The Catalytic Effect of IMF Lending: Evidence from Sectoral FDI Data

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The Catalytic Effect of IMF Lending: Evidence from Sectoral FDI Data

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Our study contributes to the search for the elusive catalytic effect of International Monetary Fund (IMF) lending on inflows of foreign direct investment (FDI). Recent scholarship has found that the catalytic effect is conditional on political regime and program stringency. We contribute to this literature by developing and testing a theory which describes how the catalytic effect also varies by economic sector. This is a departure from existing studies, which have tended to focus on aggregate FDI flows after crises. Our findings corroborate previous research, which find that in general IMF lending has a substantial and negative effect on foreign direct investment. However, we find that the negative effect is concentrated in sectors that are highly dependent on external capital and have high sunk costs in the host country. Our findings are robust to several alternative explanations common in IMF literature, namely the importance of IMF program design and the ability of governments to make credible commitments to reform. Substantively, our findings suggest that investors are more likely to use IMF lending as an escape hatch in countries where FDI is dependent on external capital and has low sunk costs.

KEYWORDS IMF; foreign direct investment; international political economy; catalytic finance; financial crises

Country partnership with the International Monetary Fund (IMF) is ideally rare and short in duration. States turn to the IMF in times of economic crisis, which usually involve some combination of increasing national debt, balance of payments problems, and dwindling foreign reserves. The conditional loans provided by the IMF serve as a temporary solution to balance of payments issues, providing a capital influx in exchange for various policy shifts designed to bring about macroeconomic stabilization. The IMF has always viewed its loans as a stopgap measure; normally only a portion of the capital flows necessary to correct a deficit are lent to countries in crisis. The rest is expected to come from private capital markets. Indeed, the entire rationale for IMF lending rests on a conundrum: private capital is unwilling to finance a current account deficit, yet the IMF's involvement is supposed to be a signal for private capital flows to resume. This 'catalytic' mission of the IMF is expressly stated as one of its three main goals, alongside adjustment to shocks and avoiding future crises:

> IMF programs can help unlock other financing, acting as a catalyst for other lenders. This is because the program can serve as a signal that the country has adopted sound policies, reinforcing policy credibility and increasing investors' confidence.[1]

Partnership with the IMF, more generally, and loan conditionality, more specifically, are to be interpreted by international investors as credible commitments to reform. This should in turn lead to more long-term investment. It is therefore surprising that most of the literature surrounding the catalytic effects of IMF lending on foreign direct investment (FDI) documents no catalytic effect at all or anti-catalytic effects, even when accounting for adverse selection into IMF programs (Adji, Ahn, Holsey, and Willett 1997; Bird and Rowlands 1997, 2002; Edwards 2006; Jensen 2004). Those studies that do find catalytic effects often find them only in limited

[1] Available at http://www.imf.org/external/about/lending.htm

circumstances, such as US investment in developing countries (Biglaiser and DeRouen 2010), when conditionality is especially strict (Woo 2013), or when IMF partners are democratic (Bauer, Cruz, and Graham 2012). IMF programs are supposed to function as seals of approval for various forms of investment to resume, but there is precious little evidence to support the catalytic ideal. What explains this gap between expectations and reality?

This paper proposes that the potential for IMF catalysis depends in part on the characteristics of incoming investment in crisis-hit countries. Recent scholarship has emphasized that IMF signaling is varied and simultaneous. Chapman, Fang, Li, and Stone (2017) argue that crisis lending produces countervailing effects on the decisions of private actors. IMF involvement may signal risk to investors, but it also may reassure investors by providing an infusion of cash and/or assuring them that needed reforms will be made. The authors argue that the net effect on incoming capital will depend on the elasticities of these effects. The catalytic effect of IMF agreements is therefore not straightforward, but instead a product of multiple channels of signaling and influence. We build on this insight and argue that the IMF is indeed sending multiple and potentially contradictory signals to private capital with the announcement of a rescue package. However, instead of focusing on the characteristics of the countries or the type of lending, we consider the varieties of audiences receiving IMF signals. That is, the sectoral distributions of direct investment in countries before and after IMF agreements. We argue that IMF programs can have varied effects on different forms of investment, depending on the attitudes toward risk and other intrinsic characteristics of firms, which vary systematically across sectors. While the overall evidence linking IMF partnership with a resumption of capital flows in crisis-hit countries is underwhelming, there are important variations in the catalytic

effect by industry. Certain sectors are likely less receptive to the catalytic signal of IMF programs (if it exists) than others.

Like previous studies, we find a reliable anti-catalytic effect of IMF programs on the overall stock of inward FDI. However, our central empirical finding is that this exodus is primarily driven by a select few sectors, including the financial industry and construction. We argue that the anti-catalytic effect of IMF lending depends crucially on two sector characteristics: dependence on external finance and fixed assets, which become sunk costs in host countries. A number of studies consider liquidity provision from the IMF as a potential driver for further investment (Bird and Rowlands 2002; Chapman et al. 2017; Edwards 2006). In these works, one of the implicit goals of conditional lending is to assure future investors of access to domestic capital in times of crisis. However, we highlight another and less-acknowledged dimension of liquidity provision that is anti-catalytic in its effects. We argue that when sectors couple high dependence on external finance with low sunk costs, firms are more likely to use an IMF agreement and attendant funds as an opportunity to deleverage or reduce risk exposure in crisis-hit countries. This results from moral hazard, but not for future investments. Rather, IMF liquidity provision encourages firms that have already taken on risk to exit. In contrast, we find no evidence of an anti-catalytic effect in sectors with high sunk costs. We argue that these sectors are less vulnerable to moral hazard, and instead interpret an IMF agreement as a signal that their assets are less likely to be expropriated. This is in line with recent scholarship such as that of Biglaiser, Lee, and Staats (2016), who argue that agreements with the IMF reduce the likelihood of nationalization. This also comports with the objectives of the IMF itself. However, our results do not demonstrate a catalytic effect in these sectors, only an absence of exodus. Therefore, our results suggest that an IMF agreement is on balance unlikely to generate

substantial broad-based inflows of any long-term capital. Instead, FDI flight may be severe depending on the type of investments prominent in the country at the time of crisis.

This paper contributes to the broader literature on international institutions and their impacts on capital flows. Many studies exist, but precious few distinguish among different forms of investment. Some research on how international institutions impact sectoral investment patterns is emerging.[2] To our knowledge, however, ours is the first study to consider the impact of IMF agreements on sectoral patterns of foreign direct investment. In treating FDI as homogenous, most studies do not capture how IMF agreements may impact different countries' prospects in different ways, depending on the types of investments already in country and those likely to materialize. We utilize a data set of sectoral FDI from the UN Conference on Trade and Development's Division on Investment Technology and Enterprise Development. These data divide FDI by sector and subsector in 52 countries. We employ a treatment effects model with a Markov transition in the treatment equation to account for adverse selection into IMF programs, and examine the sectoral volume and composition of incoming FDI stock after IMF programs. We consider dependence on external finance by sector and sunk cost characteristics, and how IMF involvement may signal varying information about increased or reduced risk to firms in different sectors. IMF rescue packages have strong anti-catalytic effects in sectors with high dependence on external finance and low sunk costs. We find no evidence of anti-catalytic effects in sectors with higher intrinsic sunk costs and low dependence on external finance and argue that the IMF may function both as a screening device and insurance mechanism for investments in

[2] Colen, Persyn, and Guariso (2016), for example, examine the varying impact of Bilateral Investment Treaties (BITs) on different forms of FDI. Also see Blanton and Blanton (2009) and Wright and Zhu (2018) for other examples using sectoral FDI data.

these sectors. In no sector do we find the IMF's involvement associated with subsequent increases in FDI stock.

