences in the mean values (based on *t* tests) and median values (based on Wilcoxon *Z* tests) of the main variables between the OFC and non-OFC samples.

estimated coefficients on *OFC* in Columns (1)–(3) imply that having affiliates or subsidiaries in OFCs translates to increased bank risk, ranging from 7.91% (= 0.0022/0.0278) to 9.55% (= 0.0017/0.0178) of the mean values of the non-OFC banks. Regarding the insolvency measure in Column (4), all else being equal, the *Zscore* of OFC banks is approximately 0.1099 lower than that of non-OFC banks, which suggests that the raw Zscore of OFC banks is 10.4% lower than that of non-OFC

Table 3 Pearson correlation matrix

	2	3	4	5	6	7	8	9	10	11	12
1. $TotalRisk_{t+1}$	**0.973**	**0.056**	**−0.236**	**0.121**	**0.183**	0.066	**0.084**	**0.122**	−0.003	**−0.040**	**0.057**
2. $IdioRisk_{t+1}$	1	**0.090**	**−0.278**	**0.105**	**0.128**	0.024	**0.029**	**0.069**	−0.004	**−0.091**	**0.051**
3. $LoanLossAllow_{t+1}$		1	**−0.324**	**0.030**	**0.086**	**0.283**	**0.047**	**0.072**	**−0.090**	**−0.164**	**−0.188**
4. $Zscore_{t+1}$			1	**−0.116**	**−0.126**	**−0.105**	**−0.108**	**−0.097**	**0.027**	**0.053**	**0.083**
5. OFC_t				1	**0.308**	**0.152**	**0.449**	**0.495**	**−0.075**	**0.233**	**−0.045**
6. $OFCSubr_t$					1	**0.079**	**0.477**	**0.545**	−0.003	**0.041**	**0.054**
7. $OFCIndex_t$						1	**0.137**	0.020	**−0.105**	**0.134**	**−0.170**
8. $IMFIndex_t$							1	**0.798**	**−0.118**	**0.204**	**−0.065**
9. $Secrecy_t$								1	**−0.133**	**0.246**	**−0.078**
10 .$Liquidity_t$									1	**−0.071**	**0.139**
11. $Size_t$										1	**−0.154**
12. $TotalLoan_t$											1
13. $Equity_t$											
14. $Leverage_t$											
15. ROA_t											
16. $LoanGrowth_t$											
17. $NonInterestIncome_t$											
18. $TierRatio_t$											
19. $\#Shareholder_t$											
20. $\#Subsidiary_t$											
21. $Independence_t$											
22. $IFRS_t$											
23. $USGAAP_t$											
24. $HighCapReg_t$											

	13	14	15	16	17	18	19	20	21	22	23	24
1. $TotalRisk_{t+1}$	**−0.043**	**0.037**	**−0.130**	**0.027**	**−0.204**	**−0.062**	0.008	**−0.140**	**−0.209**	**−0.083**	**−0.158**	**−0.117**
2. $IdioRisk_{t+1}$	**−0.077**	**0.068**	**−0.133**	**0.048**	**−0.201**	**−0.064**	**−0.095**	**−0.212**	**−0.262**	**−0.044**	**−0.212**	**−0.068**
3. $LoanLossAllow_{t+1}$	**0.133**	**−0.106**	**−0.169**	**−0.037**	**−0.260**	**−0.108**	**−0.272**	**−0.078**	**−0.141**	**0.260**	**−0.182**	−0.010
4. $Zscore_{t+1}$	**0.073**	**−0.058**	**0.158**	**0.022**	**0.171**	**0.040**	**0.197**	**0.138**	**0.317**	**−0.107**	**0.294**	**0.075**
5. OFC_t	−0.021	0.003	−0.021	**−0.125**	**0.057**	0.021	**0.061**	**0.093**	**−0.347**	0.009	**−0.359**	**−0.153**
6. $OFCSubr_t$	**0.031**	**−0.026**	0.017	**−0.044**	**0.050**	−0.015	**0.190**	0.016	**−0.113**	**−0.135**	**−0.160**	**−0.034**
7. $OFCIndex_t$	**0.155**	**−0.124**	**0.168**	**−0.096**	**0.039**	**0.110**	**0.293**	−0.014	**−0.020**	**−0.364**	**−0.204**	**−0.077**
8. $IMFIndex_t$	**0.029**	−0.017	0.014	**−0.066**	**0.078**	**0.029**	**0.226**	**0.303**	**−0.037**	**−0.065**	**−0.092**	**−0.029**
9. $Secrecy_t$	**0.043**	**−0.046**	0.003	**−0.052**	**0.102**	−0.014	**0.251**	**0.321**	**−0.044**	−0.014	**−0.139**	**−0.104**
10. $Liquidity_t$	**−0.349**	**0.352**	**−0.160**	**−0.050**	**−0.053**	**−0.350**	**−0.050**	**0.291**	0.010	**−0.250**	**0.078**	**−0.064**
11. $Size_t$	**−0.226**	**0.208**	**−0.099**	**−0.109**	**0.332**	**−0.158**	**0.336**	**0.643**	**0.039**	0.009	**0.092**	**−0.139**
12. $TotalLoan_t$	**−0.062**	**0.067**	**−0.086**	−0.015	**−0.199**	**−0.322**	**0.059**	**−0.237**	**0.054**	**−0.173**	**0.076**	**0.023**
13. $Equity_t$	1	**−0.893**	**0.404**	**0.087**	**−0.136**	**0.584**	**−0.029**	−0.016	**0.092**	**0.152**	**0.126**	**0.160**
14. $Leverage_t$		1	**−0.339**	**−0.074**	**0.135**	**−0.581**	0.016	−0.003	**−0.088**	**−0.124**	**−0.125**	**−0.151**
15. ROA_t			1	**0.228**	**0.300**	**0.280**	**−0.028**	−0.021	−0.007	**0.083**	−0.004	0.008
16. $LoanGrowth_t$				1	**0.079**	**0.009**	**−0.068**	**−0.070**	**−0.049**	**0.051**	−0.008	0.008

Table 3 (*Continued*)

	13	14	15	16	17	18	19	20	21	22	23	24
17. *NonInterestIncome*$_t$					1	**0.027**	**0.055**	**0.261**	**0.108**	**0.128**	−0.013	**−0.176**
18. *TierRatio*$_t$						1	**−0.067**	0.005	**−0.059**	**0.265**	**0.033**	**0.080**
19. *#Shareholder*$_t$							1	**0.476**	**0.343**	**−0.218**	**0.314**	**0.145**
20. *#Subsidiary*$_t$								1	**0.308**	**0.070**	**0.249**	**0.034**
21. *Independence*$_t$									1	−0.001	**0.689**	**0.216**
22. *IFRS*$_t$										1	**−0.202**	0.003
23. *USGAAP*$_t$											1	**0.284**
24. *HighCapReg*$_t$												1

This table reports the Pearson pairwise correlation coefficients between the main variables based on the full sample, including OFC and non-OFC banks. Bold text indicates significance at (or less than) the 10% level using two-tailed tests. See "Appendix B" for definitions of all variables.

banks.[12] The control variables are generally loaded with the expected signs. For instance, the coefficients on *ROA* and *NonInterestIncome* are negative when *TotalRisk*, *IdioRisk*, or *LoanLossAllow* is the dependent variable, while the same coefficients are positive when *Zscore* is the dependent variable, suggesting that banks with a higher ROA and larger non-interest income tend to engage less in risk-taking. Overall, we find that the positive impact of OFC operations on bank risk-taking is both statistically significant and economically meaningful.

Table 5 reports the OLS regression results in which the intensity of OFC operations is measured by *OFCSubr* or *OFCIndex*. As *OFCSubr* and *OFCIndex* are available only for OFC banks, we perform our analysis on a sample of OFC banks. As shown in Columns 1, 3, and 5, we find that *OFCSubr* relates to a higher *TotalRisk* (0.0023, p = 0.001), *IdioRisk* (0.0023, p = 0.000), and *LoanLossAllow* (0.0030, p = 0.086). As reported in Columns 2, 4, and 6, *OFCIndex* is also positively associated with *TotalRisk* (0.0006, p = 0.053), *IdioRisk* (0.0005, p = 0.094), and *LoanLossAllow* (0.0060, p = 0.055). These findings suggest that banks having more intensive OFC operations tend to engage more in risk-taking. As shown in Columns 7 and 8, we find that the effect of *OFCSubr* on *Zscore* is negative but not significant, while *OFCIndex* has a significantly negative association with *Zscore* (−0.0865; p = 0.082). This finding suggests that banks with more affiliates or subsidiaries in OFCs tend to have higher insolvency risk. Overall, the results reported in Tables 4 and 5 support Hypothesis 1 that OFC operations are associated with higher bank risk-taking.

