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ABSTRACT

It is widely known that rapid capital flight in the form of "sudden" withdrawal of foreign portfolio investment by foreign investors from the equity markets of developing states has devastating economic and political consequences. Given the high costs of sudden *flight* of foreign portfolio investment, it is not surprising that as the "lender of last resort," the International Monetary Fund (IMF) often provides programs and financial assistance to economically troubled developing countries to prevent such sudden flight crisis episodes in these states. Despite the Fund's earnest crisis-prevention efforts, however, sudden flight crises have occurred in some–but not all—developing countries observed under IMF crisis prevention programs. This leads to the following question: *when* are IMF programs likely to be positively associated with sudden flight of foreign portfolio investment in developing states that seek the Fund's assistance? We suggest here that the likelihood that a sudden flight crisis may occur under an IMF program critically depends on the market concentration of non-bank finance companies and asset management firms in program-participating developing countries: the higher the market concentration of these non-bank financial firms in a program-recipient nation, the more likely that the IMF program will be associated with a sudden flight crisis. Specifically, when the market concentration of non-bank financial firms in a program-participating developing country is high, these financial intermediaries will *compel* the government to renege on its commitment to implement IMF-mandated financial-sector reforms. This induces a financial panic among foreign investors that leads to a sudden flight crisis. Statistical tests from a sample of developing countries provide robust support for our hypothesis.

RESUMEN

Es ampliamente conocido que la rápida salida de capitales en la forma de retiros "súbitos" de inversiones de portafolio por parte de inversores extranjeros en los mercados bursátiles de los estados en desarrollo tiene consecuencias económicas y políticas devastadoras. Dados los altos costos de la huida súbita de la inversión extranjera de portafolio no es sorprendente que el Fondo Monetario Internacional, como prestamista de última instancia, a menudo provea programas y ayuda financiera a países en desarrollo con problemas económicos para evitar episodios de crisis por tales salidas súbitas de capitales en estos estados. A pesar de el esfuerzo serio de prevención de crisis que realiza el Fondo, sin embargo, han ocurrido crisis en algunos, aunque no en todos, los países en desarrollo que han estado bajo programas del Fondo para la prevención de crisis. Esto lleva a la siguiente pregunta: ¿cuándo es probable que los programas del FMI estén asociados positivamente con la salida súbita de la inversión internacional de portafolio en los países en desarrollo que buscan la asistencia del Fondo? Aquí sugerimos que la probabilidad de que ocurra una crisis de salida súbita bajo un programa del Fondo depende críticamente de la concentración de mercado de las compañías financieras no bancarias y de las empresas de manejo de activos en los países en desarrollo: cuando más alta sea la concentración de mercado de estas firmas financieras no bancarias en una nación que recibe programas es más alta la probabilidad de que un programa del FMI esté asociado con una crisis de fuga súbita. Específicamente, cuando la concentración de mercado de las firmas financieras no bancarias en un país en desarrollo que participa de un programa es alta estos intermediarios financieros obligarán al gobierno a renegar de su compromiso de implementar las reformas del sector financiero que requiere el FMI. Esto induce un pánico financiero entre los inversores extranjeros que lleva a una crisis de fuga súbita. Pruebas estadísticas realizadas sobre una muestra de países en desarrollo ofrece apoyo robusto a nuestra hipótesis.

The economies of most developing countries in the years after World War II were insulated from turbulence and financial crises in the international monetary system. However, starting from the 1980s onwards, the pace and depth of financial globalization has grown rapidly across the developing world. A key feature of this financial globalization has been the dramatic increase and growing volatility of foreign portfolio investment inflows—that is, investment in equity and debt securities by foreign investors—to developing countries (Sula and Willett 2009; Mosley and Singer 2008; IMF 2012). Indeed, the International Monetary Fund (IMF) recently reported that since 1982, foreign portfolio investment (FPI) flows to developing states has increased almost three-fold (IMF 2012). The growth of such FPI flows to the developing world is distinct from foreign direct investment (FDI) flows (which include foreign investment in manufacturing firms or other assets with high sunk costs). More significantly, FPI flows to developing economies have grown much more rapidly—almost twice as fast—than FDI flows (see, e.g., Goldstein and Razin 2006; UNIDO 2009; IMF 2012).

The rapid growth of FPI flows to developing countries had led to substantial benefits, including reduction in capital costs for developing country firms and greater allocative efficiency of capital that increases economic growth (IMF 2012; also see Brooks 2004; Brooks and Mosley 2007; Leblang 2010). Yet more exposure to international financial flows has also sharply increased the frequency of sudden withdrawals or, in other words, "sudden *flight*" of FPI flows from developing states (Forbes and Warnock 2012; IMF 2012). As defined by scholars of international finance, sudden flights of FPI flows occur when the year-to-year change in net portfolio investment by foreign investors in a country's stock market declines sharply (by at least 25–30%) and remains stagnant for a certain time period. Such sudden flight "crisis" episodes have in the last two decades alone occurred with *alarming regularity* in developing states such as Argentina, Ghana, Hungary, Indonesia, Kenya, Mexico, Thailand, and Uruguay. And in each of these affected countries, sudden withdrawals of FPI inflows had substantial real costs: it severely destabilized the foreign exchange rates of these states, led to stock market crashes and financial crisis, and also engendered significant economic contractions that contributed to high unemployment and political instability.

Because of the high costs of sudden flight crises, it is hardly surprising that, according to Michel Camdessus (the IMF's Managing Director, 1987–2000), as the "international lender of

last resort," the IMF's "primary mission remains as per its Article I obligation, crisis prevention...this includes preventing disruption of foreign portfolio investment inflows" (Camdessus 1999). In fact, given that the Fund is *obliged* by Article I Section iii of the IMF's Articles of Agreement to promote exchange rate stability and forestall financial crises, the IMF has repeatedly intervened in developing states to prevent sudden FPI flight from these states. Despite the IMF's sincere "crisis prevention" efforts, sudden FPI flight crisis episodes have occurred in some, though not all, countries under IMF programs. For example, the IMF provided financial assistance via Standby Arrangement programs to Thailand in 1997 and Uruguay in 2002 to forestall sudden withdrawals of FPI from these states. Yet the month-by-month level of FPI inflows to Thailand (September 1997) and Uruguay (April 2002) sharply declined and came to a standstill (indicating a "sudden flight" crisis episode) merely a month after the governments in Thailand (see figure 1) and Uruguay (figure 2) received their respective programs from the Fund. The examples of Thailand and Uruguay are not unique. An analysis of 311 IMF programs provided to several different developing states since 1985 to prevent financial crises reveals that sudden flight of FPI inflows occurred within three months after the approval of 46.9% (i.e., 146) of these 311 programs. The remaining 165 (53.1%) of these programs, however, were *not* associated with a sharp flight of FPI inflows, which thus suggests that allegations—by trenchant critics of the Fund such as Stiglitz and Sachs—that the IMF almost always fails to prevent such crisis are exaggerated.

Yet our finding that many (but not all) IMF programs are associated with sudden FPI flight in program-recipient developing states is at least somewhat "disturbing," as the IMF (under its Article I obligation) seeks to prevent such sudden flight episodes. The IMF also holds regular Article IV consultations with program-recipient states to help them resolve domestic financial-sector problems to prevent foreign investors from rapidly withdrawing their portfolio investment from these countries. Thus the fact that a non-trivial share of IMF programs is associated with costly sudden FPI flight crises leads to the following question: *when* are IMF programs more likely to be associated with a sudden flight of FPI inflows in developing countries that seek the Fund's assistance? We first present some theoretical arguments to answer this question.

Our theory examines how interaction among the following actors affects the likelihood of a sudden flight crisis in a country participating in an IMF program: the IMF, the government of

the program-recipient state, domestic private non-bank intermediaries—specifically, finance and asset management companies—in the IMF-assisted country, and foreign investors seeking portfolio investment opportunities. As described in the next section, we focus on domestic private non-bank finance and asset management firms because these financial firms are "one of the most critical sources of credit and liquidity in developing economies" (IMF 1999: 17), often targeted by the IMF for "structural reform"—in particular to prevent financial disasters such as sudden FPI flight in developing economies.

FIGURE 1

IMF PROGRAM AND *SUDDEN FLIGHT* IN THAILAND, 1997

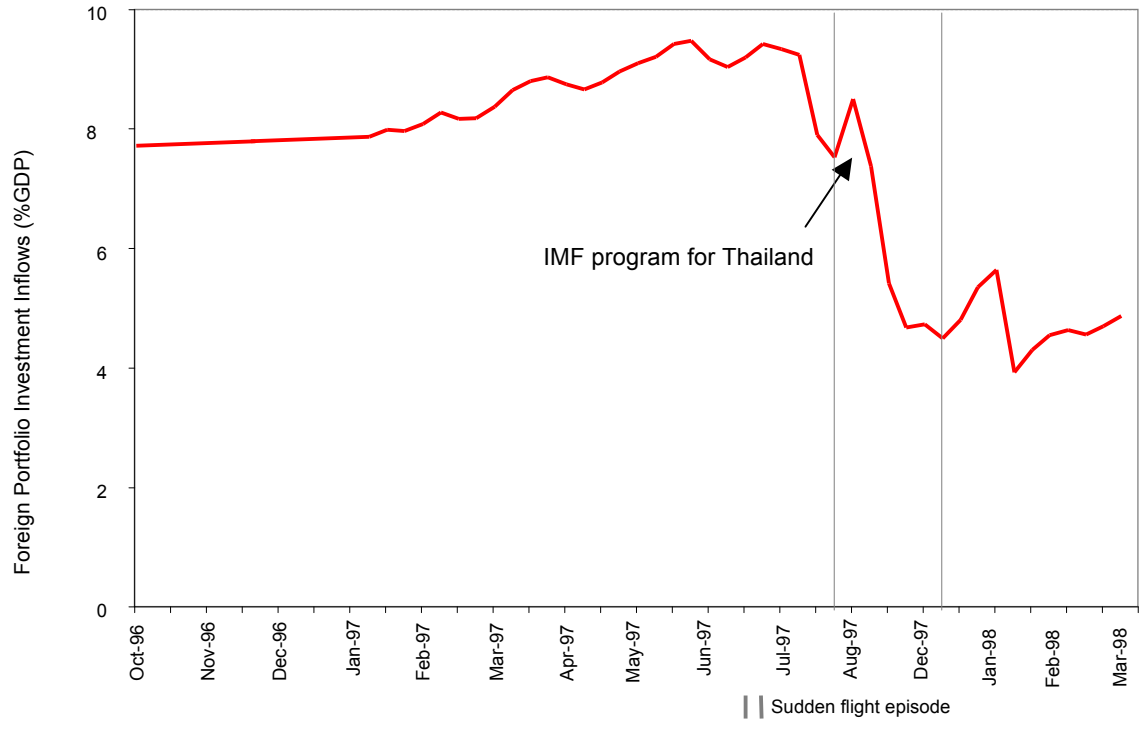
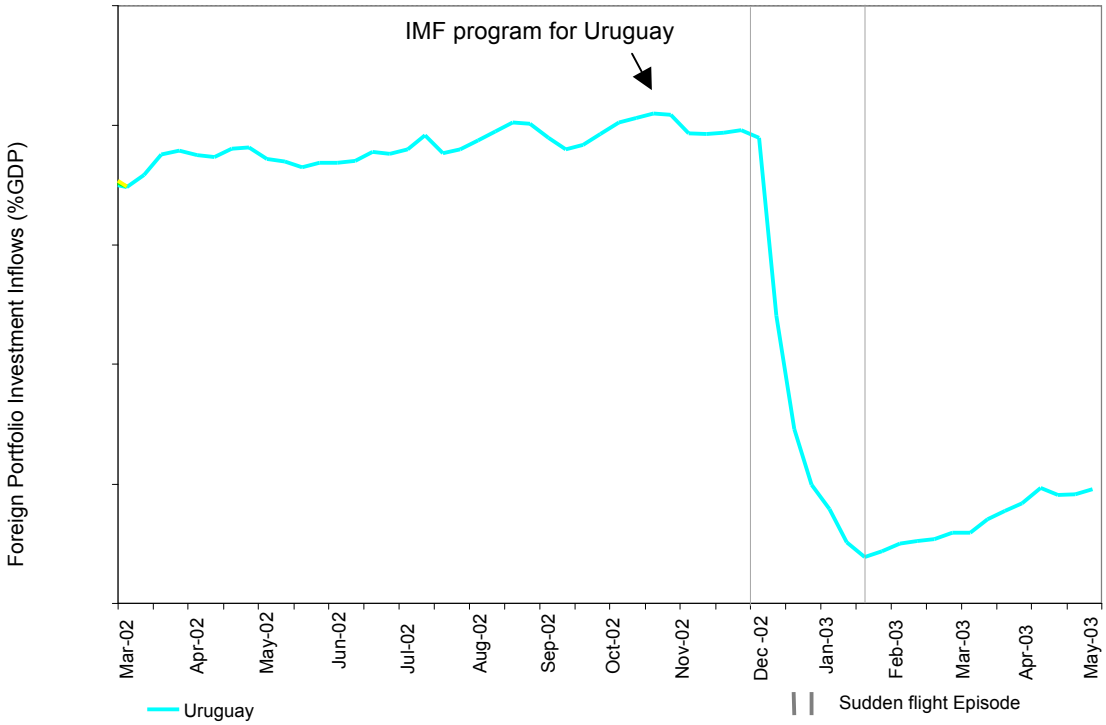


FIGURE 2

IMF PROGRAM AND *SUDDEN FLIGHT* IN URUGUAY, 2002



Since the IMF prioritizes the reform of non-bank finance and asset management firms to forestall sudden FPI withdrawals, our model analyzes how the government of the program-recipient country and its non-bank intermediaries respond to such IMF-mandated reforms. The main prediction from our theory is that IMF programs are associated with sudden flights of FPI flows with greater probability in program-recipient developing states when the market concentration of domestic private non-bank finance and asset management firms is high. The causal rationale for this claim is as follows. To start with, the IMF in the model responds to a financially troubled country's request for assistance by providing a program that includes reform measures (i.e., conditions). While reforms vary, we argue that to specifically prevent a sudden flight crisis in the program-recipient country, the IMF includes reform conditions that call for (i) government supervision and regulation of domestic private non-bank finance and asset management firms and (ii) reduction of the risky securitized assets of these intermediaries. The

non-bank finance and asset management intermediaries will oppose these reform measures, which adversely affect their profit.