The IMF as Catalyst

For much of the early postwar period, the IMF informally committed to meeting the entire liquidity needs of countries in crisis. In an environment of limited capital mobility, this was both a necessary and not onerous obligation. However, beginning in the 1970s a number of factors combined to limit the IMF's ability and will to take on this burden. In the aftermath of the oil crisis, current account imbalances surged in a number of countries. Private banks began recycling money from OPEC member countries into developing countries. These capital flows were substantial and, coupled with inflation that reduced the real value of existing contributions from member states, put stress on the IMF's capacity to manage multiple balance of payments crises simultaneously. Politically, IMF lending became more controversial as taxpayers increasingly realized that their contributions were being used to bail out private banks. The idea that private capital would respond to the IMF, and not the other way around, was therefore increasingly emphasized by the fund. Indeed, there is evidence of marked rhetorical shift toward the catalytic effect as a way to legitimize continued IMF lending. Mody and Saravia (2003:9) and Bird and Rowlands (2002:246) cite a 1997 meeting of the UK Treasury Committee, where the minutes record an "all-pervasive conventional wisdom that if you do sign up to an IMF programme you get the Good Housekeeping seal of approval and away you go!" However, there are much earlier references to catalytic finance. Cottarelli and Giannini (2006:205) point to a testimony given in 1977 by the Undersecretary of the Treasury for Monetary Affairs to the Committee on Banking, Finance, and Urban Affairs of the US House of Representatives:

> [IMF involvement] tends to represent a kind of Good Housekeeping seal of approval. Good performance under an IMF program tends to result in private capital inflows, private banks being willing to lend more to the country concerned.

In the 1980s, catalytic lending was a cornerstone of the so-called Baker Plans for debt relief in Latin America. The IMF combined massive lending with new conditionality focused on structural reforms in recipient economies. Gone was the strict focus on short-term macroeconomic stabilization. IMF policy requests increasingly included trade liberalization, privatization, and the removal of barriers to FDI, among other reforms. While these were things the fund had consistently encouraged, the loan programs of the 1980s required long-term structural reforms as a condition for further lending and as a way to open up countries to further inflows of capital, intended to fill whatever gap existed between official finance and the needs of crisis-hit countries. The appropriate amount of the IMF bailout packages would be negotiated carefully between the IMF and the recipient. It was taken on faith, however, that once the amount had been identified the country's progress on structural reforms would bring in the rest from private investors.

IMF programs generated precious little additional private inflows, as private banks were unwilling to provide any new financing in the late 1980s. However, additional Brady-type debt restructuring plans were eventually successful after 1989, based on principles of collateralization, debt-equity conversion, and rescheduling (Boughton 2001). Mexico's capital account crisis in 1994 was met with a huge financial rescue package, with relatively little reference to catalytic finance. Cottarelli and Giannini (2006) argue that this happened because financial markets stayed open during this crisis (in contrast to earlier Latin American crises), and that a full-rescue package was politically necessary. However, political pushback against the size

of this package was almost immediate and required the IMF to shift back to catalytic language soon after. In the late 1990s, the crises of Thailand, Indonesia, and South Korea were all met with relatively smaller loans coupled with attempts at catalysis. In each of these cases, no significant new forms of incoming private capital flows registered. In Russia and Brazil in 1998/1999, the IMF touted its involvement as a signal of creditworthiness to private investors.[3]

In 2000, the IMF further cemented its commitment to catalytic finance in the Prague Framework, issued by the fund's managing director, Horst Köhler. The framework endorsed the notion that the IMF's ability to fulfill the catalytic role is based on the confidence that private investors have in its programs and especially in conditionality (Bird and Rowlands 2004:470). Yet that same year, in both Argentina and Turkey, stabilization was only achieved through the augmentation of existing IMF loans, as little private capital had materialized. Indeed, throughout the past four decades the fund has repeatedly invoked the idea of catalysis even while demonstrating precious little evidence of its existence.

Empirical Evidence of Anti-Catalytic Effects

There is a large literature on the effects of IMF programs on a wide variety of economic outcomes.[4] Our study excludes short term portfolio investments, private bank lending, or interest rate changes for sovereign debt.[5] Foreign direct investment requires a medium to long-term

[3] There is some debate about the Brazilian case, because Brazil ended up drawing a fraction of its awarded IMF package before stabilizing. However, this is not necessarily evidence that the program itself led to a resumption of capital. In this particular case stabilization was only achieved after a dramatic devaluation of the *Real*.

[4] There are a number of influential studies which examine the relationship between IMF involvement and economic growth (Barro and Lee 2005; Dreher 2006; Killick 1995; Przeworski and Vreeland 2000; Vreeland 2003), which often include consideration of inflation (Killick 1995; also see Bird 2001 for review) or the direct effect on the balance of payments (Pastor 1987; Stone 2002). Bird (2001) argues that the most consistent positive effects are discovered in the balance of payments, while empirical evidence of the IMF's influence on other economic outcomes is inconclusive at best.

[5] There are some works that use market spreads on either commercial bank loans (Özler 1993) or international bonds (Eichengreen and Mody 2000; Haldane 1999) as dependent variables.

commitment, and IMF involvement may affect a country's intermediate prospects for a return on that investment. Countries routinely attempt to attract foreign corporations to boost technology transfer, generate jobs, increase tax receipts, and develop domestic and international value chains. FDI is on balance less easily reversed than other forms of capital flows, such as portfolio investment. FDI is therefore commonly promoted by international organizations and host country governments as a vehicle for development. Countries compete over FDI, and specifically higher value-added FDI. If IMF agreements and attached conditions do indeed establish sound macroeconomic environments in partner countries, we might expect that foreign firms would be more willing to make more long-term commitments in those countries. Because other forms of capital, such as portfolio investment, can be easily reversed, the IMF may still lay claim to catalysis if less-liquid forms of investment stay in place or increase in the years following fund programs. FDI is indeed less volatile than other types of capital flows, and FDI-heavy investment strategies may dilute the impact of economic crises under certain conditions (Tong and Wei 2011). The IMF has consistently argued that short term pain brought about by adjustment programs should be offset by eventual growth, and FDI might be a leading indicator of that process.

Unfortunately, the empirical record of investments following IMF programs does not support this expectation. Most studies fail to find a consistent link between agreements with the IMF and private capital. Killick (1995) considers 17 countries and finds no evidence of catalytic effects on private capital inflows. Ghosh, Lane, Schulze-Ghattas, Bulíř, Hamann, and Mourmouras (2002) look at eight IMF programs in large emerging economies in the 1990s and conclude that in every case private capital inflows were lower than projected. Bird and Rowlands (2002), in their large-n study of capital flows from 1977 to 1999, found no empirical evidence

for the catalytic effect for various forms of international capital including FDI. This finding echoes Adji et al. (1997), who also fail to demonstrate an impact on incoming FDI. Jensen (2004), using a selection model for 68 countries between 1970 and 1998, found that countries under IMF agreements attracted 25 percent less FDI inflows than countries not under IMF agreements. Barro and Lee (2005) develop instrumental variables to estimate the effects of IMF programs on investment and find that participation in a program lowers the ratio of aggregate FDI to GDP.

Edwards (2006) considers that selection into IMF programs may introduce bias, but still finds no evidence of a catalytic effect. Edwards also controls for past implementation of IMF programs, and in fact argues that not only does poor implementation lead to capital flight, but also that a record of *strong* program implementation corresponds with capital flight. Schadler, Bennett, Carkovic, Dicks-Mireaux, Mecagni, Morsink, and Savastano (1995) find some evidence of capital inflow increases, but only in a third of the 45 IMF programs studied from 1988 to 1991. Even if we assume the broadest meaning of capital flows, there are precious few studies that identify an outright catalytic effect of participation in IMF programs.[6]

A number of the more recent attempts at discovering the elusive catalytic effect have introduced conditional arguments to the debate. Bird and Rowlands (2002) argue that some types of IMF lending, including funds from the Structural Adjustment Facilities, are consistently associated with lower FDI inflows while other types of funds, such as the Extended Fund Facilities, have variable impact in poor and rich countries. Similarly, Biglaiser and De Rouen (2010) find that IMF borrowers attract more FDI from the US when stand-by agreements are in

[6] One possible example is Marchesi (2003), who argues that IMF partnership can facilitate the rescheduling of existing external debt obligations. However, this type of rescheduling is difficult to categorize as new capital inflow, and is certainly not what the IMF has in mind when it references catalysis.

place. Bauer et al. (2012) consider the political institutions of the country and argue that democratic institutions make it more likely that catalytic processes can develop because democracies can more credibly commit to reform. Mody and Saravia (2003) argue that if countries are fundamentally insolvent then IMF support is unlikely to tempt private investors back. However, IMF programs can generate capital investments in countries with more moderate levels of solvency. Woo (2013) looks at the nature of conditionality and claims that strict conditions are more likely to be catalytic as they impose greater costs and confer credibility on the government's commitment to reforms through ex ante and ex post political costs. These conditional arguments all share a concern with identifying the set of circumstances most likely to give rise to catalytic lending, while acknowledging that in not every circumstance (or perhaps not even most circumstances) will the IMF serve as a stamp of approval. Steinwand and Stone (2008) encourage this approach; moving away from generic arguments and toward a more nuanced understanding of the circumstances in which catalysis might appear. This approach is potentially more useful for both the fund and for the countries that seek to escape IMF recidivism and move on to more sustainable forms of capital inflows.