Table 6 presents the results on the impact of regulatory arbitrage opportunities provided by OFCs on bank risk-taking. Consistent with Hypothesis 2, we find that the extent of bank operations in OFCs that provide greater regulatory arbitrage opportunities, measured by *IMFIndex* and *Secrecy*, respectively, are positively associated with *TotalRisk*, *IdioRisk*, and *LoanLossAllow* (Columns 1–6). When *Zscore* is the dependent variable, the coefficient on *IMFIndex* is negative and significant, and the coefficient on *Secrecy* is negative but insignificant. Collectively, these results suggest that certain institutional features of OFCs matter in bank risk-taking. Specifically, banks with more operations in OFCs with low-quality supervision, little willingness to cooperate with onshore regulators, and strict bank secrecy policy are associated with more risk-taking. These findings also indicate that the mere presence of OFC operations may not

Table 4 The impact of OFC operations on bank risk-taking

	(1) $TotalRisk_{t+1}$	(2) $IdioRisk_{t+1}$	(3) $LoanLossAllow_{t+1}$	(4) $Zscore_{t+1}$
OFC_t	0.0016	0.0017	0.0022	−0.1099
	[<0.000]	[<0.000]	[0.006]	[0.000]
Control variables				
$Liquidity_t$	−0.0011	−0.0009	−0.0182	0.8557
	[0.652]	[0.689]	[0.154]	[<0.000]
$Size_t$	−0.0000	−0.0000	−0.0011	0.1489
	[0.809]	[0.830]	[0.215]	[<0.000]
$TotalLoan_t$	−0.0035	−0.0038	−0.0312	1.3669
	[0.044]	[0.019]	[<0.000]	[<0.000]
$Equity_t$	−0.0025	−0.0069	0.0086	0.5499
	[0.841]	[0.551]	[0.899]	[0.447]
$Leverage_t$	0.0101	0.0095	0.1765	−1.7337
	[0.267]	[0.259]	[0.091]	[0.008]
ROA_t	−0.0478	−0.0432	−0.1530	5.9137
	[0.046]	[0.054]	[0.567]	[0.000]
$LoanGrowth_t$	−0.0019	−0.0014	−0.0130	0.1662
	[0.007]	[0.035]	[<0.000]	[0.009]
$NonInterestIncome_t$	−0.1095	−0.1059	−0.4542	10.3605
	[<0.000]	[<0.000]	[0.035]	[<0.000]
$TierRatio_t$	0.0000	0.0000	0.0005	−0.0117
	[0.526]	[0.534]	[0.124]	[0.010]
$\#Shareholder_t$	−0.0003	−0.0006	−0.0053	−0.0472
	[0.619]	[0.315]	[0.204]	[0.435]
$\#Subsidiary_t$	−0.0007	−0.0005	−0.0023	0.0209
	[0.034]	[0.072]	[0.071]	[0.595]
$Independence_t$	−0.0002	−0.0002	−0.0006	0.0156
	[0.104]	[0.091]	[0.244]	[0.219]
$IFRS_t$	0.0006	0.0004	0.0000	−0.2157
	[0.391]	[0.548]	[0.988]	[0.004]
$USGAAP_t$	−0.0018	−0.0001	−0.0032	−0.3442
	[0.004]	[0.915]	[0.256]	[<0.000]
Bank-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.607	0.623	0.712	0.635
No. of observations	8156	8156	8156	8156

This table reports the regression results of testing the effect of OFC operations on bank risk-taking for the full sample. *TotalRisk* and *IdioRisk* are measures of banks' market risk. *TotalRisk* is the standard deviation of the daily stock return, and *IdioRisk* is the standard deviation of residual μ obtained from the market model $R_j = \alpha + \beta_{mj}(R_m) + \mu_j$. *LoanLossAllow* and *Zscore* are measures of banks' financial risk. *LoanLossAllow* is the ratio of the loan and lease loss allowance to bank total loans. *Zscore* is the likelihood of insolvency, which equals the natural logarithm of the sum of *ROA* and the equity-to-assets ratio divided by the standard deviation of *ROA*. *OFC* equals 1 if a bank has at least one affiliate or subsidiary in an OFC, and 0 otherwise. See "Appendix B" for definitions of all control variables. The standard errors are robust to heteroskedasticity and are clustered by bank and year in all regressions. The numbers in parentheses are probability levels at which the null hypothesis of a zero coefficient can be rejected.

necessarily increase bank risk; rather, it is the institutional environment and local policies of OFCs that play a salient role in shaping banks' risk-taking behaviors.

Table 7 reports the results on whether the bank capital regulations in the home country strengthen the effect of OFC operations on bank risk-taking (Hypothesis 3). Our sample becomes a bit smaller due to missing the home country's bank regulation index for some banks. As reported in Panels A and B of Table 7, the main effects of all OFC operation measures on the bank risk-taking proxies remain similar in that the effect is significantly positive (negative) for *TotalRisk, IdioRisk*, and *LoanLossAllow* (for *Zscore*). For the interaction terms, the signs are in the same directions as those of the OFC operation measures, and their coefficients are significant in most cases. Based on the result in Column (1) of Table 7, the effect of *OFC* on bank risk-taking, as reflected in the coefficient on *OFC* and *OFC* ×

Table 5 The impact of the intensity of OFC operations on bank risk-taking

	Dependent variable							
	$TotalRisk_{t+1}$		$IdioRisk_{t+1}$		$LoanLossAllow_{t+1}$		$Zscore_{t+1}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$OFCSubr_t$	0.0023		0.0023		0.0030		−0.5211	
	[0.001]		[0.000]		[0.086]		[0.286]	
$OFCIndex_t$		0.0006		0.0005		0.0060		−0.0865
		[0.053]		[0.094]		[0.055]		[0.082]
Control variables								
$Liquidity_t$	−0.0055	−0.0063	−0.0059	−0.0067	−0.0016	−0.0008	0.2793	0.4539
	[0.069]	[0.037]	[0.040]	[0.019]	[0.916]	[0.960]	[0.281]	[0.083]
$Size_t$	−0.0009	−0.0008	−0.0008	−0.0008	−0.0015	−0.0014	0.1663	0.1709
	[0.020]	[0.023]	[0.020]	[0.022]	[0.419]	[0.451]	[0.001]	[0.001]
$TotalLoan_t$	−0.0054	−0.0049	−0.0063	−0.0058	−0.0371	−0.0364	1.4301	1.5334
	[0.030]	[0.046]	[0.007]	[0.013]	[<0.000]	[<0.000]	[<0.000]	[<0.000]
$Equity_t$	0.0055	0.0047	0.0033	0.0041	0.0068	0.0043	0.1965	0.0043
	[0.779]	[0.810]	[0.848]	[0.811]	[0.918]	[0.947]	[0.795]	[0.996]
$Leverage_t$	0.0360	0.0390	0.0334	0.0364	0.2250	0.2263	−2.3991	−1.7341
	[0.005]	[0.002]	[0.004]	[0.002]	[0.071]	[0.065]	[0.000]	[0.005]
ROA_t	−0.0896	−0.0910	−0.0803	−0.0817	0.5937	0.5937	1.0719	1.3854
	[0.000]	[0.000]	[0.000]	[0.000]	[0.037]	[0.036]	[0.611]	[0.509]
$LoanGrowth_t$	−0.0015	−0.0016	−0.0010	−0.0010	−0.0124	−0.0121	0.3107	0.3103
	[0.159]	[0.147]	[0.332]	[0.309]	[0.002]	[0.002]	[0.000]	[0.000]
$NonInterestIncome_t$	−0.1125	−0.1080	−0.1119	−0.1073	−0.7196	−0.7199	9.8464	10.8266
	[0.000]	[0.000]	[<0.000]	[0.000]	[0.000]	[0.000]	[<0.000]	[<0.000]
$TierRatio_t$	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	−0.0015	−0.0025
	[0.575]	[0.629]	[0.532]	[0.586]	[0.750]	[0.728]	[0.783]	[0.651]
$\#Shareholder_t$	−0.0009	−0.0010	−0.0007	−0.0009	0.0008	0.0006	0.5150	0.4791
	[0.608]	[0.544]	[0.669]	[0.595]	[0.923]	[0.940]	[0.022]	[0.039]
$\#Subsidiary_t$	−0.0001	−0.0001	−0.0001	−0.0001	−0.0007	−0.0007	−0.0192	−0.0215
	[0.863]	[0.789]	[0.931]	[0.920]	[0.880]	[0.871]	[0.805]	[0.789]
$Independence_t$	−0.0000	−0.0001	−0.0000	−0.0001	−0.0004	−0.0005	0.0101	0.0106
	[0.837]	[0.789]	[0.860]	[0.755]	[0.638]	[0.560]	[0.752]	[0.750]
$IFRS_t$	0.0012	0.0012	0.0009	0.0009	0.0018	0.0015	−0.3493	−0.3492
	[0.228]	[0.229]	[0.358]	[0.359]	[0.497]	[0.559]	[0.000]	[0.000]
$USGAAP_t$	−0.0008	−0.0014	−0.0008	−0.0002	−0.0091	−0.0095	0.0614	0.0775
	[0.402]	[0.137]	[0.413]	[0.850]	[0.023]	[0.020]	[0.511]	[0.416]
Bank-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.662	0.661	0.678	0.677	0.763	0.764	0.638	0.632
No. of observations	4777	4777	4777	4777	4777	4777	4777	4777

This table reports the regression results of testing the effect of the intensity of OFC operations on bank risk-taking, using the OFC bank sample. *TotalRisk* and *IdioRisk* are measures of banks' market risk. *TotalRisk* is the standard deviation of the daily stock return, and *IdioRisk* is the standard deviation of residual μ obtained from the market model $R_j = \alpha + \beta_{mj}(R_m) + \mu_j$. *LoanLossAllow* and *Zscore* are measures of banks' financial risk. *LoanLowwAllow* is the ratio of the loan and lease loss allowance to bank total loans. *Zscore* is the likelihood of insolvency, which equals the natural logarithm of the sum of *ROA* and the equity-to-assets ratio divided by the standard deviation of *ROA*. The test variable, *OFCSubr*, is the number of OFC affiliates or subsidiaries of a bank scaled by its total number of affiliates or subsidiaries, while *OFCIndex* is the subsidiary-weighted Masciandaro (2008)'s Offshore Attitude Index of the country or jurisdiction where a bank's affiliates or subsidiaries are located. See "Appendix B" for definitions of all control variables. The standard errors are robust to heteroskedasticity and are clustered by bank and year in all regressions. The numbers in parentheses are probability levels at which the null hypothesis of a zero coefficient can be rejected.