Building on this, we argue that when the market concentration of these non-bank financial firms is high, they overcome their collective action problems and credibly exert pressure on the program-recipient government to not implement IMF-mandated conditions that hurt the intermediaries' interests.

The government acquiesces to this pressure and reneges on its commitment to implement IMF-authorized conditions that target domestic non-bank financial firms. When foreign investors observe the borrowing government reneging on its commitment to the Fund, they rationally anticipate systemic financial-sector risks and a macroeconomic crisis in the program-participating country. This induces the investors to rapidly withdraw their portfolio investment from the reneging country's stock market, thus triggering a sudden FPI flight crisis in the IMF-supported country. Hence we hypothesize that IMF programs tend to increase the likelihood of a sudden halt to FPI flows when the market concentration of domestic private non-bank financial firms in the Fund-assisted state is high. Results from several statistical models that evaluate the interactive effect of IMF programs and the Hirschman-Herfindahl index of the market concentration of domestic private non-bank financial firms on sudden flight crisis episodes provide robust support for our hypothesis.

A key implication of our study is that allegations about the positive association between "intrusive" conditions in IMF programs and financial disasters such as sudden flight crises in developing economies tend to paint the Fund's so-called "failure" at crisis prevention with a broad brush. We find that it is not IMF-mandated financial-sector reform conditions *per se* but rather the type and economic clout of powerful domestic financial actors affected by IMF reform conditions that crucially determine the Fund's efficacy or lack thereof in preventing financial disasters in developing states. Our analysis also suggests that while Fund-assisted governments should regulate domestic private non-bank financial firms with more scrutiny, they also need to compensate the "losers" from reforms.

The paper proceeds as follows. We first develop our theory that explains the conditions under which IMF programs are likely to be associated with sudden flight crises. We then present the statistical model, the data, the variables and the empirical results. We conclude by discussing the implications of our findings and suggesting avenues for future research.

BACKGROUND DISCUSSION

We provide a brief background discussion in this section that summarizes the main motivation underlying our research and provides the foundation for our theoretical analysis in the next section. This section particularly explains why we focus on domestic private non-bank financial firms to develop our theory that explores the link between the IMF's intervention and the sudden flight of FPI from developing countries. To this end, we start with a definition and description of non-bank finance firms in developing countries, which then leads to our explanation of why we focus on these firms for our theoretical analysis. As defined by the World Bank (2012: 1), non-bank finance firms in the financial sector of developing economies are firms "that operate partially or fully outside the traditional commercial banking sector, and...are either lightly regulated or not regulated at all."

The World Bank (2012) also points out that in developing economies, non-bank financial firms are non-depository institutions (i.e., financial firms that do not accept deposits) that largely include private-sector finance companies and asset management firms and, to a lesser extent, factoring companies.[1] These non-bank finance firms "provide funding and risk diversification...facilitate credit extension...and provide investors and banks a range of tools for liquidity, maturity, and credit risk management" (World Bank 2012: 2). Moreover, as emphasized by both the World Bank (2012: 2–3) and the IMF (2015: 1, 6), non-bank financial intermediaries (this includes non-bank finance firms and asset management companies) in developing countries, especially in "emerging markets," are privately owned and, as such, have been protected from foreign competition for decades. The end result of such "protection" is that foreign-owned non-bank financial intermediaries simply do not have a real presence in developing economies, given that developing country governments have been reluctant to allow non-bank foreign financial firms to operate in the domestic financial sector.

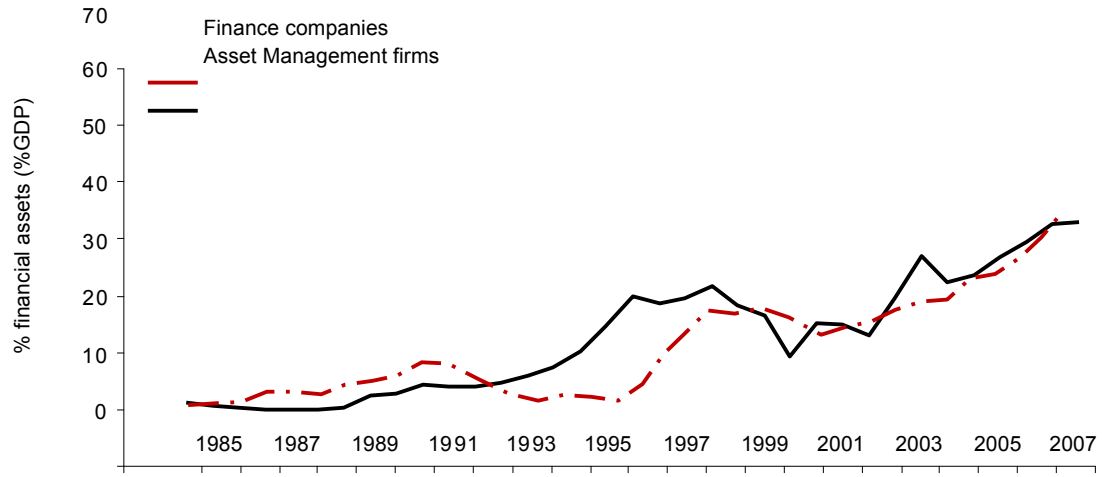
We focus on analyzing the role of domestic private non-bank finance and asset management firms (defined above) in our theory about sudden flights of FPI flows for three reasons. First, as recognized by the IMF (2012), data reveal that the financial assets (e.g., corporate and government equity plus debt securities) held by domestic private shadow banks

[1] Non-bank financial firms in advanced developed states (in contrast to developing countries) are far more complex and typically include "money market, credit hedge, investment, and exchange-trading funds; conduits or special purpose vehicles" (World Bank 2012: 2).

have grown dramatically since 1985, ranging from as much as 10% to 47% of the GDP of developing states (see figure 3). Figure 3 also shows that the financial assets (as % of GDP) of non-bank financial firms in developing economies have grown at a much faster pace than those of depository institutions such as commercial banks. It is thus not surprising that the Fund emphasizes that financial-sector and macroeconomic stability in developing states are crucially dependent on the financial health of the non-bank finance institutions and that the main source of systemic financial-sector risk in developing countries has "shifted away" from banks to non-bank intermediaries (IMF 2015: 1). The Fund also suggests that, despite the growing importance of non-bank intermediaries, "structural weaknesses" in these non-bank financial firms resulting from extremely risky securitized assets held by these firms are "common" in developing states and that this engenders "systemic" financial-sector risks. *Systemic* financial-sector risk in developing states can also—according to the IMF (2015)—lead to a full-scale panic among foreign portfolio investors who hold equity and debt investments in these countries. Such panic triggers a sudden flight crisis where foreign investors rapidly withdraw their portfolio investment from financially risky developing country equity markets.

FIGURE 3

NON-BANK FINANCE FIRMS AND ASSET MANAGEMENT COMPANIES' FINANCIAL ASSETS (% GDP)



Second, as mentioned earlier, the World Bank (2012: 1) posits that, unlike depository banks, domestic non-bank finance firms in developing economies are either not regulated or weakly regulated. Negligible regulation makes it easier for these firms not only to invest in extremely risky securitized assets but also to maintain dangerously high leverage ratios compared to depository institutions. This "encourages destabilizing behavior" by non-bank finance firms, which engenders systemic financial-sector risks that lead to the rapid portfolio investment withdrawal by foreign investors (ECB 2014; IMF 2015).

Third, given the rapid financial growth and risky securitization practices of private non-bank finance firms in developing states, the Fund explicitly emphasizes that it employs its programs to induce IMF-assisted governments to adopt reforms that resolve "structural weaknesses" in domestic private finance firms. This is considered necessary by the IMF to promote financial-sector stability as such stability prevents sudden FPI "flight" in IMF supported countries (IMF 2012; 2015). In fact we present some concrete empirical evidence below that clearly reveals that a significant majority of IMF programs in the last two to three decades has included financial-sector reform conditions that focus on reforming domestic private non-bank companies in Fund-assisted countries. These reforms have been particularly intended to forestall financial crises, including rapid FPI withdrawals. In short, the centrality of the role of domestic non-bank finance firms in the context of systemic financial risks in developing states and the fact that the Fund targets these firms for reform motivates our theory in the next section. As shown below, our theory explores how the interaction between the IMF and a Fund-assisted country as well as non-bank finance firms in this country affects the optimal investment strategies of foreign portfolio investors and the financial market repercussions of these strategies.

THEORETICAL FRAMEWORK

A recent report published by the IMF states that the Fund actively attempts to prevent sudden withdrawal of FPI in developing states since IMF programs for financially troubled countries are often designed to induce foreign investors to "retain their investment" rather than "flee" from financially troubled states (IMF, 2015). Notwithstanding the IMF's "crisis-prevention" intervention, we saw earlier that a significant share of (though not all) IMF programs is associated with the occurrence of "sudden flight" crisis episodes in Fund-assisted developing countries. To explain this phenomenon, we need first to explore when developing states are

likely to seek the IMF's assistance and how the IMF responds to requests for assistance by these states. More specifically, we posit that the interaction between the IMF and borrowing countries that participate in IMF programs unfolds as follows.

To begin with, developing states select into IMF programs when they suffer from severe domestic financial and macroeconomic problems. These problems include, for instance, a sharp contraction in economic output, terms-of-trade shocks that engender serious macroeconomic imbalances, or failure of domestic banks (Vreeland 2004; Bird and Rowlands 2004). For instance, high inflation, exposure to severe terms-of-trade shocks, and contraction in economic output in Thailand (1997), Colombia (1999), the Philippines (1999), Turkey (2000), and Uruguay (2002) influenced policymakers in these states to participate in IMF programs. The IMF's decision to assist such countries is determined in part by the magnitude of the borrowing country's financial troubles and other factors, including the exposure of US financial institutions to the country's markets, the availability of supplementary financing, and the country's extent of trade and finance with the "G-5" countries (Oatley and Yackee 2000; Gould 2003; Broz 2005; Stone 2008; Pop-Echeles 2009; Copelovitch 2010a). As such, the IMF responds to the severe financial problems of developing states that seek the Fund's assistance by approving programs (e.g., the Stand-By Arrangement or Extended Fund Facility) for these states (Willett 2001; Jensen 2004; Dreher and Walter 2010). These programs include a financial package for the developing state and "a set of economic policy reforms, or conditionality, that the borrower must implement to receive IMF credit" (Copelovitch 2010a: 51). While these reform measures vary, a key set of policy recommendations often incorporated in IMF programs for financially distressed developing states are financial-sector reforms (Boockman and Dreher 2003; Giustiniani and Kronenberg 2005).

Note that systematic and comprehensive data that identify specific financial-sector reform conditions in each IMF program are hard to obtain. The Fund has, however, released some limited information on binding financial-sector reform conditions in 191 IMF programs for just the 1994–2006 period.[2] This information confirms that the IMF indeed often targets non-bank finance companies for reform, as 173 out of these 191 programs (i.e., 90.5%) contain three

[2] Information on IMF program conditions aimed at specifically reforming non-bank intermediaries are drawn from the IMF's Monitoring Fund Arrangements (MONA) database. MONA provides information on the amount of financial support, the dates of scheduled and actual drawings, and conditions for these drawings in IMF programs.

main financial-sector reform conditions that focus on reforming domestic private non-bank intermediaries in borrowing countries to prevent sudden flights of FPI inflows: government supervision and regulation of domestic non-bank finance and asset management firms; liquidating or reducing the volume of securitized assets—that is, illiquid assets that are converted to securities[3]—held by these non-bank financial intermediaries; and reducing financial-sector entry barriers to promote competition between foreign financial companies and domestic non-bank financial firms.