IMF Catalysis by Sector

We consider a number of mechanisms through which multilateral lending may decrease foreign investment in certain sectors and/or redistribute incoming FDI toward some sectors and away from others. The first is the liquidity channel. In countries experiencing economic crisis, the lack of capital may be felt more keenly in some sectors than in others. Industries systematically differ in their need for external finance. Rajan and Zingales (1998) examine whether financial development facilitates growth by sector and find that sectors with relatively larger liquidity needs grow faster in countries with better developed financial infrastructure.

Domestic banks borrow from foreign banks, and credit provision in crisis-hit countries depends in part on access to foreign currency. Beyond stabilizing currency markets, IMF capital infusions are commonly used by governments to boost domestic credit provision, which may be accessed by firms already in country. Access to credit is also considered by those firms contemplating investment. One of the key goals of IMF intervention is to directly and indirectly stimulate private financing. We might therefore expect that industries highly dependent on external finance would see increases in foreign investment after an IMF program, in line with the catalytic ideal. However, this does not take into account preexisting moral hazard. Sectors with large external capital needs are on average more vulnerable to risk taking and are often highly leveraged in developing countries. When IMF lending begins, these sectors are more likely to use increased access to financing to reduce their risk exposure. This can include deleveraging and exit.[7] Typically, countries experiencing economic crises should witness collapses of inefficient firms and the emergence of new investors as the crisis dissipates. However, IMF support may allow some over-leveraged and risk-imbued actors to survive bankruptcy and either exit or continue as 'zombie' entities, thus blocking new firms from entering the market. Firms considering post-crisis investment opportunities in a developing country are supposed to interpret IMF involvement as a signal of renewed stability and easier access to credit. However, they will also consider the effects stabilization policies and structural adjustment programs may have on domestic purchasing power, and the risk accompanying new or continued investments in a crisis-hit country. Dependence on external finance should increase this risk.

There is also reason to suspect that firms may wait until an IMF agreement is in place before exiting a crisis-hit country. The time between the eruption of a financial crisis and the

[7] Tong and Wei (2011) note that the stock price decline following the 2007-2009 financial crisis was much more severe for firms with higher intrinsic dependence on external finance.

conclusion of an IMF agreement is often short. According to McDowell (2017:46), the median time between request and approval for the sample of 275 IMF loan requests is 30 days. Firms that rely on frequent infusions of external capital have added incentive to discern whether a rescue package is forthcoming, and to exit before the effects of austerity programs diminish the market potential of their products (Edwards 2006).

In both the case of potential new entrants and firms already in country, the IMF loan does not prompt a new wave of investment but instead confirms risk and signals the fulfillment of moral hazard dynamics. As Bird and Rowlands (2002:232) explain in their consideration of the catalytic ideal, "an alternative story is that it is the *prospect* of future IMF lending, should things go wrong, that *induces* private capital markets to lend excessively to countries" (italics original). For potential entrants, an IMF loan is likely to be interpreted by external capital-dependent firms as an indicator of tough times ahead. For firms already in the country, an IMF agreement may present an opportune moment to cut losses. In addition, moral hazard makes it more likely that firms in sectors with large external capital requirements "price in" bailout likelihood and consider it as an exit strategy. This all should lead to an anti-catalytic effect for FDI in these sectors.

H1: IMF programs are associated with decreased investment in sectors with relatively high dependence on external finance.

Beyond external finance needs, sectors differ along other important dimensions. At its most basic, the IMF's catalytic argument is about reducing risk for foreign capital. Investors with longer time horizons are naturally reluctant to invest in or continue investments in countries hit by economic crisis, but IMF involvement may reduce this reluctance. Economists have long recognized that certain economic sectors, most prominently mining and other natural resource

industries, have higher initial and enduring fixed assets than other industries. High levels of fixed assets create high sunk costs, and these create risks for firms contemplating investment. It therefore is reasonable to infer that certain signals provided by IMF partnership will mean more to industries with longer time horizons brought about by higher sunk costs. If IMF partnership is indeed a signal of long-term economic stabilization (even if preceded by short-term economic pain), and if this signal overpowers other signals, this should mean more to industries with less possibility of exit. Biglaiser et al. (2016) show that IMF partnership significantly reduces the likelihood of expropriation, which has disproportionately targeted investments with large sunk costs in the past (Hajzler 2012; Minor 1994). Multinational firms in these sectors pay more attention to the possibility of expropriation than mobile firms, and partnership with an international financial institution such as the IMF may be a credible signal that such expropriation is less likely.

Investments with large fixed assets create entry barriers and lead to cautious behavior on the part of firms, which can deter new entrants but also protects the profits of those firms willing to invest (Wright and Zhu 2018). Sectors with higher fixed assets generally display higher rates of market concentration (Baumol and Willig 1981), and firms with privileged positions may be less likely to abandon investments during an economic crisis. High sunk costs deter exodus on their own, but they also confer benefits on foreign investors present when (if) growth resumes. IMF involvement is also a concrete insurance mechanism for firms with high sunk costs and longer time horizons. Bird, Hussain, and Joyce (2004) note that many countries eventually return to the IMF for additional loans. Indeed, one of the single most reliable predictors of IMF involvement is prior IMF involvement. This recidivism is well recognized by firms and is one of the sources of continuing moral hazard. However, it also may assure immobile firms that future

loans are possibilities if countries find themselves in crisis again. We hypothesize that this effect is likely to offset risk for firms in sectors with relatively high sunk costs and low mobility. If a catalytic effect is to be found, these sectoral distinctions should make it more apparent.

H2: IMF programs are associated with increased investment in sectors with higher intrinsic sunk costs

We have so far identified two characteristics of firms which may impact the potential for patterns of foreign investment following economic crisis and IMF intervention. Table 1 combines the separate impacts of sunk costs and that of dependence on external capital into a map of our extended theoretic expectations. Sectors that combine low sunk costs with high dependence on external capital are especially vulnerable to IMF-induced exodus. These sectors are simultaneously risk acceptant and imbued with short term capital and often debt. They are the sectors most likely to have already taken on additional debt in crisis-hit countries. We argue that these sectors are the most likely to exhibit strong anti-catalytic effects after IMF programs, as firms in these sectors use the short-term liquidity generated by IMF loans for deleveraging and/or reducing risk exposure in crisis-hit countries. By contrast, in the scenario where there is a financial crisis but no IMF agreement is reached we assume there will be a greater shortage of liquidity which will naturally limit the opportunity to exit, at least relative to the scenario where there is an IMF program in place. These sectors are the ones most likely to interpret an IMF agreement as a signal to flee, and perhaps to wait until the agreement is in place to do so.

Many natural resource firms fall into the high sunk cost, low dependence quadrant. These firms are not as susceptible to IMF-induced moral hazard and are more likely to interpret IMF signaling as a bulwark against expropriation and a signal of reduced risk in the long term. Because these firms are less dependent on frequent capital infusions and must contemplate

longer-term contracts, they are less likely to depend on the IMF for indirect financial support. While an economic crisis certainly signals risk to these kinds of firms, an IMF agreement would not necessarily indicate an immediate opportunity for exit. Indeed, the agreement may signal an insurance mechanism, both from expropriation and for longer-term recovery. We expect no anti-catalytic effect in these sectors, and test for the possibility of increased investment.