HighCapReg, increases by around 390% for banks whose home countries have stricter bank capital regulations (*HighCapReg* = 1), compared to banks whose home countries have less strict bank capital regulations (*HighCapReg* = 0). Thus, when there are stricter bank capital regulations at home, banks pursue more risk-taking through OFCs. This evidence is consistent with the prediction of Hypothesis 3 and lends strong support to the view that OFCs are used by banks as a tool to escape from the

Table 6 The impact of OFC institutional features on bank risk-taking

	Dependent variable							
	$TotalRisk_{t+1}$		$IdioRisk_{t+1}$		$LoanLossAllow_{t+1}$		$Zscore_{t+1}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$IMFIndex_t$	0.0005		0.0006		0.0006		−0.1712	
	[0.008]		[0.001]		[0.086]		[0.091]	
$Secrecy_t$		0.0012		0.0014		0.0004		−0.3759
		[0.002]		[0.000]		[0.077]		[0.246]
Control variables								
$Liquidity_t$	−0.0058	−0.0058	−0.0062	−0.0062	−0.0002	−0.0005	0.3055	0.3033
	[0.053]	[0.056]	[0.031]	[0.032]	[0.990]	[0.973]	[0.238]	[0.234]
$Size_t$	−0.0010	−0.0010	−0.0009	−0.0009	−0.0016	−0.0016	0.1384	0.1385
	[0.011]	[0.010]	[0.009]	[0.009]	[0.395]	[0.411]	[0.005]	[0.005]
$TotalLoan_t$	−0.0055	−0.0056	−0.0065	−0.0066	−0.0358	−0.0363	1.3392	1.3306
	[0.027]	[0.023]	[0.006]	[0.005]	[<0.000]	[<0.000]	[<0.000]	[<0.000]
$Equity_t$	0.0047	0.0050	−0.0041	−0.0037	0.0055	0.0055	0.0313	0.1198
	[0.809]	[0.796]	[0.811]	[0.826]	[0.934]	[0.934]	[0.968]	[0.876]
$Leverage_t$	0.0365	0.0358	0.0334	0.0330	0.2312	0.2295	−2.5622	−2.6525
	[0.004]	[0.005]	[0.003]	[0.004]	[0.068]	[0.070]	[<0.000]	[<0.000]
ROA_t	−0.0889	−0.0894	−0.0791	−0.0799	−0.5898	−0.5916	0.6630	0.9237
	[0.000]	[0.000]	[0.000]	[0.000]	[0.038]	[0.037]	[0.760]	[0.673]
$LoanGrowth_t$	−0.0015	−0.0015	−0.0009	−0.0009	−0.0125	−0.0124	0.3259	0.3144
	[0.170]	[0.161]	[0.356]	[0.336]	[0.002]	[0.002]	[<0.000]	[0.000]
$NonInterestIncome_t$	−0.1116	−0.1117	−0.1115	−0.1113	−0.7110	−0.7136	9.6882	9.8101
	[0.000]	[0.000]	[<0.000]	[<0.000]	[0.001]	[0.000]	[<0.000]	[<0.000]
$TierRatio_t$	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	−0.0040	−0.0039
	[0.665]	[0.669]	[0.637]	[0.637]	[0.751]	[0.759]	[0.472]	[0.483]
$\#Shareholder_t$	0.0011	0.0011	−0.0010	−0.0010	0.0007	0.0006	0.4385	0.4510
	[0.495]	[0.503]	[0.532]	[0.548]	[0.929]	[0.939]	[0.052]	[0.042]
$\#Subsidiary_t$	−0.0001	−0.0001	−0.0000	−0.0000	−0.0008	−0.0007	0.0142	0.0086
	[0.947]	[0.945]	[0.955]	[0.968]	[0.853]	[0.871]	[0.865]	[0.915]
$Independence_t$	−0.0000	−0.0086	−0.0000	−0.0001	−0.0003	−0.0003	0.0079	0.0223
	[0.865]	[0.274]	[0.818]	[0.619]	[0.721]	[0.710]	[0.814]	[0.513]
$IFRS_t$	0.0013	0.0012	0.0010	0.0009	−0.0018	−0.0017	−0.3284	−0.3495
	[0.203]	[0.226]	[0.318]	[0.356]	[0.493]	[0.503]	[0.000]	[0.000]
$USGAAP_t$	−0.0012	−0.0012	0.0005	0.0004	−0.0101	−0.0099	−0.0033	−0.0106
	[0.214]	[0.214]	[0.637]	[0.645]	[0.020]	[0.021]	[0.972]	[0.911]
Bank-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.662	0.662	0.678	0.678	0.763	0.763	0.639	0.641
No. of observations	4777	4777	4777	4777	4777	4777	4777	4777

This table reports the regression results of testing the impact of OFC features, which captures regulatory arbitrage opportunities and OFC opaqueness on bank risk-taking, using the OFC bank sample. *TotalRisk* and *IdioRisk* are measures of banks' market risk. *TotalRisk* is the standard deviation of the daily stock return, and *IdioRisk* is the standard deviation of residual μ obtained from the market model $R_j = \alpha + \beta_{mj}(R_m) + \mu_j$. *LoanLossAllow* and *Zscore* are measures of banks' financial risk. *LoanLossAllow* is the ratio of the loan and lease loss allowance to bank total loans. *Zscore* is the likelihood of insolvency, which equals the natural logarithm of the sum of *ROA* and the equity-to-assets ratio divided by the standard deviation of *ROA*. The test variable, *IMFIndex*, is a subsidiary-weighted IMF group index of the country or jurisdiction where a bank's affiliates or subsidiaries are located, while *Secrecy* is a subsidiary-weighted secrecy index of country or jurisdiction where a bank's affiliates or subsidiaries are located. The secrecy index is based on the U.S. Internal Revenue Service's list of secrecy jurisdictions. See "Appendix B" for definitions of all control variables. The standard errors are robust to heteroskedasticity and are clustered by bank and year in all regressions. The numbers in parentheses are probability levels at which the null hypothesis of a zero coefficient can be rejected.

home country's institutional constraints so that a higher level of risk-taking can be achieved. Moreover, this evidence suggests that the home country's institutions matter in the global business environment.

Difference-in-Differences Analysis

To alleviate concerns about potential endogeneity and establish that OFC operations facilitate bank risk-taking, we perform a difference-in-differences (DiD) analysis using two distinct groups of banks.

Table 7 The moderating effect of bank home-country capital regulation

	Dependent variable									
	$TotalRisk_{t+1}$					$IdioRisk_{t+1}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Market risk measures										
OFC_t	0.0010					0.0005				
	[0.028]					[0.027]				
$OFC_t \times HighCapReg_t$	0.0039					0.0032				
	[<0.000]					[<0.000]				
$OFCSubr_t$		0.0032					0.0053			
		[<0.000]					[<0.000]			
$OFCSubr_t \times HighCapReg_t$		0.0060					0.0120			
		[<0.000]					[<0.000]			
$OFCIndex_t$			0.0010					0.0026		
			[<0.000]					[0.000]		
$OFCIndex_t \times HighCapReg_t$			0.0062					0.0049		
			[<0.000]					[<0.000]		
$IMFIndex_t$				0.0015					0.0011	
				[<0.000]					[0.000]	
$IMFIndex_t \times HighCapReg_t$				0.0036					0.0030	
				[<0.000]					[<0.000]	
$Secrecy_t$					0.0025					0.0018
					[<0.000]					[0.001]
$Secrecy_t \times HighCapReg_t$					0.0066					0.0055
					[<0.000]					[<0.000]
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.627	0.694	0.687	0.688	0.688	0.637	0.700	0.694	0.696	0.696
No. of observations	7628	4448	4448	4448	4448	7628	4448	4448	4448	4448

	Dependent variable									
	$LoanLossAllow_{t+1}$					$Zscore_{t+1}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel B. Financial measures										
OFC_t	0.0010					−0.0532				
	[0.045]					[0.068]				
$OFC_t \times HighCapReg_t$	0.0018					−0.0737				
	[0.021]					[0.015]				
$OFCSubr_t$		0.0054					−0.3498			
		[0.015]					[<0.000]			

Table 7 (*Continued*)

	Dependent variable									
	$LoanLossAllow_{t+1}$					$Zscore_{t+1}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$OFCSubr_t \times HighCapReg_t$		0.0133					−0.7198			
		[<0.000]					[0.002]			
$OFCIndex_t$			0.0017					−0.3803		
			[0.013]					[<0.000]		
$OFCIndex_t \times HighCapReg_t$			0.0072					−0.4656		
			[0.014]					[<0.000]		
$IMFIndex_t$				0.0027					−0.1096	
				[0.004]					[<0.000]	
$IMFIndex_t \times HighCapReg_t$				0.0037					−0.2255	
				[0.001]					[0.005]	
$Secrecy_t$					0.0017					−0.1217
					[0.285]					[0.075]
$Secrecy \times HighCapReg_t$					0.0018					−0.2512
					[0.319]					[<0.000]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.712	0.767	0.766	0.766	0.765	0.640	0.646	0.645	0.646	0.647
No. of observations	7628	4448	4448	4448	4448	7628	4448	4448	4448	4s448

This table reports the regression results of testing the moderating effect of strict bank capital regulations at home on the association between OFC operations and banks' risk-taking. The dependent variables are the market risk measures in Panel A and financial risk measures in Panel B. *HighCapReg* equals 1 if the bank capital regulation index is larger than five (the mean of the index ranges from 0 to 10), and 0 otherwise. The variables of interest are the interactions of *HighCapReg* and each of the OFC operation measures. See "Appendix B" for definitions of all control variables. The standard errors are robust to heteroskedasticity and are clustered by bank and year in all regressions. The numbers in parentheses are probability levels at which the null hypothesis of a zero coefficient can be rejected.