We also used the tools of text analysis by applying an unsupervised topic modeling approach (specifically a Latent Dirichlet Allocation model)[4] to our 191 IMF program description texts which, in combination with appropriate model selection criteria, identifies a total of four latent topics about reform of non-bank financial firms in 173 IMF program descriptions out of 191 programs. These four topics directly and almost exactly correspond to the dimensions of IMF-mandated non-bank finance and asset management intermediary reform conditions discussed above. For example, one topic is directly related to "liquidation" or reduction of the securitized assets of domestic private non-bank finance and asset management intermediaries. Two more topics correspond to IMF program conditions such as (i) increased governmental supervision and regulation of domestic non-bank finance firms and (ii) reduction of barriers-to-competition between foreign and domestic non-bank financial firms.

In short, our statistical text analysis of IMF programs from the MONA database further confirms that the vast majority (over 90%) of these Fund-approved programs provided to developing states incorporated conditions that called for far-reaching reforms of domestic non-bank financial firms. Examples also reveal that the IMF incorporated financial-sector reform conditions in Thailand's program in 1997, Colombia's program in 1999, the Philippines' Stand-By Arrangement (SBA) program in 1999, and Uruguay's program in 2002 to "encourage the incumbent government in each case to regulate and reduce the risky securitization practices of non-bank finance and credit intermediaries."[5] Why does the IMF often employ its programs to encourage borrowing countries from the developing world to reform domestic non-bank finance

[3] Converting illiquid assets (e.g., real estate) into securitized assets for trading is defined as securitization. Securitization of illiquid assets (typically not valued) into securitized assets can lead to severely inflated valuation of these assets.
[4] For an introduction to Latent Dirichlet Allocation models, see Blei, Ng, and Jordan (2003).
[5] IMF (2012: 40). See also Sundarajan, He, and Khamis (2002); World Bank (2013).

private-sector firms as indicated by the examples and the statistical text analysis discussed above?

The answer to this question lies in the fact that the IMF's strategy of *publicly encouraging* borrowing governments to reform domestic non-bank finance and asset management intermediaries (as per the program conditions) is intended to serve two main goals. The first goal is to induce the goverments to address structural weaknesses in domestic non-banking financial firms to stabilize macroeconomic fundamentals and forestall systemic financial-sector risks in the program-participating country. The second goal is to send a "signal to investors and creditors that the country is a good investment risk" (Vreeland 2004: 8) and that the country's financial problems stemming from domestic non-bank intermediaries will be solved (IMF 2014a). This signal is meant to "bring in what has become known as catalytic finance" (Vreeland 2004: 8; Bird and Rowlands 2004) and convince foreign investors to retain their portfolio investment in the borrowing country's stock market to prevent a sudden FPI flight crisis.

Yet the IMF can convince foreign investors not to withdraw their portfolio investment from the program-recipient country's stock market only if these investors are assured ex ante that the borrowing government will implement IMF-mandated financial-sector program conditions to stabilize the country's financial system. Despite the need for such assurance, examples reveal that IMF-funded countries have a mixed record with respect to fulfilling their promises to implement program conditions that target domestic private non-bank intermediaries for reform. For instance, the Colombian government and the Estrada administration in the Philippines implemented IMF program conditions (nonbank financial intermediaries or NBFI–specific measures) to reform domestic private non-bank finance companies, and this helped to prevent sudden FPI flight in these two countries.[6] By contrast, neither Thailand's government in 1997 nor Uruguay's government in 2002 implemented their respective IMF program conditions that required regulation and reform of private non-bank financial firms.[7] Research by the Fund further reveals that approximately half of program-participating governments renege from their promise to implement IMF program conditions that call for regulating and reforming non-bank finance and asset management companies (IMF 2012, 2014b). This variation thus raises the

[6] See IMF (2012); World Bank (2013). See Sundarajan, He, and Khamis (2002) for the Philippines case.
[7] Teunissen and Akkerman (2003: 15).

following question: when are program-recipient governments more likely to renege from their Fund-commitment to reform non-bank finance and asset management intermediaries?

We suggest as an answer to the question posited above that the higher the market concentration of non-bank finance and asset management firms in the financial sector of IMF program-recipient developing states, the more likely it is that these states will renege from their IMF program commitment to reform these intermediaries. To understand the rationale underlying this result, first observe that the non-bank finance and asset management firms will oppose the IMF-assisted government's effort to implement program conditions that seek to reform these firms. This is because implementation of IMF program conditions such as reducing the non-bank intermediaries' securitized assets directly lowers their revenue. Exposing the non-bank finance firms in the program-participating country to more competition from foreign financial firms—another key financial-sector reform condition in IMF programs—may compel these intermediaries to reduce the interest rate that they charge on corporate loans. This also serves to reduce their revenue. Lastly, reform measures that call for regulation of non-bank finance and asset management intermediaries may drive these intermediaries to cut back on their risky equity investments that pay a high risk premium. This also translates to lower revenue for these firms. Thus, the domestic private non-bank finance firms have incentives to invest resources and "effort" to put pressure on the Fund-supported government *not to enact* IMF program conditions that adversely affect these intermediaries.

Yet incentives alone are not sufficient. After all, collective action problems between the non-bank finance and asset management firms will hinder their ability to exert pressure on the government, given that they may (as individual firms) free-ride on the effort to exert such pressure. We argue, however, that the non-bank financial firms will overcome their collective action problems and invest substantial effort to curtail their Fund-supported government's IMF-mandated reform effort when the market concentration of these intermediaries is high. Two reasons account for this claim. First, higher market concentration of domestic private non-bank finance and asset management implies an oligopolistic market structure where a small number of these firms owns a large share of the total financial assets in the country's financial sector and thus financially dominates this sector (Allen and Gale 2000; Pozsar et al. 2010).[8] Because the

[8] Scholars of finance often use various indices to measure the degree of market concentration of financial firms (Bikker 2004; Beck, De Jonghe, and Schepens 2012). These indices of concentration are defined as

gains from putting pressure on their program-participating government are larger and the monitoring costs of doing so are lower for the smaller number of market concentrated non-bank intermediaries, these non-bank firms can feasibly punish defectors who free-ride on the effort they need to undertake to exert pressure on the government. This deters free-riding by the non-bank intermediaries and fosters cooperation between them.

As such, this cooperation helps the non-bank financial firms to undertake collective action and coordinate to put pressure on their Fund-supported government to not implement IMF-authorized program conditions that adversely affect these intermediaries. Moreover, higher market concentration of domestic private non-bank intermediaries produces a "resource effect" in that these concentrated firms have access to a larger pool of financial resources. This allows the concentrated intermediaries to invest substantial resources (in terms of funds and time) to put substantial pressure on the government to not adopt IMF-mandated conditions that target non-bank financial firms.

Note that the pressure exerted by the concentrated non-bank financial firms drives the program-recipient government to renege from its promise to the Fund. The rationale underlying this claim is as follows. To begin with, recall that the financial assets owned and traded by the non-bank intermediaries in the model also include government equity (e.g., equity of state-owned firms) and government debt securities. Building on this, we suggest that the higher the market concentration of private non-bank finance and asset management firms, the greater the degree of the program-recipient government's equity and debt that these intermediaries own and trade (IMF 2012, 2014a). The program-recipient government will thus be dependent on these non-bank financial firms to fund government securities and particularly public debt—which is used to finance numerous social, economic, and political goals—as the financial assets of these concentrated intermediaries will be substantially larger than those of other depository institutions.

Greater dependence by the program-participating government on market-concentrated private non-bank finance and asset management firms and the substantial resources that these

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the sum of the squared market shares of "financial assets" of the relevant financial intermediaries in the country's financial sector. Thus, as suggested by these indices of market concentration, a high market concentration of non-bank financial (finance and asset management) intermediaries implies that a small number of large non-bank financial firms owns a large share of the total financial assets in the country's financial sector.

concentrated firms garner to put pressure on the government boost their political leverage. Such leverage allows these non-bank intermediaries to credibly threaten the Fund-supported government that they (the non-bank intermediaries) will shift their investments from government equity and debt securities to buying other assets (and by so doing impose costs on the government[9]) if the government implements IMF program conditions that seek to regulate the domestic non-banking financial system. The credibility of this threat induces the government to place more weight on catering to the interests of the domestic private non-bank financial firms than on fulfilling the IMF's objectives. Hence, under the concentrated non-bank intermediaries' pressure, the government reduces its reform effort and thus sharply curtails its compliance with IMF program conditions that call for reforming non-banking financial firms. Statistically testing this prediction about compliance is extremely difficult, as comprehensive and systematic data on compliance by borrowing countries with specifically IMF-mandated conditions that target domestic private non-banking financial firms for reform are not publicly available.

We nevertheless broadly assess the claim about compliance in this proposition by employing the Fund Program Implementation index developed by the IMF to evaluate program compliance in various issue-areas.[10] In the context of assessing the compliance prediction posited above, we follow the Fund's procedure and operationalize the Fund Program Implementation index (described in the Appendix) such that it measures on a continuous scale (0=no compliance to 100=high compliance) the degree to which program-participating states have complied with the three main IMF-mandated non-bank-specific reform conditions examined here: regulation of non-bank financial firms, reducing the securitized assets of these non-bank firms, and reducing financial-sector entry barriers. Information to operationalize the Fund Program Implementation index for these three non-bank financial firm—specific program conditions (we label this operationalized index as *reform compliance*) is available from the Fund for only 47 program-recipient developing nations participating in a total of 81 IMF programs from 1994 to 2006. We use these limited data on compliance with non-bank-specific program conditions to evaluate the relationship between the level of *reform compliance* by the countries that participated in the 81

[9] Rapid sales of a large volume of government securities, e.g., equity of state-owned firms, lead to a sharp fall in the price of these securities. This makes it difficult for these state-owned firms to raise capital and sustain output, therein leading to severe losses.

[10] This index has been operationalized based on information provided in the IMF's MONA database about program conditions (prior actions, structural benchmarks, and performance criteria), test dates, and the degree of implementation of these conditions as evaluated by the Fund's staff on "test dates."

programs and each decile of a 0–1 continuous index of the Hirschman-Herfindahl index of market concentration of domestic private non-bank finance and asset management intermediaries (this concentration measure is described in the paper's empirical section) in these program-participating countries.

A descriptive figure generated from this analysis reveals that the mean *reform compliance* level by borrowing countries in which the market concentration of private non-bank finance and asset management firms is high is indeed much lower than in borrowing states with low levels of non-bank intermediary concentration (see figure 4). The mean compliance level in the 0–100 reform compliance scale observed in the highest range of the non-bank intermediary concentration index (i.e., between 0.68 and 1) is approximately 14.03. As reported in table 1, the two sample t-test and the Mann-Whitney Wilcoxon difference-of-means tests show that this mean score of 14.03 is substantively and statistically lower than the mean reform compliance level by program-participating states observed in the following two lower ranges of the non-bank intermediary market concentration index: between (i) 0 and 0.33 (mean compliance level =61) and (ii) 0.34–0.67 (mean compliance level =39).

Examples further corroborate this descriptive evidence. For instance, the government in Uruguay in 2002 acquiesced to relentless pressure from "financially concentrated private non-bank, non-depository intermediaries and subsequently reneged on its promise to enact IMF program conditions designed to reform the non-bank financial industry."[11] The influence exerted "by financially consolidated nonbanking finance companies like Finance One" on Thailand's government in 1997 made it "impossible" for the country to "take any concrete step to comply with IMF program measures that were intended to reform the unregulated, non-transparent non-banking financial companies."[12] Hence as suggested by our theoretical story so far, it is indeed plausible that compliance with IMF-mandated non-bank financial firm-specific reform conditions declines significantly in IMF-assisted countries with market-concentrated non-bank intermediaries.

[11] Teunisseen and Akkerman (2003: 21).
[12] Sundarajan, He, and Khamis (2002: 8).