High dependence on external finance and high sunk costs work at cross purposes in our theoretic framework. In the remaining quadrants of Table 1, we confront combinations of attributes where our expectations are for offsetting pressures. In sectors that combine high sunk costs with high dependence on external finance, firms are in need of capital but cannot as easily exit a crisis-hit country. These types of firms, which in our empirical analysis consist mostly of foreign utility companies, must endure a shortage of funding during a crisis while continuing to operate. We do not expect a large exodus from firms that display these characteristics, but we also do not expect any new investment resulting from IMF agreements. Take, for example, a foreign-owned electricity company in an oil-importing country during a liquidity crisis. Such a company will prefer an IMF agreement because it will stabilize the domestic currency in the short-term. As the currency stabilizes, so may the cost of importing oil, thus powering the company's electricity generators. With an IMF program, the company will avoid the worst-case scenario of having to shut down its generators in the event that there is no hard currency to import oil. However, its preference for IMF support will not necessarily translate into increased investment or an overall catalytic effect. Moreover, if no IMF support is forthcoming it may still decide to ride out the crisis because its electricity generators are not easy to sell or put to another use in the short-term. In summary, investors in high dependence and high sunk costs sectors are

unlikely to increase their stake but are also likely to hold out for a significant period of time, with or without IMF support. Thus, we expect no catalytic or anti-catalytic effect in these sectors.

In the last category, which combines low sunk costs with low external capital dependence, we also expect that IMF programs will not have an impact on subsequent investment. Moral hazard is not as prominent here, and this coupled with higher mobility may reduce the importance of IMF loans altogether for firms in this sector. These firms do not necessarily need to wait for financial rescue to exit, but they also have less difficulty exiting. We expect that IMF involvement will not alter the incentives for exodus for these firms. In our empirical analysis, this quadrant is populated by service firms in such sectors as health and social services. These sectors are increasingly linked to foreign investors in developing countries, but do not require constant infusions of outside capital. There are possible catalytic dynamics for these sectors and others. For example, if IMF programs do lead to subsequent economic recovery and demand for services we might expect increased investment. However, as there is little empirical evidence of this (Bird 2001; Killick 1995; Vreeland 2003), we do not speculate on these potential long-term linkages. Instead, we expect that IMF involvement will have no effect.

Table 1. Sectoral Attributes and IMF Catalysis

		Sunk costs (fixed assets) Low	High
Dependence on external finance	High	• More likely to use IMF agreement as an opportunity to deleverage/reduce risk exposure in crisis-hit countries • Low sunk costs make deleveraging/reducing risk exposure a more attractive option • **A rapid anti-catalytic effect is more likely in these sectors**	• High sunk costs make immediate deleveraging/reducing risk exposure a less attractive option. • **No anti-catalytic effect is expected in these sectors**
	Low	• Less likely to benefit directly from IMF liquidity provision • **No anti-catalytic effect is expected in these sectors**	• IMF signals reduced risk of expropriation/possible insurance mechanism • **A catalytic effect is more likely in these sectors**

Beyond these general predictions regarding sectoral characteristics, we acknowledge and account for previous conditional arguments on the catalytic effect. Bird and Rowlands (1997) argue that the catalytic effect depends on whether economic policy in the partner country will be better designed and more appropriate after working with the fund. Because IMF programs are not easy to implement and usually involve some kind of temporary economic pain for certain segments of the population, the country must also be committed to this path of reform. Marchesi and Thomas (1999) take this argument a step further, claiming that only countries with sound policies can afford to endure the costs associated with IMF programs. As such, it is appropriate to consider the role of conditionality in promoting this process. Woo (2013) finds that the catalytic effect of IMF programs depends on the nature of conditionality in these agreements; where stricter conditionality is present, the catalytic effect is more likely. Woo argues that strict conditions add credibility to the partner country's commitment to reform, as these commitments involve greater ex ante and ex post political costs. It is relatively straightforward to add the element of conditionality to our proposed relationships, and we include interaction terms in our models to account for these potential influences. If conditionality is indeed a signal of

commitment to reform, stronger conditionality may be associated with a catalytic effect in sectors with higher sunk costs and may reduce the anti-catalytic effect in sectors with higher dependence on external finance.

H1a: IMF programs with stricter conditionality are associated with a smaller anti-catalytic effect in sectors with high dependence on external capital.

H2a: IMF programs with stricter conditionality are associated with a larger catalytic effect in sectors with high sunk costs.

Data and Method

Dependent Variable

Our dependent variable, sectoral FDI stock as a percentage of GDP, was obtained from UNCTAD's Division on Investment Technology and Enterprise Development, which classifies FDI by sector in 52 countries between 1980 and 2008 (listed in supplementary information). Scaling FDI against GDP is common in the catalytic literature (Bauer et al. 2012; Jensen 2004, 2006) and also in the wider sectoral FDI literature (Blanton and Blanton 2009). Since the sectoral variables as a percentage of GDP are highly dispersed we use the natural log transformation. We also use an additional dependent variable in our primary analysis: logged sectoral FDI stock as a percentage of total FDI stock. The latter measurement allows us to examine changes in the distribution of FDI that may be influenced by IMF programs. As it is not scaled against production, this measure has the additional advantage of not being scaled against a moving denominator that is unrelated to FDI (GDP), which may dilute increases or decreases in FDI. We use stock instead of flows as the main dependent variable as this measure is less volatile. Stock is the aggregated position of FDI in the destination country. This measure is better suited to time

series analysis as it reflects the historical record of FDI and the accumulated extent of foreign capital penetration.[8] Both the stock measures and GDP measures are in current US dollars.

To differentiate sectors by their dependence on external capital, we developed proxies using firm-level data. We constructed two sector-level approximations of firms' intrinsic demand for external financing. For the first, we used the measure developed in Rajan and Zingales (1998) and commonly applied since:

$$\frac{capital\ expenditures - cash\ flow}{capital\ expenditures}$$

Where overall cash flow = cash flow from operations + decreases in inventories + decreases in receivables + increases in payables. All data come from US firms with over 100 million sales in Compustat, managed by Wharton Research Data Services.

The second measure is calculated using the ratio of average short-term borrowings to sales, which is one of the proxies for liquidity needs used in Raddatz (2006). This measure is particularly appropriate as it relays information about the actual use of external liquidity.

To rank economic sectors by sunk costs we adopted a similar approach, and collected from Compustat measuring the median amount, by sector, spent by firms on property, plant, and equipment divided by sales (gross) in the same large sample of US firms.[9] The second sunk cost measure has the same numerator (amount spent on property, plant, and sales) scaled against

[8] Stock is the cumulative position of FDI in the destination country and is better suited to time series analysis than flow data as it reflects the historical record of FDI and the accumulated extent of foreign investment. There is some debate in FDI literature on the merits of scaling FDI data against GDP (Li 2009). We note that scaling against GDP reduces the potential impact of outlying raw FDI stock figures. UNCTAD compiles FDI stock data based on a combination of historical cost, market value, and cumulative FDI. While these data are imperfect proxies for cross-country comparisons, Kerner (2014) notes that FDI stock data are better suited to most political science theories than yearly flow data, and that a mix of measurements (such as those employed by UNCTAD) improve on singular stock measures, particularly historical cost estimates.

[9] This measure reflects the real gross book value of property, plant, and equipment, but ignores depreciation and scrap value. Information on the sunk cost measure by sector is available in supplementary information, along with the second measure scaled against number of employees.

thousands of employees. Although the two measures do correlate, the fixed assets of some sectors are better represented by one or the other measure.