Table 8 DiD analysis of the impact of OFC operations on bank risk-taking

	(1) $TotalRisk_{t+1}$	(2) $IdioRisk_{t+1t}$	(3) $LoanLossAllowt_{+1}$	(4) $Zscore_{t+1}$
Panel A DiD analysis				
$PostOFC_t$	0.0010	0.0011	0.0021	−0.0617
	[0.002]	[0.014]	[0.137]	[0.048]
Control variables	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.590	0.598	0.734	0.585
No. of observations	5,449	5,449	5,449	5,449
Panel B The dynamic analysis of OFC operations on bank risk-taking				
Post-2	0.0002	0.0003	0.0005	−0.0203
	[0.750]	[0.511]	[0.764]	[0.718]
Post-1 PostAct	0.0002	0.0004	0.0015	−0.0429
	[0.788]	[0.654]	[0.248]	[0.411]
Post0	0.0017	0.0020	0.0019	−0.0638
	[0.002]	[0.000]	[0.083]	[0.024]
Post1	0.0010	0.0014	0.0031	−0.1260
	[0.017]	[0.008]	[0.029]	[0.021]
Post2+	0.0008	0.0012	0.0047	−0.1284
	[0.072]	[0.024]	[0.001]	[0.023]
Control variables	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.591	0.599	0.736	0.586
No. of observations	5449	5449	5449	5449

This table reports the DiD analysis results of testing the effect of changing from non-OFC to OFC banks on bank risk-taking in Panel A and the dynamic analysis of OFC operations on bank risk-taking in Panel B. The treatment group includes banks changing their status from non-OFC to OFC banks during our sample period, and the control group includes banks that maintain their non-OFC status throughout the sample period. In Panel A, the variable of interest is *PostOFC*, which equals 1 for a treatment bank after the transition from a non-OFC to an OFC bank, and 0 otherwise. In Panel B, the key test variables are the indicators for the years surrounding the status change of OFC banks. Specifically, *Post0* equals 1 for a treatment bank in the year when it changed its status from a non-OFC to an OFC bank. *Post-1 and Post-2* are indicators for the first year and second year prior to the status change of a treatment bank, respectively. *Post1* is an indicator for the first year after the status change of a treatment bank, and *Post2+* refers to two years or more after the status change of a treatment bank, respectively. See "Appendix B" for definitions of all control variables. The standard errors are robust to heteroskedasticity and are clustered by bank and year in all regressions. The numbers in parentheses are probability levels at which the null hypothesis of a zero coefficient can be rejected.

Treatment banks are those banks that change their status from non-OFC to OFC banks during the sample period, and control banks are those banks that maintain non-OFC status throughout the sample period. We test whether the change in a bank's status from a non-OFC to an OFC bank is related to a significant change in its risk-taking behavior. Specifically, we compare the change in risk-taking in the treatment banks after the transition from non-OFC to OFC bank with the corresponding change in the benchmark control banks that do not experience such a transition. We identify 3963 observations of 374 treatment banks and 1486 observations of 145 control banks. We then use the OLS procedure to estimate the following DiD model:

$$\begin{aligned} BankRisk_{it+1} = {} & \beta_0 + \beta_1 PostOFC_{it} + \beta_2 Liquidity_{it} \\ & + \beta_3 Size_{it} + \beta_4 TotalLoan_{it} + \beta_5 Equity_{it} \\ & + \beta_6 Leverage_{it} + \beta_7 ROA_{it} \\ & + \beta_8 LoanGrowth_{it} + \beta_9 NonInterestIncome_{it} \\ & + \beta_{10} TierRatio_{it} + \beta_{11} \#Shareholder_{it} \\ & + \beta_{12} \#Subsidiary_{it} + \beta_{13} Independence_{it} \\ & + \beta_{14} IFRS_{it} + \beta_{15} USGAAP_{it} + BankFE \\ & + YearFE + \varepsilon \end{aligned} \quad (6)$$

where *PostOFC* equals 1 for the treatment banks *after* the transition from a non-OFC to an OFC bank (i.e., in the post-OFC period), and 0 otherwise. We use the same set of control variables included in Eq. (2). The DiD effect is captured by β_1, the coefficient on the variable of interest, *PostOFC*, after controlling for bank and year fixed effects. The year

Table 9 The moderating effect of the post-crisis regulations

	(1) $TotalRisk_{t+1}$	(2) $IdioRisk_{t+1}$	(3) $LoanLossAllow_{t+1}$	(4) $Zscore_{t+1}$
Panel A Full sample				
OFC_t	0.0021	0.0018	0.0035	−0.2176
	[0.001]	[0.080]	[0.047]	[<0.000]
$OFC_t \times PostCrisis$	−0.0010	−0.0007	0.0021	−0.1519
	[0.139]	[0.225]	[0.018]	[0.044]
PostCrisis	−0.0061	−0.0068	−0.0035	0.8030
	[<0.000]	[<0.000]	[0.414]	[<0.000]
Control Variables	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.561	0.595	0.753	0.670
No. of observations	6528	6528	6528	6528
Panel B U.S. subsample				
OFC_t	0.0017	0.0016	0.0026	−0.5970
	[0.004]	[0.005]	[<0.000]	[<0.000]
$OFC_t \times PostCrisis$	−0.0006	−0.0002	0.0020	−0.5148
	[0.391]	[0.717]	[0.088]	[<0.000]
PostCrisis	−0.0043	−0.0045	−0.0021	0.7273
	[0.002]	[0.001]	[0.003]	[0.005]
Control variables	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.641	0.688	0.744	0.666
No. of observations	2693	2693	2693	2693

This table reports the results of testing the moderating effect of the financial crisis and post-crisis regulations on the association between OFC operations and bank risk-taking (excluding 2008–2010). Panel A reports the results for the full sample. Panel B reports the results for U.S. banks. *PostCrisis* equals 1 for the post-crisis regulation period (i.e., 2011–2018), and 0 for the pre-crisis period (i.e., 2001–2007). See "Appendix B" for definitions of all control variables. The standard errors are robust to heteroskedasticity and are clustered by bank and year in all regressions. The numbers in parentheses are probability levels at which the null hypothesis of a zero coefficient can be rejected.

fixed effects control for general changes over time in bank risk-taking trends, and the bank fixed effects control for differences in time-invariant omitted factors among banks. If OFC operations facilitate more bank risk-taking, we expect β_1 to be significantly positive when the dependent variable is *TotalRisk*, *IdioRisk*, or *LoanLossAllow*, and significantly negative when it is *Zscore*.

Panel A of Table 8 presents the results. The coefficients on *PostOFC* are positive and significant at conventional levels when the dependent variable is *TotalRisk* or *IdioRisk*, while it is positive but insignificant for *LoanLossAllow* (p = 0.137). The same coefficient is significantly negative when the dependent variable is *Zscore*. These results indicate that after switching from non-OFC to OFC banks, there is a significant increase in the level of risk-taking by the treatment banks, compared to the control banks. This evidence buttresses and enriches our earlier finding that OFC operations facilitate bank risk-taking.

We perform two robustness tests for our DiD analysis. First, we conduct a multi-period dynamic DiD analysis to check whether the parallel trend assumption is violated or not. A key assumption underlying the DiD model is that the trend in risk-taking should be the same for both treatment and control banks in the absence of a status change in the treatment banks. If the parallel-trend assumption is valid, we should observe no difference in the risk-taking trend between the two groups in the pre-OFC period. To assess the validity of this assumption, following Kerr and Nanda (2009) and Amore, Schneider and Zaldokas (2013), we generate a series of indicator variables for time periods surrounding the status change of treatment banks. The variable *Post0* equals one for the year when the treatment bank established OFC operations, and zero otherwise. The variable *Post1* takes a value of one for treatment banks in the first year after the status change, and zero otherwise. The variable *Post2+* refers to two or more years after the treatment banks' status change. The variables *Post-1* and *Post-2*

are indicators that equal to one for treatment banks in the first and second years prior to the status change, respectively. Other unspecified years are used as the reference period. We replace *PostOFC* in Eq. (5) with these five indicator variables.