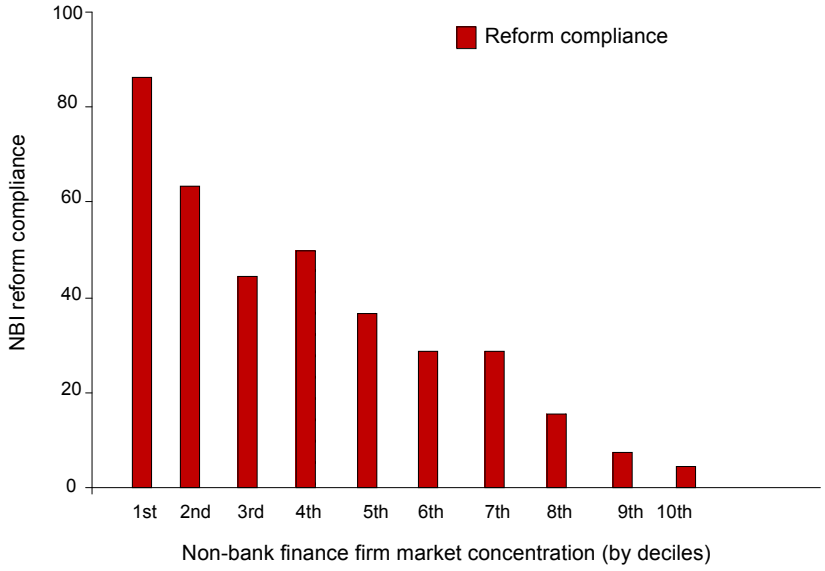
TABLE 1

DIFFERENCE-OF-MEANS TEST RESULTS FOR REFORM COMPLIANCE

	Mean level of *NBI reform compliance*			
	(i)	(ii)	(iii)	(iv)
Range of non-bank finance firm market *concentration*				
Two Sample t-test				
0.68 to 1.00	14.029			
0.34 to 0.67		39.116		
0 to 0.33			61.024	
Diff-of-means between columns (i) and (ii)				-25.087 (p=0.012)
Diff-of-means between columns (i) and (iii)				-46.995 (p=0.009)
Diff-of-means between columns (ii) and (iii)				-21.908 (p=0.017)
Mann Whitney Wilcoxon Test				
0.68 to 1.00	14.037			
0.34 to 0.67		39.252		
0 to 0.33			60.797	
Diff-of-means between columns (i) and (ii)				-25.215 (p=0.010)
Diff-of-means between columns (i) and (iii)				-46.760 (p=0.008)
Diff-of-means between columns (ii) and (iii)				-21.545 (p=0.023)

FIGURE 4

NON-BANK FINANCIAL FIRMS' MARKET CONCENTRATION AND *REFORM COMPLIANCE*



The decline in the program-participating government's level of compliance with IMF conditions that target domestic non-bank finance companies owing to the concentrated non-bank intermediaries' pressure is observed by the foreign investors. This drives them to rapidly withdraw their portfolio investment from the program-participating country's stock market. The intuition that leads to this particular claim is given by the following two-step causal argument. For the first step, note that when foreign investors observe the program-participating government acquiescing to the pressure exerted by the concentrated non-bank intermediaries, they become more *uncertain ex ante* about the government's ability to undertake the necessary reform efforts to resolve the country's severe financial problems.

Higher ex ante uncertainty about the government's reform effort exacerbates the investors' concerns about the program-participating country's financial health. It also generates expectations among investors that the rate of return from their portfolio investment in the program-participating country's financial market will decline significantly. This increases the risk associated with their portfolio investment in the Fund-assisted country's stock markets. The

foreign investors will thus seek to curtail their exposure to this investment risk by substantially reducing their level of portfolio investment in the program-participating country's stock market. For the second step, the model shows that when foreign investors observe the government failing to comply with program conditions that seek to reform domestic non-bank financial intermediaries, they expect that structural weaknesses in these intermediaries will persist and that this may evolve into a "systemic risk" in the program-participating country's financial sector.

Because systemic financial-sector risk adversely affects macroeconomic fundamentals (IMF 1999; 2014a), each investor rationally anticipates that the reneging country's fundamentals will sharply deteriorate in this case. This anticipation leads to a "self-reinforcing panic" where each investor believes that total portfolio investment inflows to the program-recipient country may fall sharply as other investors may "flee" from the troubled-country's financial markets. This panic leads to an outcome in which each foreign investor's strictly dominant strategy is to withdraw its portfolio investment from the borrowing country's stock market. This in turn triggers a "sudden flight" crisis or, in other words, a sudden *flight* of FPI inflows in the program-participating country. Further, we learn from the examples discussed earlier that it is precisely the self-reinforcing panic described above that led to a sudden flight of FPI inflows in program-participating countries such as Thailand (in 1997) and Uruguay (2002), which reneged on their commitments to the Fund to reform domestic non-bank intermediaries. The preceding discussion and examples thus lead to the following testable hypothesis:

Hypothesis 1: *IMF programs will be more likely to be positively associated with the sudden "flight" of FPI inflows (i.e., a sudden flight crisis) when the market concentration of non-bank finance and asset management firms in program-participating developing countries is sufficiently high.*

STATISTICAL METHODOLOGY

Since the dependent variable in hypothesis 1—sudden "flight" of FPI flows (the operationalization of this variable, labeled *sudden flight*, is described below) in developing countries—is binary, we test this hypothesis by using a probit model that is estimated with cluster adjusted robust standard errors (that account for within-country correlation and heteroskedasticity) and random effects that accounts for unobserved heterogeneity. We also

include a cubic polynomial in the probit specification to correct for temporal dependence (Carter and Signorino 2010).

While useful, the probit model does not address three key econometric challenges that scholars face when ascertaining the IMF's influence on outcomes such as sudden flight of foreign portfolio investment. The first challenge is selection bias, since the factors that lead a country to select into an IMF program may also determine the likelihood of a *sudden flight* crisis. Indeed, our theory suggests that country-participation in IMF programs is not random, as states select into IMF programs when they experience severe economic problems. We address this challenge by estimating a bivariate probit model that consists of a first stage selection equation (which accounts for selection into IMF programs) and an outcome equation (where *sudden flight* is the dependent variable).

The second econometric challenge that we face is spatial "contagion," in that the sudden flight of FPI flows from one developing country can spread to other geographically neighboring countries (see Blanchard, Dell Ariccia, and Mauro 2010; Forbes and Warnock 2012). Such spatial contagion of rapid FPI flight occurred across neighboring states in Southeast Asia and Latin America in the 1990s. Hence, not surprisingly, tests reveal the presence of spatial dependence in our dependent variable *sudden flight* across the countries in our sample.[13] The third econometric challenge is that our data indicate (also confirmed by tests) that country participation in IMF programs exhibits clustering—a common form of spatial dependence in which several countries within a region participate in IMF programs during the same time period.[14] Many Latin American nations, for example, participated in IMF programs in the mid-1980s and 1990s and, likewise, numerous Southeast Asian countries participated in IMF programs during the mid-1990s.

To address these challenges, we estimate a spatial autoregressive error bivariate probit model (hereafter SAE bivariate probit model) that specifies spatially autocorrelated disturbances in *both* the selection and outcome equations. This model, developed by Wang, Iglesias, and Wooldridge (2009), is defined (after dropping subscript *t* for time for notational convenience) as:

[13] Moran-I test rejects the null of no spatial autocorrelation for *sudden flight* in our sample.
[14] The Moran-I test also rejects the null of no spatial autocorrelation in IMF program participation.

$$y_{i1}^{*} = X_{i1}\beta_1 + \varepsilon_{i1}, \quad \varepsilon_{i1} = \lambda \sum_{j \neq i} w_{ij}\varepsilon_{j1} + u_{i1} \tag{1}$$

$$y_{i2}^{*} = X_{i2}\beta_2 + \varepsilon_{i2}, \quad \varepsilon_{i2} = \lambda \sum_{j \neq i} w_{ij}\varepsilon_{j2} + u_{i2} \tag{2}$$

w_{ij} are elements of the spatial weights matrix $\mathbf{W}$ and λ is the spatial autoregressive error coefficient.[15] Equation (1) is the selection equation in which the binary dependent variable $y_{i1} = 1$ indicates participation in an IMF program; it takes the value of zero otherwise. Equation (2) is the outcome equation in which the binary variable y_{i2} is equal to 1 when a *sudden flight* occurs and is zero otherwise.

Because geographic proximity may influence the spread of "sudden flight" crises across countries, we operationalize spatial contiguity in the spatial weights matrix of the SAE bivariate probit model as the inverse distance between states *i* and *j*, where $w_{ij} = 1/d_{ij}$. As the distance between *i* and *j* increases (decreases), w_{ij} decreases (increases), giving less (more) spatial weight to the state pair when $i \neq j$. We use a "minimum distance database" of the shortest distance between the two closest physical locations for every pair of independent polities in the world.[16] The results reported below remain robust for alternative measures of contiguity such as directed trade-flow shares of country *j* in country *i*'s total and directed-dyad bank credit flows (this accounts for financial-sector linkages) between countries *i* and *j* (Papaioannou 2009; Forbes and Warnock 2012).[17]

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[15] u_{i1} and u_{i2} are *i.i.d* $N(\mathbf{0}, \sum)$.

[16] Gleditsch and Ward (2006). Their database records the shortest distance in kilometers between points on the outer boundaries for two polities, regardless of whether the states are separated by land or sea. We update their database for the countries in our sample up to 2007.

[17] Data on bank flows are from the Bank of International Settlement's Locational Banking Statistics which report aggregate asset holdings of banks located in up to 40 jurisdictions across more than 150 countries since 1977. Bank credit flows in the BIS database include cross-border bank loans, debt investment, and other standard inter-bank lending activities.

TABLE 2

DEVELOPING COUNTRIES SAMPLE, 1985–2008 (82 COUNTRIES)

Country	Country	Country
Algeria	Jamaica	Thailand
Angola	Jordan	Trinidad and Tobago
Argentina	Kenya	Tunisia
Armenia	Latvia	Turkey
Bahamas	Lebanon	Uganda
Bangladesh	Libya	Ukraine
Barbados	Lithuania	Uruguay
Bolivia	Madagascar	Venezuela
Botswana	Malaysia	Vietnam
Brazil	Mauritius	Zambia
Bulgaria	Mexico	Zimbabwe
Cambodia	Mongolia	
Cameroon	Morocco	
Chile	Mozambique	
China	Namibia	
Colombia	Nepal	
Costa Rica	Nicaragua	
Cyprus	Niger	
Czech Republic	Nigeria	
Dominican Republic	Pakistan	
Ecuador	Panama	
Egypt	Paraguay	
El Salvador	Peru	
Estonia	Philippines	
Fiji	Poland	
Georgia	Romania	
Ghana	Russia	
Guatemala	Rwanda	
Guyana	Senegal	
Haiti	Singapore	
Honduras	South Africa	
Hungary	South Korea	
India	Sri Lanka	
Indonesia	Syria	
Iran	Tanzania	
Israel		

We focus below on presenting the results from the SAE bivariate probit model since we want to statistically account for spatial contagion in the *sudden flight* and *IMF program* dependent variable rather than directly model (i.e., empirically) spatial dependence in *sudden flight*. Yet for robustness tests we report the estimates obtained from the spatial autoregressive lag (SAL) bivariate probit model, in which the spatial lag of the (i) *sudden flight* dependent variable is included in the outcome equation and (ii) the *IMF program* dummy is included in the selection equation. The SAE and the SAL bivariate probit model is estimated with random effects to account for unobserved heterogeneity, and we also include a cubic polynomial in the outcome equation of these two statistical models.

SAMPLE AND VARIABLES

A time-series cross-sectional sample of 82 developing countries from 1985 to 2008 (listed in table 2) is compiled to test hypothesis 1, as this hypothesis focuses on developing countries. The size and temporal range of our sample is determined by the availability of data to operationalize our dependent and independent variables described below. We operationalize the binary dependent variable in hypothesis 1—*sudden flight* of FPI inflows—in two steps.

First, following extant empirical studies in international finance about sudden stops or flights of foreign investment, we compute the year-to-year change in FPI inflows[18]—that is, net portfolio investment in equity securities, debt securities, depository receipts, and direct purchases of shares in local stock markets by foreign investors–for each country in the sample (e.g., Broner and Rigobon 2006; Forbes and Warnock 2012). Second, as suggested by studies on sudden flights (or reversals) of international capital flows,[19] the binary *sudden flight* variable is coded as 1 *when*:

- the year-to-year change in FPI inflows for country *i* falls at least two standard deviations below its county-specific sample mean (this addresses the unexpected requirement of a sudden flight episode); and

[18] Following standard balance-of-payments accounting, FPI inflows include net portfolio investment by foreign investors; this is distinct from portfolio investment by domestic residents (Fratzscher 2011; Forbes and Warnock 2012). Data for FPI inflows are in current US dollars.

[19] These countries are listed in table A in the paper's supplemental information appendix.

- the "sudden flight" phase ends only if the year-to-year change in FPI inflows in country *i* is smaller than one standard deviation below the country-specific sample mean.

If these two conditions are not met, then *sudden flight* is coded as 0. The *sudden flight* variable described above serves as our main dependent variable. The results, however, remain robust if *sudden flight* is coded as 1 when the year-to-year change in FPI inflows for country *i* falls between 1.5 to 3 standard deviations below its country-specific sample mean.