This exercise, which is described in greater detail in supplementary information, yielded four NAICS three-digit sectors that are characterized by low sunk costs and high dependence on external finance (L, H): finance, construction, metal and metal products, and textiles. Only one sector is characterized by both high sunk costs and high dependence on external finance (H, H): electricity, gas, and water. These utilities are well-represented in Compustat and UNCTAD data. Community, social and personal service activities, and health and social services are classified as low sunk cost and low dependence sectors (L, L). Finally, mining, quarrying and petroleum, and transport, storage and communications are classified as high sunk costs and low dependence on external capital (H, L). We then matched UNCTAD FDI data to the NAICS codes. Although these are two different sectoral classification systems, the UNCTAD sectoral data allowed matches with all nine of our focus sectors. Some sectors displayed more data coverage than others. For example, the UNCTAD sectoral data on finance was comprehensive for the countries included in the analysis. However, FDI data for both service sectors in the low, low quadrant (community, social and personal service activities, and health and social services) were sparser. This reflects continuing efforts to classify FDI flows in the booming service sector, which have in the past not received as much attention as investments in manufacturing and natural resources (Weymouth 2017).

Independent Variables

The IMF program variable takes a value of '1' when a country is participating in an IMF program and zero otherwise.[10] Our sample includes both concessional and non-concessional

[10] Data on IMF programs are from Dreher (2006).

programs. These programs may have different effects on FDI inflows, in part because they serve different client groups. We present additional tests disaggregating the IMF program variable in supplementary information, and these tests largely support our key findings.

As in previous studies on the effect of IMF programs on FDI, we use a variety of control variables to capture economic development, macroeconomic conditions, and the institutional environment for investment. Larger and more developed economies are expected to attract more FDI, as are countries that are more open to trade and capital. To measure economic development we use per capita income in thousands of US dollars (real GDP per capita) and the natural log of gross domestic product (real GDP). To capture macroeconomic conditions we use economic growth (GROWTH), the natural log of trade as a percentage of GDP (TRADE), and government consumption in billions of US dollars (GOVCON). All of these preceding measures are from the World Development Indicators. The institutional environment is measured using the number of veto players (CHECKS) and the updated Chinn and Ito (2008) Index (KAOPEN), which measures a country's degree of capital openness. The CHECKS measure is from World Bank's Database of Political Institutions. We use US foreign aid in billions of US dollars (USAID) as our proxy for preferential treatment by the IMF and its large shareholders. This variable comes from the World Development Indicators. Like previous studies on this subject we include a lagged dependent variable to address serial autocorrelation, and country and year dummies. Descriptive statistics for our independent variables are presented in supplementary information. As sectoral FDI data is limited we use listwise deletion to preserve sample size.

Model

Our objective is to estimate the typical effect of an IMF program on sectoral FDI, controlling for important intervening factors and selection into IMF programs. To realize this

goal we use a dynamic treatment effects model.

$$Y_{it} = \beta_0 + \beta_1(Y_{i(t-1)}) + \beta_2(Z_{i(t-1)}) + \beta_3(IMF_{i(t-1)}) + \varepsilon_{it} \quad (1)$$

where Y_{it} is FDI as a percentage of GDP to country *i* at time *t*, *Z* represents the other variables and $\varepsilon_{it}$is an error term. IMF is an endogenous treatment variable estimated by a second equation:

$$IMF_{it}^{*} = \beta_1(IMF_{i(t-1)}) + \beta_2(X_{i(t-1)}) + \beta_3(IMF_{i(t-1)} * X_{i(t-1)}) + \mu \quad (2)$$

$$IMF_{it} = \begin{cases} 1 \text{ if } IMF_{it}^{*} > 0; \\ 0 \quad \text{otherwise} \end{cases}$$

In this equation, *IMF** is an unobserved latent variable, which is a function of observed IMF participation in the previous year, exogenous covariates and random component μ. The covariance between the error terms ε (Eq. 1) and μ (Eq. 2) is assumed not to be equal to zero. Hence, we assume that unobserved factors influence participation in IMF programs and FDI inflows. The model corrects for these unobserved correlations so that the comparison is between the outcomes of countries that participated in an IMF program with their hypothetical outcomes had they not participated. This allows us to assess the effects of IMF intervention separately from the effects of crisis, as some crisis-hit countries receive IMF packages and others do not. This basic approach is common in the literature on IMF and FDI inflows (see Jensen 2006; Woo 2013). Following Bauer et al. (2012), we extend this approach to model IMF participation as a first order Markov process, estimated by Eq. 2. Modelling participation in this way allows us to capture how the shift from participation to non-participation depends on the state of each variable in the previous time period, as well as their interaction with IMF program status. One of the requirements of our model is that at least one covariate entering Eq. 2 must be absent from Eq. 1 and be statistically significant. In this instance, we use the level of international reserves and inflation as our exclusion restriction, as well as their interacted values with IMF program

participation. We provide probit estimates of IMF participation and further discussion of our modelling decisions in supplementary information.

Findings

We first verified the anti-catalytic effect of IMF participation on overall levels of FDI stock, and this analysis is included in supplementary information. Turning to the sectoral FDI data, Table 2 presents our main findings. The Wald test statistics and associated *p* values indicate that our overall model is a good fit.[11] Furthermore, the Wald test of the independence of our equations is statistically significant for several models, notably all of the models where we find a statistically significant association between IMF participation and FDI.

Models 1-4 present estimates related to sectors with low sunk costs and high dependence on external finance relative to other sectors, namely construction; textiles, clothing and leather; metal and metal products; and finance. Models 5 and 6 present estimates related to sectors characterized by low sunk costs and low dependence on external finance, namely community, social and personal service activities; and health and social services.[12] Model 7 is the electricity, gas, and water sector, which is characterized by high external finance dependence and high sunk costs. Models 8 and 9 present estimates related to sectors with low dependence and high sunk costs, namely mining and petroleum, and transport. The results support our argument: the negative effect of IMF programs on subsequent stocks of FDI is heavily concentrated in sectors with high dependence on external finance and low sunk costs. All else equal, IMF lending is associated with a reduction of investment in finance, construction, and metal and metal products.

[11] Inspection of the correlation matrix and variance inflation factors show that multicollinearity is not a cause for concern. ADF tests indicate that the data are stationary. Our models include country and year dummies, a lagged dependent variable, and robust standard errors. We test alternative specifications in supplementary information.

[12] Our dynamic treatment effects model did not converge in these sectors due to low numbers of observations (M5 and 6), so we present fixed effects estimates, which should be interpreted with caution as the IMF program coefficient is not adjusted to account for endogeneity bias.

These are sectors with some of the highest scores on the external dependence measures and lowest scores on the sunk costs measures.

In terms of the substantive effect of the IMF on sectoral FDI, we estimate that construction sector FDI as a percentage of GDP will be 44.63 per cent lower for countries under an IMF program than for countries in similar economic circumstances that are not under an IMF program.[13] Similarly, in the metal sector, FDI will be 23.82 per cent lower and in the financial sector, it will be 21.42 per cent. Consider the average country in our data set, where financial sector FDI as a percentage of GDP is approximately 6 per cent. If such a country were to experience a decrease of 21.42 per cent of financial sector FDI it would equate to 1.23 billion US dollars, a considerable sum in the context of most developing and emerging economies.In Table 3, we repeat these specifications using logged FDI as a percentage of total FDI stock. We find that IMF lending is associated with a transformation in a composition of FDI in several sectors. Following an IMF program, the distribution of FDI shifts away from metal, construction, and finance. In addition, we find that FDI shifts toward transport, storage and communications, a sector characterized by high sunk costs and low dependence on external finance. Taken together, the findings reinforce and extend our earlier findings in Table 2. Countries that participate in IMF programs go on to develop different FDI profiles, as FDI becomes less concentrated in sectors that are highly dependent on external finance and have low barriers to exit, relative to countries in similar circumstances but without IMF support.