As shown in Panel B of Table 8, we find that the coefficients on *Post-2* and *Post-1* are not statistically significant, while the coefficients on *Post0*, *Post1*, and *Post2+* are significant with the predicted signs. These results suggest that there is no pre-existing non-parallel trend between the treatment and control banks; furthermore, the significant between-group difference in risk-taking is related to the status change of going offshore.[13] This evidence further corroborates our finding that banks take more risk after they establish operations in OFCs. Moreover, for all four risk-taking measures, we find coefficients on *Post 2+* are positive and significant and the difference in the coefficients of *Post1* and *Post2+* is not statistically significant (untabulated). This suggests that the effect of entering OFCs on risk-taking did not diminish over time.

Second, we employ a propensity scoring matching technique to construct a sample in which the treatment and control banks are matched based on the predicted likelihood of a bank having OFC operations. Following Bailey and Liu (2020), we estimate a Probit regression of the likelihood of having OFC operations on five predictor variables: a country's capital regulation, bank size, equity ratio, accounting standards, and shareholder independence. Using the estimated coefficients on these predictor variables, we obtain the propensity score (i.e., the predicted likelihood). We then construct a propensity-score-matched (PSM) sample of treatment and control banks and perform a DiD analysis.[14] Untabulated results using this PSM sample reveal that after switching from non-OFC to OFC banks, there is a significant increase in the level of risk-taking for the treatment banks, compared to the control banks.

ADDITIONAL ANALYSIS AND ROBUSTNESS TESTS

Effects of Post-crisis Regulations on OFC Bank Risk-Taking

After the recent financial crisis, banking regulators around the world have taken action against OFCs, especially non-cooperative jurisdictions. First, the OECD issued a new blacklist in April 2009 to improve OFCs' compliance with supervisory standards in banking and anti-money laundering. Second, the Financial Stability Board developed an effective peer review program to assess OFCs' compliance with regulatory standards (G20, 2009). Third, the Basel Committee of Banking Supervision drafted Basel III, which adds heavier risk weighting for securitization exposure and off-balance-sheet vehicles in OFCs (Financial Stability Board, 2012). A limitation of all the above international regulatory efforts is the lack of enforcement. None of these international regulatory organizations possesses the formal authority or power to enforce the new standards (Rixen, 2013; Sullivan, 2007; Turner, 2011). As argued by Rixen (2013), due to governments' concerns about international competitiveness and the problem of collective action, many regulatory reforms after the financial crisis have tended to be ineffective. Moreover, there is a real fear that imposing stricter regulations on regular banks would increase the attractiveness of shadow banks in OFCs (Financial Stability Board, 2011).

In the United States, the Dodd-Frank Act was passed in 2010 to regulate the financial market. However, the Act merely sets out regulatory goals; it will require a long process to craft rules and implement them. Therefore, it is very likely that many strict rules will be watered down during this lengthy process (Woolley & Ziegler, 2012). Also in 2010, the U.S. Financial Reporting Standard Board promulgated SFAS166/167 to tighten standards on the consolidation of off-balance-sheet vehicles. Under these new standards, many banks' OFC activities need to be brought back onto the balance sheet. As a result, banks' OFC activities will become more transparent to onshore investors and regulators.

In this section, we perform additional tests to shed light on whether the relation between OFC operations and bank risk-taking changes after the global financial crisis. We exclude observations in 2008–2010 from our sample to have a cleaner comparison between the pre- and post-crisis periods. We exclude 2010 because some regulations were implemented in 2010. We generate an indicator variable, *PostCrisis*, that equals 1 for observations in the post-crisis period after 2010 (i.e., 2011–2018), and 0 for those in the pre-crisis period (2001–2007). We estimated Eq. (2) after adding *PostCrisis* and its interaction with *OFC*. In Table 9, Panels A and B report the results using the full sample and the U.S. sample, respectively. As shown in both panels, we find that the main effect of *OFC* is consistent with the results reported in Table 4.

Table 10 Robustness tests for U.S. banks

	Dependent variable									
	$TotalRisk_{t+1}$					$IdioRisk_{t+1}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A Market risk measures										
OFC_t	0.0020 [0.002]					0.0013 [0.026]				
$OFCSubr_t$		0.0090 [<0.000]					0.0080 [<0.000]			
$OFCIndex_t$			0.0019 [0.096]					0.0018 [0.169]		
$IMFIndex_t$				0.0049 [<0.000]					0.0045 [<0.000]	
$Secrecy_t$					0.0014 [0.026]					0.0027 [<0.000]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.806	0.831	0.831	0.801	0.831	0.801	0.829	0.829	0.829	0.829
No. of observations	3237	1952	1952	1952	1952	3237	1952	1952	1952	1952
	Dependent variable									
	$LoanLossAllow_{t+1}$					$Zscore_{t+1}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel B Financial risk measures										
OFC_t	0.0008 [0.043]					−0.1725 [0.000]				
$OFCSubr_t$		0.0004 [0.216]					−0.0209 [0.787]			
$OFCIndex_t$			0.0015 [0.041]					−0.2161 [0.002]		
$IMFIndex_t$				0.0003 [0.130]					−0.0272 [0.087]	
$Secrecy_t$					0.0005 [0.038]					−0.0693 [0.381]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.737	0.758	0.758	0.759	0.759	0.667	0.692	0.692	0.692	0.692
No. of observations	3237	1952	1952	1952	1952	3237	1952	1952	1952	1952

This table reports the regression results for U.S. banks using the market risk measures in Panel A and financial risk measures in Panel B. The regressions are conducted for the entire U.S. bank sample in Columns 1 and 6 in Panels A and B, and for the U.S. OFC bank sample in the other columns of both panels. See "Appendix B" for definitions of all control variables. The standard errors are robust to heteroskedasticity and are clustered by bank and year in all regressions. The numbers in parentheses are probability levels at which the null hypothesis of a zero coefficient can be rejected.

The coefficients on the interaction term are not statistically significant when bank risk is measured by *TotalRisk* or *IdioRisk* (Columns 1 and 2), and are significantly positive (negative) when *LoanLossAllow* (*Zscore*) is the dependent variable in both the full sample (Panel A) and the U.S. subsample (Panel B). Collectively, we find no evidence that the positive association between OFC operations and bank risk-taking is weakened in the post-crisis period. These findings are in line with the concern that many regulations toward OFCs are feeble and symbolic (Rixen, 2013; Sullivan, 2007; Turner, 2011).[15]

Results for U.S. and Non-U.S. Banks

As shown in Table 1, U.S. banks represent the largest portion of our full sample (39.69%). To evaluate whether our results are driven by U.S. banks and whether our findings still hold for non-

Table 11 Robustness tests for non-U.S. banks

	Dependent variable									
	$TotalRisk_{t+1}$					$IdioRisk_{t+1}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A Market risk measures										
OFC_t	0.0007					0.0006				
	[0.028]					[0.046]				
$OFCSubr_t$		0.0016					0.0012			
		[0.117]					[0.165]			
$OFCIndex_t$			0.0009					0.0009		
			[0.045]					[0.025]		
$IMFIndex_t$				0.0010					0.0006	
				[0.037]					[0.008]	
$Secrecy_t$					0.0009					0.0009
					[0.095]					[0.029]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.593	0.650	0.650	0.650	0.650	0.599	0.657	0.658	0.657	0.657
No. of observations	4919	2825	2825	2825	2825	4919	2825	2825	2825	2825
	$LoanLossAllow_{t+1}$					$Zscore_{t+1}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel B Financial risk measures										
OFC_t	0.0029					−0.0968				
	[0.009]					[0.004]				
$OFCSubr_t$		0.0221					−0.3773			
		[0.010]					[0.006]			
$OFCIndex_t$			0.0071					−0.0484		
			[0.056]					[0.069]		
$IMFIndex_t$				0.0024					−0.0469	
				[0.018]					[0.053]	
$Secrecy_t$					0.0066					−0.0621
					[0.002]					[0.074]
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.691	0.764	0.764	0.763	0.763	0.632	0.653	0.652	0.653	0.652
No. of Observations	4919	2825	2825	2825	2825	4919	2825	2825	2825	2825

This table reports the regression results for non-U.S. banks using the market risk measures in Panel A and financial risk measures in Panel B. The regressions are conducted for the entire non-U.S. bank sample in Columns 1 and 6 in Panels A and B, and for the non-U.S. OFC bank sample in the other columns of both panels. See "Appendix B" for definitions of all control variables. The standard errors are robust to heteroskedasticity and are clustered by bank and year in all regressions. The numbers in parentheses are probability levels at which the null hypothesis of a zero coefficient can be rejected.

U.S. banks, we repeat our analyses for the U.S. and non-U.S. banks separately. As reported in Panel A of Table 10 using the market-based measures of risk-taking (*TotalRisk* and *IdioRisk*) and in Panel B using the financial measures of risk-taking (*LoanLossAllow* and *Zscore*), the results for the U.S. banks are qualitatively similar to those reported in Tables 4, 5 and 6.