We use an alternative measure of the dependent variable for robustness tests. This alternative measure (*portfolio flight*) is from Guidotti et al. (2004) and is coded as 1 when the year-to-year change in FPI inflows is one standard deviation below its country-specific mean and exceeds 5% of the country's GDP measured in absolute value; the *portfolio flight* phase ends only if the year-to-year change in FPI inflows is smaller than one standard deviation below its country-specific mean and is less than 5% of the country's GDP measured in absolute value.[20]

The data to operationalize the three measures of the dependent variable have been drawn from the IMF's *Balance of Payments Statistics* database (IMF, 2013a), the IMF's *Coordinated Portfolio Investment Survey* (IMF, 2013b), Forbes and Warnock (2012), UNCTAD's *Global Investment Trend Monitor* (2013), and balance of payment statistics data from national sources for a few countries.

We require a dichotomous measure for the incidence of an IMF program, which constitutes the dependent variable in the selection equation of the (SAE) bivariate probit model. The binary dependent variable in the selection equation *IMF program* is coded as 1 when the IMF assists developing countries under any of these eight types of programs (it is coded 0 otherwise): Stand-By and Extended Stand-By Arrangement, Supplementary Reserve Facility, Extended Fund Facility, Contingency Funding Facility, Buffer Stock Funding Facility, Currency Stabilization Facility, Structural Adjustment Fund, and the Poverty Reduction and Growth Facility. Data to code these IMF programs are drawn from Vreeland (2004) and IMF *Annual Reports* (various years).

[20] Our results also remain robust when we use another alternative measure of the dependent variable which is coded as 1 when FPI inflows to a country falls by at least 5% of that country's GDP in any given year but is positive in the preceding year (Guidotti et al. 2004).

Turning to the independent variables, recall that hypothesis 1 posits an interactive effect between IMF programs and the market concentration of domestic private non-bank finance companies and asset management firms on sudden flight. We thus need to interact the following two independent variables to test this hypothesis: the first is a dummy variable for IMF programs and the second is the market concentration of private non-bank finance companies and asset management firms for each country-year. The *IMF program* dummy variable was described earlier. We operationalize the market concentration of the aforementioned non-bank financial intermediaries (NBFI) by using the 0–1 Hirschman-Herfindahl index of market concentration of these NBFIs in each country's banking sector. Following existing studies,[21] the Hirschman-Herfindahl index of market concentration of NBFIs, which we label as *concentration*, is defined for each country-year (after dropping the parameter *t* for time for notational convenience) as $\sum_{i=1}^{n} s_i^2$ where s_i is the share of each non-bank finance and asset management firms' assets in the total financial assets of the financial sector per year for each country and *n* is the number of domestic private non-bank financial and asset management intermediaries. The financial assets of the non-bank financial firms in this case refer to their cash assets, government securities, and equity investments but not deposits, since bank deposits are liabilities. Hence, the Hirschman-Herfindahl index is the sum of the squared market shares in terms of financial assets of the non-bank finance and asset management firms in the financial sector.

The variable *concentration* ranges from 0 (its lowest value) and 1 (maximum value). Higher values of this index capture greater economic clout of non-bank financial firms in the country's financial sector. The index thus accurately captures the distribution of the market share and market power of NBFIs in the country. The *concentration* measure described above is also characterized by significant variation in the sample, which provides us with sufficient empirical leverage to evaluate hypothesis 1. To test the interactive effect state in hypothesis 1 we interact *IMF program* with *concentration*. We then introduce *IMF program* x *concentration* in the probit specification and the outcome equation of the (SAE) bivariate probit model to test hypothesis 1, and also control for the individual components of this interaction term. As a robustness test, we use an alternative measure for the market concentration of NBFIs which is taken from Bikker

[21] See, e.g., Bikker (2004).

(2004). Defined as the comprehensive market concentration index (hereafter *index*), this alternative measure is operationalized for each country-year as:

$$index = s_1 + \sum_{i=1}^{n} s_i^2 (1 + (1 - s_i)) \quad (3)$$

where s_i^2 is the square of the share of each private non-bank finance and asset management intermediary's financial assets in the total assets of the financial sector per country-year and s_1 is the share of financial assets held by the financially largest non-bank intermediary in the financial sector. Higher values of index capture greater market concentration of non-bank finance and asset management intermediaries. We also test hypothesis 1 by interacting *IMF program* with *index* and introducing *IMF program* x *index* in the relevant specification as well as control for the individual components of this interaction term. Based on the prediction in hypothesis 1, *IMF program* x *concentration* and *IMF program* x *index* will be positively associated with *sudden flight*.

The data to operationalize *concentration* and *index* are drawn from secondary sources, including Fitch IBCA Bankscope Database (2013),[22] the Orbis database (2013),[23] Cihak et al.'s "Global Financial Development" database (2013), and Worldscope Global Database (Thomson Financial, 2013). These two measures of the independent variable are also operationalized from several region- and country-specific primary sources (e.g., from data recorded by central banks of countries) that are listed in detail in table A of the Appendix.

We next turn to discuss the variables incorporated in the selection equation of the (SAE) bivariate probit model. Three variables are included in the selection equation to account for our theoretical claim that countries that experience serious economic problems are more likely to participate in IMF programs: *output loss* (measured as the magnitude of growth contraction relative to growth trend), *log inflation*, and *terms of trade shock*. All three engender macroeconomic imbalances that may encourage governments to self-select into IMF programs. Following extant studies, we also include other economic controls that influence IMF program participation: *log GDP per capita*, *current account* (% GDP), and log (foreign exchange) reserves. The dummy *lag IMF program* is added to the selection equation, as scholars suggest that previous participation in programs offered by the Fund drives countries to self-select into

[22] The Bankscope data have been bought from http://www.bvdep.com/en/bankscope.html.
[23] Data purchased from https://orbis.bvdinfo.com/version-2014812/home.serv?product=orbisneo.

IMF programs (Vreeland 2003, 2004; Jensen 2004; Dreher 2005; Nooruddin and Simmons 2006). *Veto players* is added to the specification, as scholars suggest that the presence of more veto players in government can influence participation in IMF programs (e.g., Vreeland 2003, 2004).

Numerous studies suggest that powerful advanced industrial democracies–specifically G-5 countries–use their financial prowess within the IMF to exert pressure on the Fund to assist and "bail out" economically larger developing countries (e.g., Argentina, Brazil, Indonesia, Mexico) in which these G-5 countries have high economic stakes (see Gould 2003; Steinwand and Stone 2008; Copelovitch 2010a, 2010b). This is particularly because financial disasters in these economically larger or "too-big-to-fail" developing states may adversely affect financial institutions or other firms based in the G-5 countries that may have investments in larger developing states. Thus we include two controls in the selection equation that proxy for the economic interests of G-5 countries in IMF lending cases. These two controls include the exposure of G-5 commercial banks (*G-5 bank exposure*) to each borrowing country's market and *G-5 foreign aid* commitments.[24]

Several economic and political controls are also included in the probit specification and the (SAE) bivariate probit's outcome equation, as these variables may influence the *sudden flight* measure. With respect to the economic controls, we first include *log gdp per capita*, *log* (*foreign exchange*) *reserves* and *growth rate* of real GDP, as these variables are each negatively associated with the sudden flight of FPI inflows (Sula and Willett 2009; Forbes and Warnock 2012). We also control for *external debt* (% GDP), *domestic credit growth*, *terms of trade shock*, *domestic real interest rate*,[25] Chinn and Ito's (2013) *capital account openness* index, and a de facto *fixed exchange rate*[26] dummy, as scholars suggest that these variables are positively associated with the binary *sudden flight* variable (e.g., Tarzi 2001; Cavallo and Frankel 2004; Calderón and Kubota 2011). The lag of the dependent variable (*lag sudden flight*) is added, as countries are more likely to suffer a sudden flight of FPI flow if they experienced such an episode in the recent past.

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[24] For these measures, see Copelovitch (2010a, 2010b); data for G-5 foreign aid commitments are from OECD (2011).

[25] The economic controls listed above and domestic *real interest rate* (operationalized as the deposit money market rate adjusted for consumer price inflation) is from the IMF's IFS and World Bank's WDI.

[26] Operationalized from Reinhart and Rogoff's (2004) de facto exchange rate regimes (updated till 2008) data.

With respect to the political controls in the probit specification and (SAE) bivariate probit outcome equation, we first incorporate the polity *democracy* measure, as some studies find that democracies are less vulnerable to sudden FPI flow flight.[27] *Veto players* is included as the presence of more veto players in government engenders policy uncertainty that leads to "sudden flight" crises.[28] We include the *G-5 bank exposure* and *G-5 foreign aid* measures as well in the outcome equation, given that the G-5 countries for reasons delineated above have incentives to prevent financial crises such as *sudden flights* in developing states in which they have high economic stakes. The *G-5 bank exposure* and *G-5 foreign aid* measures are expected to be negatively associated with the *sudden flight* dependent variable.

RESULTS AND ROBUSTNESS TESTS

We first derive a figure (see figure 5) from our data that presents the level of FPI flows to developing countries in our sample for every level of the *concentration* measure both with and without IMF programs. Figure 5 shows that among the higher decile values of *concentration* (such as those ranging from deciles 5 to 10), there is a sharp decline in the degree of FPI among IMF program participating countries *but not* for non-IMF program–participating countries. In fact, among IMF program–participating countries that are observed in the 8th to 10th decile of the *concentration* measure, the level of FPI flows declines by (on average) 5% of GDP, which is substantial. This figure broadly supports our claim but is clearly not sufficient for evaluating our hypothesis. We therefore next present the estimates from a baseline probit specification (model 1, table 3) and baseline bivariate probit outcome equation (model 2) that each contains a limited set of controls that influence the *sudden flight* dependent variable.

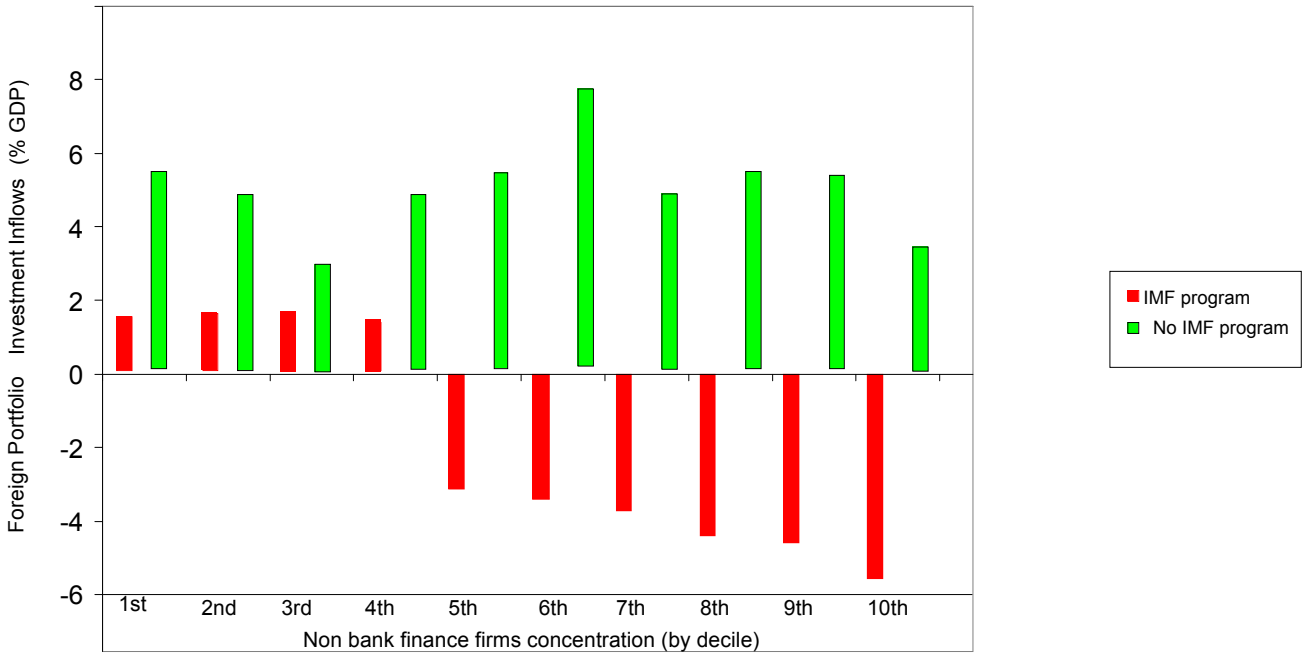
IMF program x *concentration* is positive and highly significant in models 1 and 2, which statistically corroborates hypothesis 1. The coefficient of *IMF program* x *concentration* remains positive and highly significant in the fully specified probit model (see model 3) and in the bivariate probit outcome equation (model 4) that together include all the controls listed earlier that influence *sudden flight*. The probit and bivariate probit model results are encouraging but do not account for spatial contagion in the *sudden flight* variable and clustering associated with IMF program participation. We thus turn to report the results from the SAE bivariate probit model

[27] Tarzi (2001); Cao and Ward (2014).
[28] Julio and Yook (2013).

that statistically account for these econometric issues. To this end, we first briefly report the selection equation results from the bivariate probit model and (largely) the SAE bivariate probit model (see table 4) in which the dependent variable is the *IMF program* dummy. We then discuss the estimates from the SAE bivariate probit model's outcome equation that evaluate the effect of *IMF program* x *concentration* on sudden flight.