[13] Since our dependent variable is logged we use the following formula to obtain unlogged values: if the IMF coefficient switches from 0 to 1, the % impact of an IMF program on FDI/GDP is 100[exp(c) - 1]

Table 2. IMF programs and sectoral FDI/GDP

VARIABLES	(1) (L,H) Construction	(2) (L,H) Textiles, Clothing and Leather	(3) (L,H) Metal and Metal Products	(4) (L,H) Finance	(5) (L,L) Community and Social Services	(6) (L,L) Health and Social Services	(7) (H,H) Electricity, Gas, and Water	(8) (H,L) Mining and Petroleum	(9) (H,L) Transport, Storage, and Communica-tions
FDI/GDP	0.003	0.006	-0.052**	-0.003	-0.017	0.403**	0.059	0.050	0.053
	(0.034)	(0.022)	(0.025)	(0.017)	(0.134)	(0.149)	(0.053)	(0.038)	(0.039)
GDPPC	-0.029	-0.051***	0.014	-0.009	-0.209**	0.105	0.161**	0.072	-0.024
	(0.027)	(0.019)	(0.028)	(0.011)	(0.085)	(0.131)	(0.073)	(0.050)	(0.016)
GDP	0.009	0.350	-0.860**	0.317	-0.840	-0.870	-0.608	-0.630*	-0.000
	(0.377)	(0.293)	(0.395)	(0.217)	(0.702)	(2.886)	(0.458)	(0.382)	(0.237)
GROWTH	0.018	0.070*	0.071	0.005	-0.046	0.012	-0.006	-0.001	0.055
	(0.042)	(0.041)	(0.050)	(0.024)	(0.173)	(0.167)	(0.096)	(0.048)	(0.039)
TRADE/GDP	0.029	0.488***	-0.056	0.027	0.899	1.537	-1.186**	-0.042	0.001
	(0.229)	(0.162)	(0.189)	(0.098)	(0.893)	(2.185)	(0.472)	(0.213)	(0.145)
GOVCON	-0.025	0.002	-0.001	-0.000	-0.026	0.129***	-0.003	-0.008	0.000
	(0.016)	(0.004)	(0.003)	(0.003)	(0.040)	(0.039)	(0.006)	(0.005)	(0.003)
KAOPEN	0.131***	0.040	0.052*	0.100***	0.132	-0.092	-0.040	-0.004	0.052*
	(0.044)	(0.025)	(0.031)	(0.021)	(0.106)	(0.339)	(0.080)	(0.042)	(0.030)
CHECKS	0.053	0.025	-0.027	0.009	-0.173	-0.047	0.076**	0.028	-0.019
	(0.038)	(0.023)	(0.028)	(0.016)	(0.134)	(0.104)	(0.037)	(0.025)	(0.018)
USAID	-1.732***	0.084	-0.890*	-0.294	-0.522	0.305	0.403	0.320	0.408*
	(0.464)	(0.391)	(0.467)	(0.378)	(1.290)	(0.697)	(0.488)	(0.468)	(0.231)
IMF PROGRAM	-0.591***	0.052	-0.272**	-0.241***	0.043	0.092	-0.252	0.002	0.125
	(0.186)	(0.138)	(0.119)	(0.090)	(0.115)	(0.193)	(0.183)	(0.119)	(0.119)
Observations	370	269	254	453	172	109	298	381	439
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
LDV	YES	YES	YES	YES	YES	YES	YES	YES	YES
Log p. likelihood	-358	-134	-175	-225	-122	-101	-389	-393	-346
lambda	0.38	-0.013	0.16	0.18	.	.	0.13	-0.00055	-0.0048
sigma	0.51	0.29	0.36	0.30	.	.	0.63	0.46	0.37
rho	0.75	-0.047	0.43	0.61	.	.	0.21	-0.0012	-0.013
Wald chi2	27522	89690	21657	34233	.	.	197082	9572	52812
Prob. > chi2	0.000	0.000	0.000	0.000			0.000	0.000	0.000
Wald test of indep.	8.09	0.022	6.33	7.96	.	.	2.03	0.000068	0.0050
Prob. > chi2	0.0044	0.88	0.012	0.0048	.	.	0.15	0.99	0.94
R-squared					0.945	0.879			

Selected equation, year dummies, country dummies, and lagged dependent variables not displayed. Robust standard errors in parentheses. Columns 5 and 6 present fixed effects estimates.*** p<0.01, ** p<0.05, * p<0.1

We next address the supplementary hypotheses *H1a* and *H2a*, concerning the role of conditionality. Woo (2013) argues that the catalytic effect of IMF programs depends on the extent of conditionality in these agreements; where stricter conditionality is present, the catalytic effect is more likely. Strict conditions may add credibility to the partner country's commitment to reform. In Table 4, we assess the role of program design in moderating the impact of IMF lending in sectors where we have found it to be statistically significant, namely metal and metal products, construction, and finance. These are sectors where we observe a significant anti-catalytic effect. We focus on two dimensions of program design: the number of conditions using Woo's (2013) conditionality data and the size of financial support. Based on previous findings, we expect that more conditions will moderate the negative impact of IMF programs on sectoral FDI. We expect that larger loans will make it easier for existing firms to continue their operations, potentially halting fire sales of assets and transfer of resources abroad. Models 19-21 present interactions with the number of conditions in an IMF agreement and models 22 and 23 with loan size.[14] We find no evidence to support an association between IMF program design and the (anti-)catalytic effect. The level of conditionality and the level of IMF financial support do not seem to moderate the impact of an IMF program on subsequent FDI.

Figure 1 depicts the impact of IMF program participation on FDI one to five years after an IMF program is agreed.[15] Positive numbers indicate a catalytic effect, negative numbers indicate contraction. Figure 1 largely corroborates the findings from the tests presented in Tables 2 and 3. The IMF coefficient is comparable across each time period in three of the sectors that

[14] Our model interacting loan size with IMF program status in the metal and metal products sector did not converge, so our table does not display these estimates.

[15] The figure uses estimates from the models in Table 2, specifically values of the IMF program coefficient at t+1 to t+5.

we analyzed. In each of these sectors – finance, construction, and metal – the size of the negative coefficient increases for several years, suggesting long-term exodus rather than a return to normal. The coefficients are not comparable across panels but help us to understand the evolution within sectors over time. Taken together, they suggest there is little evidence that sectors eventually recover, at least for the 5 years following IMF program initiation. Nonetheless, we note that one of the four sectors we identified – textiles, clothing and leather– does not conform to our expectations of an anti-catalytic effect, even in the long term.[16]

We had hypothesized that sectors with high levels of sunk costs/fixed assets and low dependence on external finance would be those most likely to respond in a positive way to IMF agreements. However, we find no evidence of a catalytic effect in these sectors. The most that can be said here is that these attributes keep investments in natural resource sectors, along with transport, storage, and communications, from leaving the country. We do find that country investment profiles are redistributed to represent more of these sectors after IMF agreements, most likely as other investors in other sectors leave the country (see Table 3).

[16] We note that this is a sector especially driven by price competition in developing countries, which may explain its lack of exodus. However, we do not include price in our theoretic framework.

Table 3. IMF programs and the distribution of FDI

VARIABLES	(10) (L,H) Construction	(11) (L,H) Textiles, Clothing and Leather	(12) (L,H) Metal and Metal Products	(13) (L,H) Finance	(14) (L,L) Community and Social Services	(15) (L,L) Health and Social Services	(16) (H,H) Electricity, Gas, and Water	(17) (H,L) Mining and Petroleum	(18) (H,L) Transport, Storage, and Communica-tions
IMF PROGRAM	-0.56***	0.21	-0.25**	-0.19**	-0.05	0.20	-0.28	0.07	0.20*
	(0.189)	(0.229)	(0.124)	(0.083)	(0.115)	(0.116)	(0.188)	(0.123)	(0.116)
Observations	370	269	254	453	172	109	298	381	439
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
LDV	YES	YES	YES	YES	YES	YES	YES	YES	YES
Log p. likelihood	-347	-137	-169	-162	-118	-95.3	-380	-360	-309
lambda	0.35	-0.15	0.13	0.13	.	.	0.13	-0.051	-0.060
sigma	0.49	0.30	0.35	0.25	.	.	0.61	0.42	0.34
rho	0.71	-0.49	0.36	0.51	.	.	0.21	-0.12	-0.18
Wald chi2	18060	29234	20010	18011	.	.	129612	11175	65511
Prob > chi2	0.000	0.000	0.000	0.000			0.000	0.000	0.000
Wald test of indep.	7.20	0.58	5.42	4.95	.	.	1.74	0.48	0.75
Prob. > chi2	0.0073	0.44	0.020	0.026	.	.	0.19	0.49	0.39
R-squared					0.915	0.896			