Similarly, Panels A and B of Table 11 show that our baseline results still hold for the non-U.S. banks. In particular, we find that all of the test variables, including *OFC*, *OFCSubr*, *OFCIndex*, *IMFIndex*, and *Secrecy* have significant effects on all four risk measures (*TotalRisk*, *IdioRisk*, *LoanLossAllow*, and *Zscore*) in the predicted directions for the non-U.S. banks, and some effects are stronger for the non-U.S. banks than for the U.S. banks. The results in Tables 10 and 11, taken together, indicate that having business operations in OFCs generally increases the risk-taking of both U.S. and non-U.S. banks, while having more operations in OFCs whose institutional features offer more regulatory

arbitrage opportunities leads to greater risk-taking for both U.S. and non-U.S. banks.[16]

Other Robustness Tests

In our baseline analyses, the treatment group includes banks with OFC affiliates or subsidiaries, while the control group (i.e., the non-OFC bank sample) includes both multinational banks whose affiliates or subsidiaries are located in non-OFC foreign countries and domestic banks that have no foreign affiliates or subsidiaries. To alleviate the concern that our baseline results may be driven by internationalization rather than by offshore operations, we drop domestic banks that have no foreign operations and perform a robustness test by repeating the estimation using this reduced sample of multinational banks only. Our results (untabulated) remain qualitatively the same using the reduced sample.

Our main tests include bank and year fixed effects and cluster the standard errors by bank and year. The results (untabulated) remain similar when the standard errors are clustered by bank only or by home country only. To control for country-level business cycle events, we add country × year dummies to the model. The results (untabulated) remain similar. All untabulated results are available upon request.

DISCUSSION

The primary focus of this study is to examine whether banks' operations in OFCs influence their level of risk-taking. We began by drawing on banking theory, which posits that banks are unique because they benefit from explicit deposit insurance guarantees and other implicit guarantees (e.g., bailouts in crisis periods) from the government (Bhattacharya & Thakor, 1993; Diamond & Dybvig, 1983, 1986; Merton, 1977). As government guarantees act as a put option on a bank's assets, and the value of this put is increasing in bank risk (Merton, 1977), banks generally have strong incentives for pursuing activities that increase overall risk. High risk-taking by banks would increase the likelihood of bank failure and undermine their financial stability. Therefore, traditional onshore bank regulators usually impose strict capital regulations on banks to prevent excessive risk-taking, which leads to a misalignment between the needs of banks and their home country's regulatory environment. Oliver (1991) argues that, when the needs of a company are misaligned with its institutional environments, the company is likely to escape from its current institutional structure and to relocate to places with institutional environments that are more aligned to their goals. Comparative capitalism, a strand of institutional theory within political science (Aguilera & Grøgaard, 2019), emphasizes that different types of economies may give rise to comparative institutional advantages that then lead to institutional arbitrage; thus, companies may shift their activities to other nations in order to pursue their goals (Hall & Soskice, 2001; Jackson & Deeg, 2008). By integrating banking theory and institutional theory, we hypothesize that offshore locations are used by banks to engage in institutional arbitrage and to pursue riskier activities. Our finding of a positive association between bank OFC operations and risk-taking strongly supports the view that OFCs facilitate banks' risk-taking needs. Also in line with institutional arbitrage is our expectation that banks with more operations in OFCs where the institutional environment is friendlier for bank risk-taking (i.e., more regulatory arbitrage opportunities) are associated with greater risk-taking. Therefore, our findings strongly support these associations between OFC institutional environments and bank risk-taking.

We also examine the moderating effect of a bank's home-country capital regulation on the association between OFC operations and bank risk-taking. Specifically, tighter bank capital regulations in the home country can lower banks' risk-taking in OFCs if their home country's institutions are embedded in banks' culture, and if this culture is carried over to OFCs. On the other hand, tighter home-country bank capital regulations can increase the severity of misalignment problems, and, as a result, create greater incentives for banks to engage in high-risk activities in their offshore locations. Our findings are consistent with the latter argument that the positive association between bank OFC operations and risk-taking is more pronounced for banks whose home countries have stricter bank capital regulations.

Our paper contributes to the existing literature in the following ways. First, although a large body of IB research seeks to understand the determinants and consequences of globalization in modern corporations, relatively little attention has been paid to banking globalization (Fang et al., 2019; Verbeke et al., 2018). Banks are distinct from nonfinancial companies in that they are opaque and highly regulated, and their failure could disrupt global

markets. Berger et al. (2003) argue that, due to strict regulations and the uniqueness of banking services, the process of banking globalization would differ very much from that of nonfinancial companies. Therefore, it is essential that IB researchers have a better understanding of the potential economic consequences of banking globalization. Our analysis on bank OFC operations (a variation of bank internationalization) and their association with bank risk-taking helps fill this gap in the IB literature. Understanding the potential effects of banking globalization has implications for IB because global banks are often major credit suppliers for multinational companies, and banking stability plays an essential role in global trade and investment flows (Cetorelli & Goldberg, 2012; Claessens, Hassib, & Horen, 2017; Iacovone & Zavacka, 2009). Our findings show that banking globalization can incentivize and facilitate bank risk-taking, and therefore provide useful insights into the potential benefits and costs of bank internationalization. Moreover, our focus on an international sample of banks from different countries provides further insights into how the home and host countries' institutional environments jointly determine the most appropriate strategies for banks operating there. We theorize and show that the institutional environments of both home and host countries play an important role in affecting banks' incentives and ability to use OFCs for risk-taking purposes. These findings add to the IB research that aims to explain why and how companies differ across national contexts.

Second, we contribute to the literature investigating multinational bank risk-taking. Although several studies have examined the impact of bank expansion on bank risk (Buch et al., 2013; Crystal et al., 2002; Goetz et al., 2016; Méon & Weill, 2005), little attention has been paid to bank OFC operations. We contribute to this line of research by examining banks' activities in offshore locations, the places of central importance to the banking sector, as they host a significant amount of banks' international business operations (Damgaard et al., 2018). By integrating insights from institutional theory and banking theory, our study differs from prior research that relies mostly on portfolio theory to explain the role of foreign expansion in bank risk-taking. Traditional portfolio theory posits that internationalization brings about diversification benefits that lead to lower risk (Kim et al., 1993; Rugman, 1976; Shapiro, 1978). Based on this argument, OFC operations, which help banks invest globally, should reduce bank-specific risk. We find evidence that, instead of helping banks diversify risk, OFCs are mainly used by banks to pursue institutional arbitrage and to engage in high-risk activities. Therefore, our results shed new light on how bank risk-taking can be shaped by the location choice of bank internationalization.

Last, our study adds to the literature related to OFCs. Focusing on nonfinancial companies, prior studies have found that companies with subsidiaries in OFCs or tax havens are more opaque in their voluntary disclosures (Ben Amar et al., 2018), exhibit lower financial reporting quality or higher levels of earnings management (Durnev et al., 2017; Dyreng et al., 2012), engage more in tax avoidance or evasion (Bennedsen & Zeume, 2018; Blouin et al., 2012; Chernykh & Mityakov, 2017), face a higher implied cost of equity capital (Taylor et al., 2018) and a higher implied cost of bank loans (Ge et al., 2016), and have a more concentrated loan syndicate structure (Ge et al., 2018). Our study provides new evidence on the economic consequences of having operations in OFCs, that is, it enables banks to engage in more risk-taking activities. Accordingly, bank operations in OFCs may pose a potential threat to the stability of the global financial system.

Our theoretical contributions are twofold. First, we contribute to the comparative capitalism strand of institutional theory. The concept of comparative institutional advantage in comparative capitalism emphasizes that the institutional structure of a particular political economy provides companies with the advantages of engaging in certain types of activities there. This is why particular nations tend to specialize in specific types of industries (Hall & Soskice, 2001; Jackson & Deeg, 2008;). Our results add to the comparative capitalism literature by shedding light on how certain countries or jurisdictions (i.e., OFCs) develop a set of institutions related to financial system that provide heavily regulated banks with advantages for engaging in high-risk activities. Specifically, our evidence shows that, by strategically expanding businesses into OFC countries, banks are able to secure the advantages that the institutional frameworks of OFCs offer for pursing their goals of risk-taking. Many studies from the comparative capitalism literature argue that the behaviors of institutional arbitrage favor multinational companies and their home countries (Clausen, 2014; De Propris & Driffied, 2006; Oliveira, Roth, & Ponte, 2003; Schneider et al., 2010; Singh, 2007). This is because foreign

subsidiaries can be used as a knowledge-sourcing device that directs knowledge from the host to the home country. In contrast to those studies, our study focuses on the banking industry, a highly regulated industry, and uncovers a potential dark side of institutional arbitrage. We show that banks from onshore countries set up subsidiaries in offshore jurisdictions to circumvent home-country bank regulations so that they can engage in highly risky activities that are not allowed under the home country's bank regulations. Excessive risk-taking by banks is often considered a major cause of a financial crisis that could seriously disrupt the financial stability of the home countries. Thus, institutional arbitrage in the banking industry could potentially create more harm than benefits to the home country's economy. This finding has important implications for IB, as it points to a potential negative consequence of institutional arbitrage for highly regulated industries.