FIGURE 5

NON-BANK FINANCIAL FIRMS' CONCENTRATION AND LEVEL OF SUDDEN FPI FLOWS (% GDP)



As indicated in the selection equation results in table 4, previous participation in IMF programs is a strong predictor of current participation in IMF programs. Our expectation that countries are more likely to participate in IMF programs when they experience serious economic problems is also borne out, since *log inflation*, *terms of trade shock*, and *output loss* are each consistently positive and significant in the selection equation. Other factors with statistically significant effects include *log GDP per capita* and *log reserves*. But *veto players* and *current account* are each statistically insignificant in the selection equation. Interestingly, *G-5 bank*

exposure and *G-5 foreign aid* are both positive and significant in the selection equation. This broadly suggests that pressure exerted on the Fund by the G-5 states tends to influence IMF lending decisions. The estimate of the spatial autoregressive error parameter in each selection equation is positive and statistically significant. Hence, econometrically accounting for spatial dependence is necessary when evaluating the determinants of IMF program participation.

TABLE 3

MAIN RESULTS FOR SUDDEN FLIGHT

	probit	bivariate probit	probit	bivariate probit	SAE-BVP $w_{ij} = 1/d_{ij}$	SAE-BVP $w_{ij} = 1/d_{ij}$	SAE-BVP $w_{ij} = bank\ flows$
lag sudden fligh	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
log GDP per capita	.044*** (.012)	.065*** (.020)	.002** (.001)	.010*** (.001)	.008*** (.000)	.010*** (.002)	.004*** (.001)
IMF program	-.016 (.034)	-.011 (.065)	-.000 (.005)	-.003** (.001)	-.001* (.000)	-.006*** (.002)	-.004** (.002)
	-.029 (.045)	-.033 (.036)	-.021 (.084)	-.055 (.102)	-.074 (.106)	-.045 (.079)	-.039 (.079)
IMF program x concentration							
Concentration	.200*** (.034)	.177*** (.042)	.165*** (.056)	.106*** (.027)	.115*** (.024)		.109*** (.034)
IMF program x index	.153 (.117)	.127 (.164)	.116 (.112)	.104 (.119)	.110 (.152)		.121 (.134)
Index						.130*** (.040)	
credit growth						.123 (.116)	
log reserves			.014 (.012)	.039 (.093)	.040 (.082)	.038 (.089)	.046 (.077)
growth rate			-.008 (.019)	-.020** (.010)	-.016** (.08)	-.035** (.018)	-.044** (.020)
external debt			.025 (.067)	-.074 (.157)	-.061 (.184)	-.078 (.247)	-.095 (.183)
equity mkt liberalization			.014* (.009)	.080** (.035)	.074** (.035)	.067** (.032)	.052* (.029)
capital account openness			.010 (.119)	.019 (.023)	.021 (.045)	.015 (.067)	.011 (.078)
terms of trade shock			.022 (.053)	.010* (.06)	.016* (.009)	.011 (.008)	.012 (.010)
fixed exchange rate			.073* (.085)	.219* (.124)	.216* (.130)	.170* (.093)	.182* (.110)
real interest rate			.030* (.028)	.058** (.027)	.075** (.037)	.025* (.014)	.039 (.062)
veto players			.021 (.082)	.058 (.045)	.049 (.043)	.051 (.068)	-.060 (.072)
G-5 bank exposure			.065 (.077)	.060* (.037)	.058* (.034)	.062* (.038)	.069* (.043)
G-5 aid commitments			-.024** (.010)	-.033*** (.009)	-.026** (.011)	-.023** (.010)	-.021** (.009)
			-.029* (.017)	-.036* (.021)	-.022* (.012)	-.016* (.009)	-.023* (.013)
ρ					.015**	.026**	.029**

					(.008)	(.013)	(.014)
T		.025	.063**	.077**	.082**	.053**	.080**
		(.047)	(.037)	(.040)	(.041)	(.025)	(.029)
t^2	.015	.026	.023	.004	.002	.009	.005
	(.112)	(.065)	(.049)	(.018)	(.029)	(.020)	(.020)
t^3	.032*	.025*	-.012	-.010	-.017	-.027	-.020
	(.018)	(.014)	(.049)	(.035)	(.028)	(.025)	(.034)
Constant	-.024*	-.037*	.029*	.023	.022	.029	.034
	(.014)	(.021)	(.017)	(.017)	(.036)	(.035)	(.040)
log likelihood	-3.25	-1.94	-2.80	1.41	1.75	1.97	1.34
	(2.64)	(1.55)	(1.95)	(3.97)	(4.59)	(3.03)	(1.77)
N	-1609.7	-1287.21	-1917.6	-2291.1	-2643.1	-2044.2	-2936.7
	1597	1697	1514	1514	1514	1514	1514

Notes: ***, **, *: 1%, 5%, and 10% levels of significance. Bootstrapped standard errors in parentheses. All models estimated with random effects.

TABLE 4

RESULTS FOR IMF PROGRAM

	Dependent variable: *IMF program*					
	Column A	Column B	Column C	Column D	Column E	Column F
	selection equation results for model 4 (table 3)	*selection equation results for model 5and 6 in table 3*	*selection equation results for model 9 in table 4*	*selection equation result for model 10 in table 4*	*selection equation results for model 11 in table 4*	*selection equation results for model 12 in table 4*
veto players	.045* (.026)	.037* (.021)	.044* (.025)	.040* (.023)	.028* (.015)	.023* (.012)
log reserves	-.090*** (.027)	-.108*** (.037)	-.092*** (.029)	-.084*** (.025)	-.070** (.035)	-.068** (.034)
log inflation	.031*** (.009)	.043*** (.012)	.025** (.010)	.018** (.008)	.016** (.008)	.012** (.006)
log GDP per capita	-.044*** (.011)	-.028** (.014)	-.042*** (.010)	-.033** (.016)	-.026** (.012)	-.021** (.010)
current account	-.052 (.084)	-.021 (.017)	-.054 (.082)	-.053 (.087)	-.029 (.062)	-.021 (.076)
output loss	.025** (.010)	.037*** (.012)	.024** (.010)	.033*** (.009)	.026** (.011)	.023** (.010)
terms of trade shock	.051** (.025)	.038*** (.010)	.052** (.025)	.038** (.019)	.024** (.010)	.021** (.009)
G-5 bank exposure	.034** (.017)	.028** (.014)	.035** (.017)	.040** (.020)	.031* (.018)	.029* (.017)
G-5 foreign aid	.032** (.016)	.021** (.010)	.019** (.009)	.014** (.007)	.027* (.015)	.011* (.006)
voting affinity						.027 (.032)
lag IMF program	.020** (.010)	.036*** (.010)	.024** (.012)	.039*** (.011)	.024** (.012)	.023** (.010)
Constant	.763*** (.193)	.517*** (.165)	.729*** (.197)	.584*** (.166)	.815*** (.170)	.834*** (.249)
$\hat{\lambda}$		.058** (.027)	.037** (.019)	.071** (.035)	.032** (.015)	.029** (.014)
% predicted	90%	91%	90%	90%	90%	89%
LR χ^2	57.16	78.24	87.61	80.12	84.31	81.27

Notes: *,**, ***: 1%, 5%, and 10% significance levels. The selection equation results for the (i) bivariate probit outcome equation in model 2 and (ii) SAE bivariate probit outcome equation in model 7 are not reported to save space; these selection results are similar to the selection equation estimates reported above.

Model 5 in table 3 presents the estimates from the outcome equation of the SAE bivariate probit model in which the dependent variable is *sudden flight*. The results from the selection equation of this model (reported in table 3) were discussed above. Note that the estimated coefficient of the interaction term *IMF program* x *concentration* in model 5 is positive and highly significant at the 1% level. This statistically corroborates hypothesis 1. With respect to the individual components of *IMF program* x *concentration*, we find that the estimate of the individual *IMF program* is negative but insignificant, while *concentration* is positive and statistically insignificant. This suggests that it is indeed the interaction of the two independent variables—rather than each variable individually—that increases the likelihood of a "sudden flight" crisis.

To gain a better sense of how *IMF program* x *concentration* affects the probability of *sudden flight*, we derive and analyze the substantive effect of this interaction term as follows. Specifically, we use the estimates from model 5 to compute the marginal effect of *IMF program* x *concentration* on the probability of *sudden flight* in our developing countries sample as well as the standard error of this marginal effect. The result from the exercise mentioned above–illustrated in figure 3–shows that when *IMF program* is set equal to 1 (indicating a program-participating country)[29] and the other variables in the specification are held at their respective mean, then increasing *concentration* by one standard deviation above its mean in the sample increases the predicted probability of *sudden flight* from 0.29 to 0.37 or, in other words, by a substantial 21.6%. As figure 6 shows, this substantive effect is statistically significant at the 95% confidence level. Thus there exists strong statistical *and* substantive support for hypothesis 1.

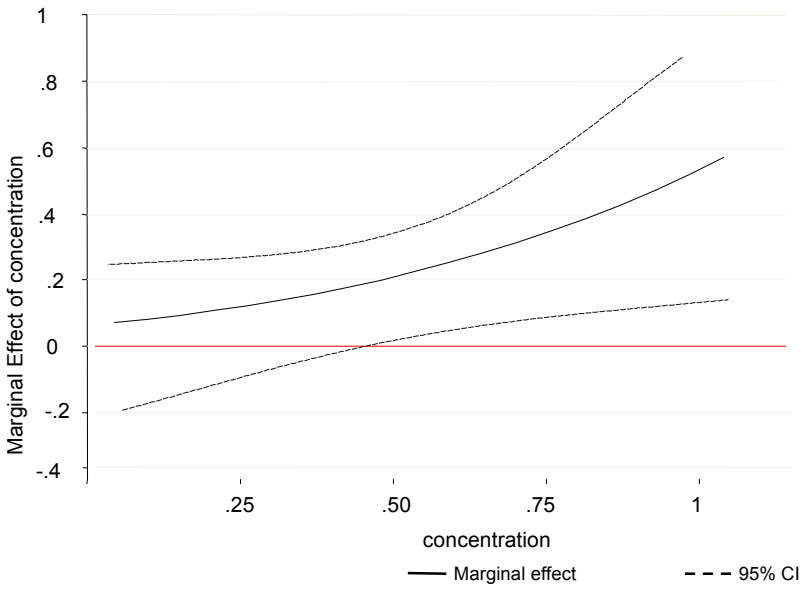
We checked whether the results reported above hold when we replace *IMF program* x *concentration* with *IMF program* x *index* in the outcome equation and control for the individual components of the latter interaction term. *IMF program* x *index* has a positive and highly significant association with *sudden flight* in the SAE bivariate probit model's outcome equation (see model 6, table 3). We also find that the association between *IMF program* x *concentration* and *sudden flight* is positive and highly significant in the SAE bivariate probit model's outcome

[29] The term "program-participating countries" refers to all country-years in our sample in which countries are observed as participating in an IMF program. We set *IMF program* equal to 1 since it is a dummy variable.

equation, when cell entries in the spatial weights matrix in the outcome equation are operationalized by using directed-dyad bank credit flows between countries *i* and *j* (model 7).[30]

FIGURE 6

ESTIMATED MARGINAL EFFECT OF CONCENTRATION ON SUDDEN FLIGHT



The control variables *terms of trade shock*, *growth rate*, *capital account openness*, *real interest rate* and *credit growth* are each statistically insignificant in the outcome equation. *Log GDP per capita* and *log reserves* are in the predicted negative direction and are each statistically significant, while the positive estimate of *external debt* and *fixed exchange rate* is also significant in the outcome equation of the SAE bivariate probit model. *Democracy* is negative but insignificant, while *veto players* is positive and also insignificant. As predicted, *G-5 bank exposure* and *G-5 foreign aid* are each negative and significant in the outcome equation. The spatial autoregressive error coefficient is positive and statistically significant in the outcome equation as well. Hence, statistically accounting for spatial dependence is necessary when

[30] Our main results hold when we use directed dyad trade-flow shares of country *j* in country *i*'s total, instead of using the inverse distance between all states *i* and *j*, for operationalizing the cell entries in the spatial weights matrix of the SAE bivariate probit model. These additional results are available on request.

evaluating the impact of covariates on *sudden flight*. Further, the statistical significance of *rho* in the outcome equation suggests that it is appropriate to econometrically account for the nonrandom participation of countries in IMF programs when testing hypothesis 1.