Control variables not displayed. Selected equation, year dummies, country dummies, and lagged dependent variables not displayed. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

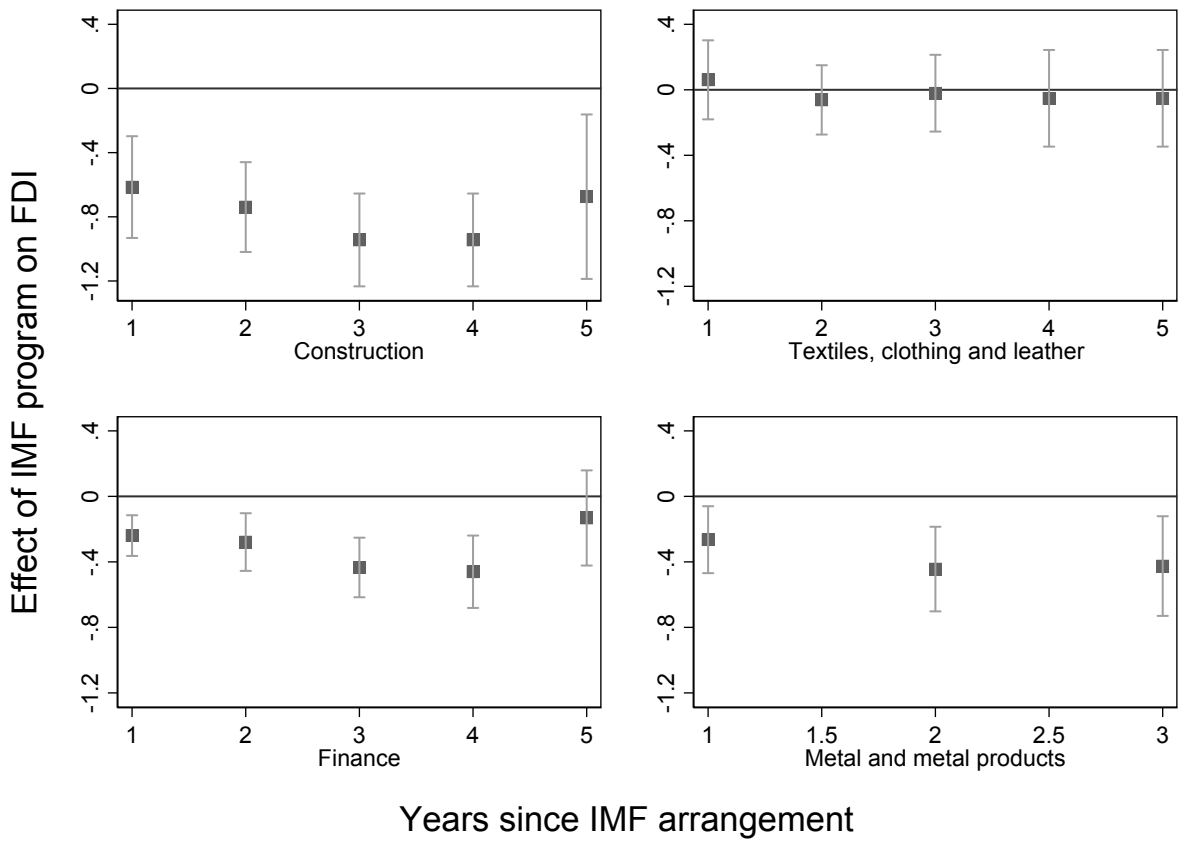
Table 4. IMF program design and sectoral FDI

VARIABLES	(19) Construction	(20) Metal	(21) Finance	(22) Construction	(23) Finance
IMF PROGRAM	-0.61***	-0.30***	-0.23***	-0.51***	-0.21***
	(0.117)	(0.105)	(0.064)	(0.155)	(0.080)
CONDITIONS	-0.07	-0.01	0.06		
	(0.099)	(0.195)	(0.048)		
IMF * CONDITIONS	0.08	0.11	-0.07		
	(0.107)	(0.199)	(0.053)		
LOAN SIZE				-0.26	0.89**
				(0.801)	(0.382)
IMF * LOAN SIZE				-0.00007	-0.00007*
				(0.00003)	(0.00003)
Observations	370	254	453	235	312
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
LDV	YES	YES	YES	YES	YES
Log p. likelihood	-358	-171	-224	-218	-174
lambda	0.38	0.13	0.19	0.38	0.19
sigma	0.51	0.36	0.30	0.47	0.30
rho	0.75	0.36	0.63	0.80	0.65
Wald chi2	4593	8060	9829	3935	4767
Prob. > chi2	0.000	0.000	0.000	0.000	0.000
Wald indep. of eqns.	22.5	4.02	18.9	10.5	11.9
Prob. > chi2	0.000	0.045	0.000014	0.0012	0.00057

Note results not displayed for the metal and metal products sector where loan size is interacted with program status because the model did not converge. Control variables not displayed. Selected equation, year dummies, country dummies, and lagged dependent variables not displayed. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In summary, the findings support the central hypothesis that firms in various economic sectors differ in their responses to IMF support. There is substantial evidence that the exodus of FDI following an IMF agreement is concentrated in sectors with high dependence on external finance and low sunk costs. In three of the four sectors we identified, IMF programs are associated with a significant and lasting decrease in FDI. By contrast, IMF programs are associated with no effect in other sectors. No sector exhibited a strong and consistent catalytic effect at all time periods, suggesting that host country policymakers should seek to limit and avoid losses rather than focus on the potential gains from signing an IMF agreement.

Figure 1. High external dependence and low sunk cost sectors (year one to five following IMF program)



We performed a series of robustness checks using alternate sectoral FDI data and alternative model specifications. These checks support our findings and are described in supplementary information.

Conclusion

We build upon current research which has suggested a conditional relationship between IMF involvement in crisis-hit countries and subsequent flows of international capital (Bauer et al. 2012; Biglaiser and De Rouen 2010; Bird and Rowlands 2002; Woo 2013). Though almost all recent research has found that IMF involvement has an anti-catalytic effect on overall FDI, recent scholarship has suggested that IMF signaling may be more complex. Our findings support the idea that firms in various economic sectors differ in their attitudes toward IMF support. There is substantial evidence that the catalytic effect of IMF lending is absent in sectors with higher intrinsic dependence on external finance and low sunk costs. In these sectors, IMF programs are associated with a significant and lasting decrease in stocks of FDI. IMF programs are associated with a substantively large and negative effect on investment in financial and construction-related FDI, two sectors that exhibit a high degree of external capital dependence and low sunk costs. In contrast, FDI in high sunk cost, low external dependence sectors do not experience similar exodus after IMF programs. Overall, these findings serve to corroborate Chapman et al.'s (2017) point that IMF signaling may have varying and simultaneous impacts on capital markets. Our analysis suggests that involvement with the IMF is not a risk-reducing signal for new entrants and may at best prevent exodus in limited sectors. Where investors are tied and risk-averse, the information provided by partnership with the IMF may serve as a critical signal regarding the returns on future investment, diminished likelihood of expropriation, and/or the possibility of future bailouts. However, the same agreement is likely interpreted as signal to leave in other sectors such as finance and construction, where significant outflows often follow an economic crisis and IMF intervention. The prospect of austerity measures, limited growth, and structural adjustment likely combine with these sectors' relatively leveraged positions at the time of crisis to prompt exit. The funds provided by the IMF also likely allow these firms to recoup some

losses before leaving. IMF support may allow risk-imbued actors to survive and either exit or prevent new entrants from entering the market. In either case, the IMF program does not prompt a new wave of investment but instead signals the fulfillment of moral hazard dynamics for firms already in country.