Second, our study contributes to banking theory, according to which deposit insurance is the only known effective measure to prevent bank runs while preserving the ability of banks to create liquidity; however, with deposit insurance in place, the government bears downside risk that creates incentives for banks to take on too much risk. As a result, bank policy should be designed to counteract those incentives (Diamond & Dybvig, 1986). Capital regulation is a commonly used bank policy to control bank risk. In this study, we find that, with globalization of the economy, offshore locations (especially those with weaker legal regulations and more opaque information environments) are used by banks to avoid their home country's institutional constraints and to pursue riskier activities. We also find that the stricter the home country's bank capital regulations, the higher the bank risk-taking through OFCs. Banking theory emphasizes that institutions govern actions and remain silent on bank reactions to bank policy. The cross-border regulatory arbitrage documented in our study highlights the importance of incorporating the concept of comparative institutional advantage within the global setting into the development of banking theory for multinational banks.

Our findings yield important policy implications. There is an ongoing debate over the costs and benefits of offshore operations. Some studies document several benefits of OFC operations, such as facilitating the effective movement of capital in response to investors' demands, easy incorporation procedures, proximity to countries that attract more capital inflows, and lower transaction costs (Huang, 2008; Kleinfeld, 1994; Pei, 2008; Sharman, 2012). For example, Sharman (2012) finds that, because regulations and laws in developing countries (such as China) are commonly confusing, politicized, and poorly enforced, many Chinese companies chose to go to OFC countries in order to more easily raise capital and more efficiently use their capital. This line of studies therefore concludes that OFCs provide development potential for companies in developing countries with weak institutions. On the other hand, there is evidence that OFCs can be used to hide stolen wealth, such as tax evasion and embezzlement (Bennedsen & Zeume, 2018; Blouin et al., 2012; Chernykh & Mityakov, 2017), and for money laundering or other criminal activities (Palan et al., 2010; Young, 2013). Therefore, banks' operations in OFCs remain controversial. Our study adds to this debate by uncovering the implications of OFC operations on bank risk-taking. Using a large international sample of banks from 66 countries around the world, we show that operations in OFCs enable banks to engage in more risk-taking activities. Given that high risk-taking by banks is likely to pose a potential threat to the stability of the global financial system, regulators should consider this effect when evaluating policies regarding OFCs.

Many argue that excessive risk-taking by banks in OFCs is the major cause of the 2008–2009 financial crisis (Acharya & Naqvi, 2012; Acharya & Richardson, 2009; Cheng, Hong, & Scheinkman, 2015). It is well known that international bodies and major economies implemented several new regulations in response to the crisis, aiming to improve oversight of OFCs and to deter banks' incentives to engage in high-risk activities through OFCs. However, we do not find that the positive association between OFC operations and bank risk-taking has been weakened after implementing new regulations. One reason for this finding may be due to the problem of collective action. Because governments are concerned about the international competitiveness of their countries, many regulatory reforms after the financial crisis were not well enforced (Rixen, 2013). Moreover, we find weak evidence that the positive association between OFC operations and bank risk-taking has become even stronger after the crisis. This finding echoes the concern of banking regulators that imposing stricter regulations on regular banks would increase their incentives to pursue regulatory arbitrage using OFCs (Financial Stability Board, 2011).

Our study has limitations and opens future research opportunities. First, as our study chose a quantitative rather than a qualitative approach, it lacks in describing the mechanism on how banks engage in high-risk activities through OFCs in a deep and comprehensive manner. Second, although we find evidence that OFC operations are associated with higher risk-taking, we do not study whether the increased risk-taking is value-destroying or value-adding. We do not explore whether banks use OFCs to take risk for the purpose of extracting private benefits at the expense of shareholders. Such research requires data on bank ownership structure, corporate governance, and management compensation structure to measure the degree of agency conflicts faced by banks. As our study focuses on a large sample of banks from many countries, those data are not readily available. Future research can use a single-country setting and examine whether OFC operations induce risk-taking by bank managers beyond the level desirable for shareholders. Third, the issue of measurement is one concern in this study. Many risks taken in OFCs are through the shadow banking system, such as SPVs, SIVs, etc., and many of them are kept off the balance sheet. Although our accounting-based bank risk measures capture some bank risk taken off the balance sheet, they may not capture all off-balance-sheet risk-taking. Thus, there is an opportunity for future research to further enrich our understanding of how OFC operations influence bank risk-taking by examining potential hidden risk. Lastly, as we require banks to have available ISIN and available subsidiary information, our sample is comprised of mostly big banks from 66 countries. Also, the bank distribution across different countries is uneven and is not proportional to the number of banks in those countries. Thus, the banks in our sample may not represent all banks, which limits the broad generalizability of our results. We therefore recommend future studies to further validate our results by including more small banks into the sample to check how these additions would influence the effects found in this study.

CONCLUSIONS

In this study, we examine whether banks' subsidiary operations in OFCs influence their level of risk-taking. We provide novel evidence that banks with subsidiary operations in OFCs exhibit a higher level of risk-taking than banks without OFC subsidiaries, and that banks with more intensive OFC operations are more aggressive in risk-taking. Our DiD analysis shows that a switch from a non-OFC to an OFC bank significantly increases the level of risk-taking, thereby lending support to the causal relationship between OFC operations and bank risk-taking. We further analyze how some specific institutional features of the host and home countries affect banks' risk-taking in OFCs. Our findings indicate that more intensive operations in OFCs that offer more regulatory arbitrage opportunities are associated with more risk-taking by OFC banks, and that strict bank capital regulations at home increase bank risk-taking via OFC operations. Overall, this paper provides large-sample, systematic evidence that OFC operations are associated with higher bank risk-taking. Our findings should be of interest to global banking supervisory bodies and onshore banking regulators across different countries around the world.

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DATA AVAILABILITY

All data used in the paper are available from the subscribed or publicly available sources noted in the text.

NOTES

[1]For example, the Cayman Islands were the largest foreign holder of US mortgage-backed securities.

[2]Basel Committee for Banking Supervision member, Jose Maria Roldan, stated at the Asian Banker Summit in Hong Kong in April 2011, "If we have higher capital requirements, we are going to have higher incentives for regulatory arbitrage. Within banks, across banks, across countries, if you have an

uneven application of Basel III you will see banking activity going to the country that has a softer approach."

[3]Several other anecdotal evidence shows that onshore banks engage in a variety of activities in OFCs (such as money laundering, tax evasion, hedge funds, unrestricted lending, etc.), which significantly increase bank risk. For example, in 2012, the British multinational bank, HSBC, signed a deferred prosecution deal and admitted that it had laundered at least $881 million for Latin American drug cartels (https://www.icij.org/investigations/fincen-files/global-banks-defy-u-s-crackdowns-by-serving-oligarchs-criminals-and-terrorists/) through the use of OFCs. HSBC's Swiss private banking unit was alleged to set up illegal schemes (e.g., forgery and falsification of records, illegal use of financial intermediaries) to help investors funnel money by creating offshore companies in Panama and other OFCs in the Caribbean, and it was fined nearly $336 million in 2019 (https://www.aljazeera.com/economy/2019/8/6/hsbc-fined-336m-to-repay-belgium-after-huge-tax-fraud). The failure of Bear Stearns, a New York-based global investment bank that collapsed in 2008, was strongly linked to its two Cayman-registered hedge funds (file://C:/Users/zjing/Downloads/Bear%20Stearns%20and%20OFC_%20Dollars%20&%20Sense_2021June.pdf). In August 2007, a few months before Lehman Brothers filed for bankruptcy, 85 percent of its long-term debt was issued by Lehman Brothers Treasury B.V., an SPV located in Amsterdam. Through establishing SPVs in various OFCs, Lehman Brothers was able to incur an excessive amount of debt without being limited by the onshore regulators' capital reserve requirement (Fernandez & Wigger, 2016).

[4]The sample period starts in 2001 due to the limitation of affiliates or subsidiary data of Osiris in prior years.

[5]For example, after merging Bankscope with Datastream, the number of UK banks is about three times larger than that of Ghana banks. However, after we merge the data with the Osiris database, a large number of UK bank observations are dropped because they do not disclose their subsidiary information. This is why, in the final sample, the number of UK bank observations is similar to the number of Ghana bank observations. Similarly, we have more bank observations from Bangladesh because a large proportion of Bangladesh banks voluntarily disclose their subsidiary information. To further ensure the robustness of our findings, we reestimate our models excluding banks from Ghana, the UK, and Bangladesh. Our results remain qualitatively the same.

[6]The average asset size is $103.098 billion for banks with ISIN, and $15.816 billion for those without ISIN. The average size of banks that disclose (do not disclose) subsidiary information is $71.591 billion ($56.061 billion). This means our sample covers mainly large banks.

[7]In December 2007, Citigroup brought back onto its balance sheet $49 billion of SPE assets that it had previously securitized (Sidel, Reilly, & Enrich, 2007).

[8]The index equals zero if a country shows a strong onshore attitude; one if a country does not show a strong onshore attitude but is not listed on one of the blacklists; and two, three, or four if a country appears in one, two, or three blacklists, respectively. Finally, one is added to the index if a country or jurisdiction is listed by the International Financial Centre's Yearbook from 2006 to 2007, where a country or jurisdiction is classified as an OFC if the authorities of the country or jurisdiction approved this status.

[9]The IMF has not updated its categorization of OFC groups since 2000, so we hold the group numbers of OFCs constant throughout our sample period.

[10]The list is available from the US Congress website: https://www.congress.gov/110/bills/s681/BILLS-110s681is.xml.