For the first robustness test, we check and find that the association between *IMF program* x *concentration* and the alternative measure of the dependent variable–that is, *portfolio flight*–is positive and significant in the fully specified (i) probit model (model 8, table 5) and (ii) SAE bivariate probit outcome equation (model 9).[31] Second, following extant research, we add more controls to the outcome equation that may influence the binary *sudden flight* dependent variable: *current account*, *M2/reserves*, *equity market liberalization*, *debt service/export*, and *liability dollarization*. The variable *voting affinity* in the UN General assembly between G-5 nations and developing countries[32] (in the sample) is introduced in the selection equation to proxy for the political interests of G-5 countries in IMF lending cases, since such political interests encourage G-5 countries to put pressure on the IMF to assist developing countries (Steinwand and Stone 2008; Copelovitch 2010a, 2010b). The estimate of *IMF program* x *concentration* is positive and significant in the augmented outcome equation in model 10 that includes the additional controls mentioned above. But the additional controls *current account*, *equity market liberalization*, *M2/reserves*, *debt service/export*, and *liability dollarization* are each insignificant in this model. *Voting affinity* is positive but insignificant in the statistical model's augmented selection equation in column F. And, as shown in model 11 in table 5, we find that the statistical influence of *IMF program* x *concentration* on *sudden flight* is positive and highly significant in the outcome equation of the spatial autoregressive lag (SAL) bivariate probit model (in other words, the bivariate probit model with spatial lag dependence).

[31] *IMF program* x *concentration* has a positive influence on *portfolio flight* in the fully specified bivariate probit outcome equation as well (not reported to save space but available on request). Additionally, the selection equation results obtained from the SAE bivariate probit model for the outcome equation specifications mentioned above are reported in table 4.

[32] For more details about the operationalization of this measure, see Copelovitch (2010a, 2010b).

TABLE 5

ROBUSTNESS TEST RESULTS

	portfolio flight		*Sudden flight*				
	Probit	SAE-BVP $w_{ij} = 1/d_{ij}$	SAE-BVP $w_{ij} = 1/d_{ij}$	SAE-BVP $w_{ij} = 1/d_{ij}$	SAE-BVP $w_{ij} = 1/d_{ij}$	SAE-BVP $w_{ij} = 1/d_{ij}$	SAE-BVP $w_{ij} = 1/d_{ij}$
	Model 8	**Model 9**	**Model 10**	**Model 11**	**Model 12** 1985–1995	**Model 13** 1996–2008	**Model 14**
lag dependent variable	.033*** (.012)	.010*** (.001)	.012*** (.003)		.027 (.053)	.057*** (.019)	.042** (.019)
Spatial lag of *sudden flight*				.009*** (.002)			
log GDP per capita	-.057** (.028)	-.003*** (.001)	-.002** (.000)	-.010*** (.003)	.011 (.040)	.021 (.041)	-.012 (.033)
IMF program	-.026 (.095)	-.044 (.082)	-.038 (.087)	-.030 (.062)	-.033* (.019)	.021 (.045)	.002 (.006)
IMF program x concentration	.157*** (.041)	.138*** (.040)	.219*** (.053)	.125*** (.034)	.102** (.053)	.221*** (.058)	.114*** (.043)
Concentration	.087 (.105)	.109 (.157)	.104 (.135)	.119 (.165)	.064 (.137)	.010 (.019)	.107 (.063)
log reserves	-.024* (.013)	-.023** (.010)	-.040** (.021)	-.008** (.004)	-.042 (.055)	-.058 (.039)	-.001 (.064)
current account			.010 (.072)				
liability dollarization			.040 (.039)				
cap account openness	.011 (.043)	.036 (.027)	.043 (.030)	.035 (.037)	.017 (.012)	.022 (.081)	.012** (.006)
external debt	.062** (.030)	.056** (.029)	.074** (.035)	.019** (.009)	.025** (.012)	.020*** (.010)	.025** (.011)
terms of trade shock		.186** (.092)	.125** (.064)	.174** (.077)	.020** (.010)	.018* (.007)	.103 (.097)
debt service/export			.012 (.018)				
equity mkt liberalization			.011 (.078)				
fixed exchange rate	.037** (.019)	.023** (.011)	.010** (.005)	.037** (.020)	.018 (.093)	.022 (.075)	.015 (.064)
M2/reserves			.033 (.075)				
real interest rate	.023 (.046)	.019 (.023)	.021 (.045)	.025 (.067)	.011 (.024)	.014 (.032)	.012 (.030)
growth rate	-.061 (.085)	-.080 (.087)	-.036 (.090)	-.094 (.087)	-.024** (.011)	-.031 (.055)	-.024 (.057)
G-5 bank	-.029***	-.058***	-.054***	-.035*	-.012	-.020*	-.015

exposure	(.010)	(.017)	(.016)	(.020)	(.050)	(.011)	(.010)
G-5 aid commitment	-.040* (.023)	-.055* (.031)	-.036* (.019)	.047* (.027)	-.036 (.027)	-.043 (.030)	-.034 (.099)
democracy (polity)	-.015 (.049)	-.033* (.019)	-.036* (.020)	-.021* (.011)	-.023 (.022)	-.011 (.032)	-.010 (.025)
veto players	.027 (.036)	.024 (.028)	.030* (.018)	.016 (.019)	.061 (.057)	.033 (.075)	.023 (.065)
		.040** (.021)	.035** (.018)	.026** (.014)	.036*** (.010)	.034*** (.011)	
ρ		.095** (.041)	.102** (.053)	.088** (.043)	.110** (.048)	.104** (.047)	
T	.036* (.020)	.011 (.034)	.007 (.049)	.003 (.067)	.012 (.030)	.010 (.047)	-.009 (.043)
t^2	-.030 (.019)	-.060 (.326)	-.041 (.215)	.048 (.271)	.021* (.011)	.018* (.010)	.017 (.021)
t^3	.021** (.010)	.009 (.023)	.002 (.027)	.005 (.010)	-.016* (.009)	-.012* (.007)	-.010* (.005)
Constant	1.53 (2.77)	2.29 (3.23)	1.14 (.883)	1.37 (.950)	.351*** (.032)	.560*** (.067)	1.983 (2.054)
log likelihood	-2867.3	-2957.1	-3031.2	-2826.5	-1723.2	-1022.7	-3571.2
N	1509	1509	1238	1514	605	919	1509

Notes: ***, **, *: 1%, 5%, and 10% levels of significance. Bootstrapped standard errors in parentheses. All models estimated with random effects.

As a sample robustness test, we checked and found that the impact of *IMF program* x *concentration* on *sudden flight* remains positive and highly significant in the SAE bivariate probit outcome equation that is separately estimated for each of the two sub-periods: 1985–1995 (model 12, table 5) and 1996–2008 (model 13).[33] We also estimated additional probit and (SAE) bivariate probit models after adding the following controls: the ratio of *forex reserves* to *current account balance*, *trade openness*, *M2/reserves*, and the *US real interest rate*, a variable that measures at time *t* the cumulative number of sudden flight episodes that have occurred in country *i*, an *election* dummy, and the market concentration of depository banks for each country-year. We do not report the results obtained after including these additional controls because of space constraints, but our key results were unchanged.

Diagnostic tests reveal that none of the estimated models suffer from serial correlation and that the residuals are normally distributed.[34] Further, while our selection equation enables us to account for potential endogeneity issues between *sudden flight* and the *IMF program* dummy, we conducted four exercises to assess whether there exists an endogenous relationship between the *sudden flight* dependent variable and the two independent variables of interest: *IMF program* and *concentration*. For the first exercise, we checked the exact date (specifically, the exact week) in which "sudden flight" crisis episodes occurred in countries observed under IMF programs in our sample. It is important to note here that across 94% of the crisis-affected IMF program–recipient states in our sample, a *sudden flight* crisis occurred between three weeks to six months after the introduction of an IMF program in these states. In effect, this means that IMF programs almost always *precede* rather than follow the occurrence of a sudden flight crisis. Or, put differently, the IMF always intervenes *prior to*–in a bid to prevent–the occurrence of sudden flight crisis rather than getting involved after the outbreak of such crises. Thus it is unlikely that there exists an endogenous relationship between the *IMF program* dummy and the *sudden flight* binary dependent variable in our sample.

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[33] The association between *IMF program* x *concentration* and *sudden flight* also remains positive and highly significant in the fully specified probit model and bivariate probit outcome equation that are separately estimated for each of the two sub-periods: 1985–1995 and 1996–2008 (results available on request).

[34] The relevant VIF values indicate that multicollinearity is not a problem. The Breusch-Godfrey LM test fails to reject the null of no serial correlation, the Jarque-Bera test shows that the residuals are distributed normally, and diagnostic tests establish the validity of the exclusion restrictions parameters in the estimated models.

In addition to the previous exercise, we conducted three additional endogeneity checks for these two variables–*sudden flight* and *IMF program*–and the *concentration* measure. F-statistics from Hurlin and Venet's (2003) Granger causality test for panel data reveal that there is no endogeneity problem between the binary *sudden flight* dependent variable and the two independent variables: *IMF program* and *concentration*. Given our relatively small *t*, this method is useful for our country panel sample, and allows us to test for, and rule out, the potential for reverse causality between *sudden flight* and both *IMF program* and *concentration* for each country therein.

Second, the Wu-Hausman F-test and the Durbin-Wu-Hausman chi-squared test also indicates that there is no endogeneity problem between *sudden flight* and *IMF program* as well as *concentration*. These test results are not surprising, as studies show that the market concentration of financial firms is influenced by the type of domestic legal system (e.g., the common law system), financial-sector regulatory policies, or mergers and acquisition activity among domestic private non-bank firms rather than factors such as IMF programs or "sudden flight" crises.[35] Yet, for the third exercise, we further addressed the possibility of endogeneity by testing hypothesis 1 via Rivers and Vuong's (1988) two-stage conditional maximum likelihood (2SCML) approach. The 2SCML approach has been noted for its applicability to models with binary dependent variables and endogenous regressors (Timpone 2003: 296), which underscores its capacity to correct for potential endogeneity in our case and provide consistent estimates. *IMF program* x *concentration* has a positive and significant impact on *sudden flight* in the 2SCML model that includes all the controls (model 14).

CONCLUSION

The theory presented in this paper suggests that domestic market concentrated non-bank finance and asset management intermediaries exert pressure on program-recipient governments to not implement IMF program conditions that seek to reform these intermediaries to avert a sudden flight crisis. Governments acquiesce to this pressure and renege on their Fund-commitment to reform the non-banking financial system. This generates a financial panic among foreign investors, who then rapidly withdraw their portfolio investment from the reneging country's

[35] Bikker (2004); Cihak et al. (2013).

stock market, thus triggering a sudden FPI flight crisis. Results obtained from our statistical models corroborate our main contentions.

The findings presented here provide numerous theoretical and empirical contributions. The paper's first theoretical contribution is that it systematically explores how the behavior of non-bank finance and asset management intermediaries can affect the IMF's ability (or lack thereof) to prevent sudden flight of FPI inflows in Fund-supported developing states. This is an important theoretical step forward because, even though scholars have extensively explored how interest groups from the conventional banking sector (e.g., depository banks) influence financial and monetary policies,[36] they have not to our knowledge systematically analyzed the role of non-bank financial firms. As shown in this study, however, non-bank financial firms have emerged as key actors in the financial sector of developing economies. They can also organize themselves into powerful interest groups to actively pursue their interests (particularly when the market concentration of these firms is high). The concentrated non-bank financial firms' ability to act collectively in turn may influence financial outcomes such as sudden flight of FPI inflows (in the context of IMF programs).

Second, extant research on the determinants of portfolio investment flows and sudden stop or sudden flight crises provides rich insights,[37] but it tends to underestimate the IMF's role in influencing international capital flows. The vast literature about the IMF, however, has debated the Fund's ability to promote catalytic finance and has investigated the effect of IMF programs on a variety of outcomes, including economic growth, fiscal policies, and foreign direct investment (Bird and Rowlands 2004; Vreeland 2004; Jensen 2004; Dreher 2005; Nooruddin and Simmons 2006; Pop-Echeles 2009).[38]

But studies on the IMF have paid less attention to the IMF's impact on sudden flight crises.[39] Thus, our paper speaks to the literature on portfolio investment flows *and* the IMF by studying the link between IMF programs and sudden flight crises. It also contributes to these two literatures by showing that the association between IMF programs and sudden flight of FPI

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[36] Frieden 1991; Brooks 2004.
[37] Sula and Willett (2009); Leblang (2010); Forbes and Warnock (2012); Cao and Ward (2014).
[38] Edwards (2006) studies the effect of IMF programs on portfolio investment flows but not on sudden flight crises, as we have done in this paper.
[39] Eichengreen, Gupta, and Mody (2006) analyze the IMF's impact on sudden stop crises. But unlike our paper, they neither explore the effect of IMF programs specifically on sudden flight of FPI inflows nor examine the role of private non-bank intermediaries.

inflows is conditional upon a vital domestic factor that has not received much (if any) consideration in previous research: namely, the market concentration of non-bank intermediaries in Fund-assisted countries.