[11]Barth, Caprio, and Levine (2013) construct the capital regulation index based on surveys on bank regulation in 1999, 2003, 2007, and 2011, covering 180 countries. The index is composed of the answers from specific survey questions: (1) Is the capital asset ratio risk weighted in line with the Basel I guidelines? (2) Does the minimum capital asset ratio vary as a function of an individual bank's credit risk? (3) Does the minimum capital asset ratio vary as a function of market risk? (4) Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital? Market value of loan losses not realized in accounting books? Unrealized losses in securities portfolios? Or unrealized foreign exchange losses? (5) What fraction of revaluation gains is allowed as part of capital? (6) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? (7) Can the initial disbursement or subsequent injections of capital be done with assets other than cash or government securities? and (8) Can the initial disbursement of capital be done

with borrowed funds? The maximum possible value is 10, while the minimum possible value is 0. We assume that a country's regulation index remains the same until it is updated. Specifically, we use the index of 1999 for observations before 2003, the index of 2003 for observations from 2003 to 2006, the index of 2007 for observations from 2007 to 2010, and the index of 2011 for observations from 2011 to 2018. We then generate an indicator variable, *HighCapReg,* that equals 1 if a country's index is larger than five (the mean of the index), and 0 otherwise.

[12]*Zscore* is the natural logarithm of raw Z-score. Therefore, the raw Z-score of OFC banks = $e^{-0.1099}\times$ raw Z-score of non-OFC banks.

[13]Coefficients of *Post-2* and *Post-1* capture the difference in risk-taking trend between the treatment and control banks in the two years before the event year (i.e., difference-in-differences = Diff[-Treat-Control]$_{\text{year-2 or year-1}}$ − Diff[Treat-Control]$_{\text{benchmark years}}$). We find that the coefficients on both *Post-2 and Post-1* are statistically insignificant, which suggests that the *risk-taking trends* are similar between the treatment and control banks in the pre-treatment period. These results do not suggest that there is no difference in the *level of risk-taking* between treatment banks and control banks; instead, they merely suggest that in the years prior to OFC entry, there is no differing trend in risk-taking between treatment and control banks.

[14]We use 1-to-1 matching with replacement based on the nearest propensity score and a caliper distance of 0.1.

[15]After replacing *OFC* with other test variables, *OFCSubr, OFCIndex*, *IMFIndex*, and *Secrecy,* the results are similar.

[16]As OFC operations in some pass-through economies such as Singapore could be different from others, we conduct an additional analysis comparing banks with and without OFCs in Singapore. We do not find any significant differences between the two groups.

[17]The sum of the bank-year observations across OFCs is larger than 4,777. This is because a bank may have multiple OFC locations in one year.

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APPENDIX A: OFCS

OFC	Country code	Offshore attitude index	IMF group index	IRS secrecy jurisdiction	No. of bank-year observations[17]
Andorra	AD	2	2	1	13
Antigua and Barbuda	AG	4	3	1	10
Bahamas	BS	5	3	1	147
Bahrain	BH	3	2	0	119
Bermuda	BM	2	2	1	461
Barbados	BB	3	2	1	84
Belize	BZ	4	3	1	6
Cayman Islands	KY	4	3	1	626
Costa Rica	CR	2	3	1	27
Cyprus	CY	4	3	1	127
Gibraltar	GI	3	2	1	45
Hong Kong	HK	1	1	1	480
Ireland	IE	0	1	0	407
Latvia	LV	1	0	1	35
Lebanon	LB	3	3	0	70
Liechtenstein	LI	5	3	1	21
Luxembourg	LU	1	1	1	556
Liberia	LR	4	0	0	83
Malta	MT	2	2	1	60
Marshall Islands	MH	5	3	0	119
Mauritius	MU	3	3	0	122
Netherlands Antilles	AN	4	3	1	109
Panama	PA	5	3	1	139
Saint Kitts and Nevis	KN	5	3	1	3
Singapore	SG	2	1	1	426
Switzerland	CH	0	1	1	431
Virgin Islands (British)	VG	4	3	1	242

Sources: IMF background paper of offshore financial centers (IMF, 2000) http://www.imf.org/external/np/mae/oshore/2000/eng/back.htm, Zoromé (2007), Masciandaro (2008), and 110th U.S. Congress Bill, https://www.congress.gov/110/bills/s681/BILLS-110s681is.xml.

APPENDIX B: VARIABLE DEFINITIONS

Variable	Definition
Dependent variables: proxies of bank risk-taking (measured at the end of year t+1)	
TotalRisk	The standard deviation of the daily stock return
IdioRisk	Idiosyncratic risk, which is the standard deviation of residual μ of the following market model (Chen et al., 2006): $R_j = \alpha + \beta_{mj}(R_m) + \mu_j$ where R_j is the daily return on bank *j*, and R_m is the daily market return
LoanLossAllow	The ratio of loan and lease loss allowance to bank total loans. A higher value indicates higher risk
Zscore	The natural log of [(return on assets + equity/total assets)/standard deviation of the return on assets]
Test variables: measures of OFC engagement (measured at the end of year t)	
OFC	Indicator variable that equals 1 if a bank has at least one subsidiary in an OFC as listed in "Appendix A", and 0 otherwise
OFCSubr	Ratio of OFC subsidiaries computed as the number of OFC affiliates or subsidiaries of a bank scaled by its total number of affiliates or subsidiaries
OFCIndex	Subsidiary-weighted Offshore Attitude Index (OAI) from Masciandaro (2008). The OAI measures a jurisdiction's offshore characteristics, and its value ranges from 0 (lowest degree of offshore characteristics) to 5 (highest). $OFCIndex_{it} = \sum_c OAI^c \times (Subsidiary_{it}^c / Total\ number\ of\ subsidiaries_{it})$ where OAI^c is the OAI of country or jurisdiction *c*, and $Subsidiary_{it}^c$ is the number of subsidiaries that bank *i* in year *t* has in country *c*
IMFIndex	Subsidiary-weighted IMF group index $IMFindex_{it} = \sum_c Grouping\ number^c \times (Subsidiary_{it}^c / Total\ number\ of\ subsidiaries_{it})$ where $Grouping\ number^c$ is the IMF group number of country or jurisdiction *c*, and $Subsidiary^c$ is the number of subsidiaries that bank *i* in year *t* has in country *c*
Secrecy	Subsidiary-weighted secrecy index. The secrecy indicator is based on the U.S. Internal Revenue Service's list of secrecy jurisdictions. If an OFC is on the list, its secrecy indicator is coded 1, and 0 otherwise $Secrecy_{it} = \sum_c Secrecy\ Indicator^c \times (Subsidiary_{it}^c / Total\ number\ of\ subsidiaries_{it})$ where $Secrecy\ Indicator^c$ is the IRS' secrecy indicator of country or jurisdiction *c*, and $Subsidiary_{it}^c$ is the number of subsidiaries that bank *i* in year *t* has in country *c*
HighCapReg	Indicator variable that equals 1 if a country's bank capital regulation index is larger than five (the mean of the index ranges from 0-10), and 0 otherwise
Post0	Indicator variable that equals 1 for a treatment bank in the year when the bank changed its status from a non-OFC to an OFC bank, and 0 otherwise
Post-1	Indicator variable that equals 1 for a treatment bank in the year prior to the bank's status change from a non-OFC to an OFC bank, and 0 otherwise
Post-2	Indicator variable that equals 1 for a treatment bank in the second year prior to the bank's status change from a non-OFC to an OFC bank, and 0 otherwise
Post1	Indicator variable that equals 1 for a treatment bank in the first year after the bank's status change from a non-OFC to an OFC bank, and 0 otherwise
Post2+	Indicator variable that equals 1 for a treatment bank in two years or more after the bank's status change from a non-OFC to an OFC bank, and 0 otherwise
PostOFC	Indicator variable that equals 1 for treatment banks after the transition from non-OFC to OFC banks (i.e., in the post-OFC period), and 0 otherwise
PostCrisis	Indicator variable that equals 1 for the period of 2011–2018, and 0 for the pre-crisis period of 2001–2007
Control variables (measured at the end of year t)	
Liquidity	Sum of deposits and short-term funding divided by total assets
Size	Natural log of total assets in thousand U.S. dollars
TotalLoan	Total loan scaled by total assets
Equity	Equity scaled by total assets
Leverage	Leverage, computed as total liability scaled by total assets
ROA	Return on assets, computed as net income divided by total assets
LoanGrowth	Growth of gross loan
NonInterestIncome	Net non-interest income scaled by total assets
TierRatio	Regulatory Tier 1 and 2 Capital Ratio in a percentage

(*Continued*)

Variable	Definition
#Shareholder	Natural log of the number of recorded shareholders that a bank has. Recorded shareholders include those whose shareholding is larger than 1%
#Subsidiary	Natural log of the number of subsidiaries that a bank has
Independence	Natural log of the Independence Indicator that Bureau Van Dijk has constructed to measure the degree of independence of a bank's minority shareholders from its controlling shareholders. The indicator ranges from one to ten, with one representing the lowest degree of independence and ten representing the highest
IFRS	Indicator variable that equals 1 if a bank follows the IFRS, and 0 otherwise
USGAAP	Indicator variable that equals 1 if a bank follows the U.S. GAAP, and 0 otherwise

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