A substantive implication that emerges from this paper is that extant debates about whether or not IMF reform conditions are "excessive, onerous and intrusive" are too simplistic.[40] We find that it is not the amount of IMF program conditions (e.g., financial-sector reform) per se that makes it difficult for borrowing governments to implement these conditions. Rather it is the type and financial clout of domestic actors affected by IMF reform conditions that crucially determines the ability of IMF-assisted governments to implement Fund-mandated reform measures. Analyzing the interests of domestic actors for whom IMF-mandated reforms are costly is thus necessary to understand when IMF-supported governments are unlikely to comply with program conditions. The second implication is that the rapid financial growth of non-bank intermediaries in developing states exponentially increases the challenge for developing country governments to regulate these intermediaries even with the IMF's assistance. Failing to regulate domestic non-bank intermediaries may increase the likelihood of financial crises in developing states, as we now know that the lack of regulation of non-bank intermediaries was partly responsible for the recent global financial crisis.

The above results give rise to several potential avenues for future research. For example, our findings could be extended by a more in-depth analysis of the bargaining dynamics between borrowing governments and domestic non-bank financial intermediaries under the shadow of IMF programs. Doing so may yield insights into how strategic interaction among international institutions, governments, and financial intermediaries may shape domestic and international financial outcomes. A second extension is assessing the political and economic consequences of "sudden flight" crises that are observed specifically under IMF programs. A more systematic analysis of the consequences of sudden FPI flight under IMF programs will further elucidate the political and economic repercussions of IMF program participation for developing countries.

[40] For well-known examples of this debate, see Radelet and Sachs (1998) and Stiglitz (2003).

APPENDIX

OPERATIONALIZATION OF FUND PROGRAM IMPLEMENTATION INDEX

The Fund Program Implementation index operationalizes the extent to which 47 program-recipient developing states have complied with the three non-bank financial firm reform conditions listed in the text for 81 programs approved by the Fund from 1994 to 2006. The IMF has in fact has developed this index in three main steps. First, there are *n* "performance criteria" in each of these 81 programs. The *n* "performance criteria" refers to the number of policy actions associated with the three non-bank financial firm-specific reform measures listed in the text that the borrowing country has to implement to receive the IMF's assistance. Second, as emphasized by the IMF, there are *t* test dates per year for each program. The *t* test dates refer to the number of times the Fund's staff has checked (and recorded) in each year the extent to which the borrowing country in question has complied with the *n* "performance criteria" in its program. Third, given *n* and *T*, the Index of Fund Program Implementation (*FPI*) is calculated by the Fund as follows:

$$FPI = \frac{\sum_{t=1}^{T}\sum_{i=1}^{n} pc_{it}}{10Tn} \tag{A.1}$$

where pc_{it} refers to the result value for performance criteria *i* in test date *t* and takes values determined by compliance (as recorded and evaluated by the Fund's staff) as follows:

- Met = 10
- Waived = 5
- Met after modification = 5
- Waived after modification = 3
- Not met after modification = 0
- Not met = 0

The FPI index (we label this index as *reform compliance*) is operationalized on a continuous 0 to 100 scale. The index takes a value of 0 if, at all test dates, the three shadow bank–specific reform conditions are not met or not met after modification. Conversely, the index takes a value of 100 if, at all test dates, the three aforementioned shadow-specific reform conditions are met. Thus lower (higher) values of the *reform compliance* index in equation A.1 indicate that the extent of compliance with the three non-bank financial firm-specific reform conditions listed earlier by the borrowing country is low (high).

TABLE A

Table A lists all the additional region- and country-specific primary sources employed to operationalize the *concentration* and *index* variable. Sample years range from 1985 to 2008 for all countries.

TABLE A

REGION AND COUNTRY-SPECIFIC PRIMARY DATA SOURCES FOR CODING *CONCENTRATION* AND *INDEX*

Region and Countries in Our Sample within Each Region	Region- and Country-Specific Sources
Central and Eastern Europe; Post-Soviet Republics and Russia Bulgaria; Czech Republic; Estonia; Hungary; Latvia; Lithuania; Poland, Romania; Russia; Ukraine	**Region-Specific Sources:** EBRD. 1998. *Transition Report: Financial Sector in Transition*. London: European Bank for Reconstruction and Development. Essinger, James. 1994. *Eastern European Banking*, 1st Edition, London: Chapman & Hall. Europa World Yearbook. 2014. *Financial Supervision in the EU*. Brussels, London: Major Financial Institutions of Europe, Graham & Whiteside Moody's International Company Data, Moody's Investors Service, 1994 Version, New York, U.S.A. **Country-Specific Sources:** Goddard, J. A., P. Molyneux, and J. O. S. Wilson. 2001. *European Banking: Efficiency, Technology and Growth*. London: John Wiley and Sons. Harper, Joel T., and James E. McNulty. 2008. "Financial System Size in Transition Economies: The Effect of Legal Origin." *Journal of Money, Credit and Banking* 40 (6, September): 1263–80. Zsámboki, B. 2002. "The Financial Sector in Hungary." In *Financial Sector in EU Accession Countries*, ed. Christian Thiman. Frankfurt, Germany: European Central Bank. **Country-Specific Central Bank Sources**: Bank of Latvia. *Annual Report*. Bulgarian National Bank. *BNB Annual Report*. Central Bank of Hungary. *Annual Report*. Central Bank of the Republic of Lithuania. *Annual Report*.

	Central Bank of the Russian Federation. *Annual Report*. Czech National Bank. *Annual Report*. Esti Bank. *Annual Report*. National Bank of Poland. *NBP Annual Report*. National Bank of Romania. *Annual Report*. National Bank of Ukraine. *Annual Report*.
Central and Latin America Argentina; Bahamas; Barbados; Bolivia; Brazil; Chile; Colombia; Costa Rica; Dominican Republic; Ecuador; El Salvador; Guatemala; Guyana; Haiti; Honduras; Jamaica; Mexico; Nicaragua; Panama; Paraguay; Peru; Trinidad and Tobago; Uruguay; Venezuela	**Region-Specific Sources:** *América Economía*, Latin America's Business Magazine. Various Years. *Latin America's 500 Largest Companies*, Annual Edition. Asociación Latinoamericana de Instituciones Financieras para el Desarrollo (ALIDE). 2003. *Finanzas para el desarrollo: Nuevas soluciones para viejos problemas*. Lima, Peru: ALIDE. Cabrera, Ángel, Sergio de la Cuadraz, Alexander Galetovicx, and Ricardo Sanhueza. 2002. "Las pyme: Quiénes son, cómo son y qué hacer con ellas." Mimeo, Centro de Estudios Públicos, Santiago de Chile. **Country-Specific Sources:** *Banker's Almanac*. Reed Information Services, London, UK. Extel Financial Ltd. 1995–2000. *Financial Times*' Company Briefings. 1995–2008. *Guia Bancaria Latinoamericana*, 16th Edition. 1996. Bogotá, Colombia: Federación Latinoamericana de Bancos. Haber, S. 2004. "Mexico's Experiments with Bank Privatization and Liberalization, 1991–2003." Paper prepared for the World Bank Conference on Bank Privatization, November 11–12, 2003. Clarke, G., and R. Cull. "The Political Determinants and Economic Effects of Bank Privatization in Argentina." 2001.In *Politics and Economics of Latin America*, ed. Frank Columbus, 1–34. Huntington, NY: Nova Science Publishers, Inc. Superintendencia de Bancos y Entidades Financieras de Bolivia. 2003. "Boletín informativo." June. [Translation: Superintendency of Banks and Financial Entities of Bolivia. 2003. "Newsletter." June.] *Thomson Bank Directory*. 1987–2008. Thomson Financial Publishing World Scope Global Disclosure Inc. **Country-Specific Central Bank Sources**: Bank of Guatemala. *Economic and Financial Information*.

	Bank of Guyana. *Annual Report*. Bank of Jamaica. *Bank of Jamaica Annual Report*. Bank of Mexico. *Annual Report*. Bank of the Republic of Haiti. *Annual Report*. Central Bank of Argentina. *BCRA Annual Report*. Central Bank of the Bahamas. *Annual Report & Statement of Accounts*. Central Bank of Bolivia. *Annual Report*. Central Bank of Brazil. *Annual Report*. Central Bank of Chile *Annual Report*. Central Bank of Costa Rica. *Annual Report*. Central Bank of Dominican Republic. *Statistics*. Central Bank of Ecuador. *Statistical Information*. Central Bank of Nicaragua. *Annual Report/Annual Statistical Report*. Central Bank of Paraguay. *Preliminary Economic Report*. Central Bank of Trinidad and Tobago. *Annual Report*. Central Bank of Uruguay. *BCU Financial Statements*. Central Reserve Bank of El Salvador. *Annual Economic Indicators*. Central Reserve Bank of Peru. *Annual Report*. Republic Bank (Barbados) Limited. *Annual Report*.
Asia and Oceania (excluding Middle East) Bangladesh; China; India; Indonesia; Malaysia; Mongolia; Nepal; Pakistan; Philippines; Singapore; South Korea; Sri Lanka; Thailand; Vietnam	**Region-Specific Sources:** Aggarwal, Raj, and John W. Goodell. 2009. "Markets and Institutions in Financial Intermediation: National Characteristics as Determinants." *Journal of Banking and Finance* 33 (10, October): 1770–80. Asian Development Bank. 2007. *Beyond the Crisis: Emerging Trends and Challenges*. Manila: ADB. *Bankers Handbook for Asia*. 1985–2007. Dataline Asia-Pacific Limited. East Asia Analytical Unit. 1999. *Asia's Financial Markets: Capitalizing on Reform*. Canberra: Australian Department of Foreign Affairs and Trade. *Financial Times*' Company Briefings. 1995–2008. Moody's International Company Data, Moody's Investors Service., 1987–2008. New York, U.S.A. World Scope Global Disclosure Inc. Various Years. **Country-Specific Central Bank Sources:** Bangladesh Bank. *Annual Report*.

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MENA (Middle East and North Africa region) Algeria; Egypt; Iran; Jordan; Libya; Morocco; Syria; Tunisia; Turkey	**Region-Specific Sources:** *Banker's Almanac*. Various Years. Reed Information Services, London, UK. Carkoglu, A., M. Eder, and K. Kirisci. 1998. *The Political Economy of Regional Cooperation in the Middle East*. London: Routledge Press Tahari, A., P. D. Brenner, J. E. J. De Vrijer, M. Moretti, A. Senhadji, G. Sensenbrenner, and J. Solé. 2007. "Financial Sector Reforms and Prospects for Financial Integration in Maghreb Countries." IMF Working Paper, May. *Thomson Bank Directory*. Various Years. Thomson Financial Publishing. World Bank. 2010. "Bank Competition in the Middle East and Northern Africa Region." World Bank Policy Research Working Paper 5363. World Scope Global Disclosure Inc. **Country-Specific Sources:** Amman Financial Market Companies Guide. 1999–2009. Association of Banks in Jordan, Annual Reports. 2001–2009. Bugra, A. 1994. *State and Business in Modern Turkey*. Albany: State University of New York Press.

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Africa (excluding North Africa) Botswana; Cameroon; Ghana; Kenya; Madagascar; Malawi; Mauritius; Mozambique; Niger; Nigeria; South Africa; Tanzania; Uganda; Zambia; Zimbabwe	**Region-Specific Sources:** *AED African Financial Directory*. 1987–2009. African Economic Digest, London, UK. African Development Bank Report. Various Years. Banker's Almanac. 2013. Reed Information Services, London, UK. Kelly, R., and G. Mavrotas. 2003. "Savings and Financial Sector Development: Panel Cointegration Evidence from Africa." Discussion paper 2003/12, World Institute for Development Economics Research (WIDER), United Nations University, Finland. *Thomson Bank Directory*. 2011. Thomson Financial Publishing. World Scope Global Database. **Country-Specific Sources:** Agusto & Co. 1995. *Banking Industry Survey*. Lagos. Ikhide, S. 1992. "Financial Deepening, Credit Availability and the Efficiency of Investment: Evidence of Selected African countries." Development Research Paper Series, Research Paper 2. Nyagetera, B. M. 1997. "Financial Repression in Tanzania: Its Impact on Savings, Investment, Credit and Growth." Unpublished PhD thesis, University of Dar-es-salaam. Nwankwo, G. O. 1980. *The Nigerian Financial System*. London: Macmillan.

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