One possible objection to our findings is that these natural resources targeted by multinational firms do not exist elsewhere. Therefore their very availability determines the lack of exodus rather than any IMF signaling mechanisms. However, if the fund's involvement were truly incidental to these natural resource investment patterns, we would not see systematic variation before and after IMF agreements are implemented. Our analysis accounts for selection effects and compares investment positions to crisis-hit countries with and without IMF rescue packages. The dynamic treatment effects model allows us to analytically separate the effect of the crisis from the effect of the IMF program. We are limited somewhat by our sample, which over-represents middle income countries. States which receive little FDI, often among the most underdeveloped countries, may not be subject to the dynamics outlined here. We were, however, able to corroborate our results using different data from the US Bureau of Economic Analysis. While the UNCTAD data are more comprehensive, we are heartened that strictly US sectoral FDI data hews to the same relationships.

Taken together, these findings emphasize the role of the IMF as a potential policy screening and insurance mechanism to only some investors. The catalytic ideal is but one possible signal to foreign capital, and we do not find evidence for it. One implication of our findings is that the failure of IMF programs to generate sustained inflows of international capital may have less to do with the IMF itself and more to do with the changing nature of international investment. Since the 1990s, FDI has diversified greatly in developing countries. Natural

resource FDI has declined as a proportion of overall FDI flows in these countries, and service sector investments have increased substantially (Blanton and Blanton 2007). As investment patterns change, large outflows of investments after crises and IMF interventions perhaps become more understandable.

Our findings also have implications for host country governments and international organizations. Greater attention should be paid to the specific types of investments entering developing countries before and after economic crises. If mobile firms with high external dependence do indeed anticipate crises and subsequent bailouts, it would suggest that these types of investments do not represent sustainable vehicles for industrial upgrading in fragile economies. High acceptance of risk and financial hedging against crises may produce outflows of investment. At minimum, analysts and policymakers alike should consider the types of investment common in crisis-hit countries and how these investors are likely to respond to an IMF agreement. Investment 'profiles' of individual countries will allow the IMF to craft more effective interventions and will allow governments to anticipate the uneven impact of a fund program across sectors. Ultimately, we look forward to additional and perhaps firm-level work that may clarify how different firms react to IMF intervention, based on other characteristics. By recognizing these heterogeneous impacts, we hope that policymakers will have more tools at their disposal to understand and address the repercussions of these investment shifts in domestic economies.

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The Catalytic Effect of IMF Lending: Evidence from Sectoral FDI Data

Supplementary Information

Our theory posits that two particular attributes of economic sectors matter: their reliance on external capital and their level of sunk costs. To differentiate our sectoral FDI data by these attributes we developed proxies using firm-level data. From these data, we constructed two sector-level approximations of firms' intrinsic demand for external financing. For the first, we used the measure developed in Rajan and Zingales (1998) and commonly applied since:

$$\frac{capital\ expenditures - cash\ flow}{capital\ expenditures}$$

Where overall cash flow = cash flow from operations + decreases in inventories + decreases in receivables + increases in payables. All data come from US firms with over 100 million sales in Compustat, managed by Wharton Research Data Services. Sectors were separated by three-digit NAICS codes, which were matched to the corresponding FDI sectors in the UNCTAD data.[1] We first calculated each firm's dependence on external finance, using all fiscal year firm records available from 1980 to 2010. We then determined sector-level medians for all sectors.[2] We use these median values as proxies for external finance demands by sector in all countries. The external finance measures therefore do not vary by country, vary a small amount over time, and vary greatly between sectors. While it would be desirable to have external finance measures that are country-specific, these data are not available. However, as Rajan and Zingales (1998) point out, the amount of external finance demanded by firms within industries is

[1] The concordance file for these matches is available in supporting information.

[2] The median level was used in order to reduce the influence of outliers. Information on the external dependence measure by sector is available in supplementary information.

likely to be similar across countries. Furthermore, external shocks within industries (technological advances, for example) that increase external finance demands are likely to do so within sectors across countries.

The second measure used to approximate reliance on external capital is a measure of short term debt. Because many multinational service firms do not rely heavily on maintaining a large physical inventory, traditional inventory-based measures of financing needs do not capture turnover in these firms. Many financial institutions, for example, require frequent infusions of cash. The ratio of short-term debt to sales is calculated using the ratio of average short-term borrowings to sales, which is one of the proxies for liquidity needs used in Raddatz (2006). This measure is particularly appropriate as it relays information about the actual use of external liquidity. As with the first measure, ratios are calculated for all firms and median values are organized by three-digit NAICS codes.

To rank economic sectors by sunk costs we adopted a similar approach, and collected from Compustat the median amount, by sector, spent by firms on property, plant, and equipment divided by sales (gross) in the same large sample of US firms.[3] The second sunk cost measure has the same numerator (amount spent on property, plant, and sales) scaled against thousands of employees. Although the two measures do correlate, the fixed assets of some sectors are better represented by one or the other measure.

We scored each sector, distinguished by NAICS three-digit code, on our four external finance and sunk cost measures. We excluded sectors with fewer than ten observations, and

[3] This measure reflects the real gross book value of property, plant, and equipment, but ignores depreciation and scrap value. Information on the sunk cost measure by sector is available in supplementary information, along with the second measure scaled against number of employees.

sectors that represented collections of firms not included in other categories.[4] The remaining sectors can be clearly differentiated along our dimensions of interest. We then sorted the sectors into four quadrants based on the following procedure. Any sector that fell outside one standard deviation of the mean for any of the four attributes was listed as a candidate for inclusion. Sectors were then allocated into quadrants based on whether they combined extreme measures for both sunk costs *and* dependence on external finance. This exercise yielded the sectors that we analyzed in all of our empirical tests. These sectors are described in the main article, in the data and method section.

Robustness tests

Foreign investors in different sectors respond in different ways to IMF agreements. In this section, we report the findings from a series of additional robustness tests. In our article, we use sectoral FDI data from UNCTAD. However, there are alternative sources of sectoral FDI data. We collected similar data from the US Bureau of Economic Analysis (BEA), which tracks the foreign investment position of American firms in different sectors over time. These data are unlike the UNCTAD data in that they represent only one sending country. The United States is historically the single largest source of foreign investment. Its outbound FDI has often been used in literature on the catalytic effect (Biglaiser and DeRouen 2010) and in literature concerning sectoral patterns of FDI (Blanton and Blanton 2009). Though the sectoral categories of the BEA do not exactly match the sectoral classification system of UNCTAD, there are enough similarities to form a basis for comparison. We collected BEA sectoral data for 53 countries between 1999 and 2008. These data include developed and developing countries and over-represents countries which receive substantial amounts of US investment compared to smaller

[4] This excludes sectors such as NAICS 812, other services. We also excluded wholesale trade sectors (420-454) and others not represented in FDI stock data.

and less developed countries. The BEA also classifies foreign investment as ownership or control of 10 percent or more of a foreign business. Investments are classified on a historical-cost position of firms, which is largely equivalent to FDI stock as it includes assets and equity. While there are differences in accounting practices between the BEA and UNCTAD, the series are roughly comparable as FDI stock by sector, through time.

Due to the smaller number of time periods, our BEA models failed to converge using the full specification. However, we were able to obtain results from a set of parsimonious models, which lagged dependent variables and our treatment for the endogenous IMF program variable.[5] The results do not conform to the results of the models using UNCTAD data. Participation in an IMF program not associated with FDI in any of the 18 sectors we analyzed. Nonetheless, these results should be interpreted with caution due to the relatively short time series and lack of correction for endogeneity bias.

We also tested our hypotheses using alternative dependent variables, namely the log transformation of raw FDI figures (not scaled against GDP) and differencing the various FDI stock indicators, which approximates FDI flow. These are not exact flow measures. First, FDI stock is usually measured in historical-cost position, which relays the "book value" of the investment. This is usually the sale price at the time of purchase, which does not take into account exchange rate fluctuation, appreciation of assets, or inflation (Blanton and Blanton 2009: 476). However, stock measures offer other advantages over flow measures, as referenced above. They better indicate the cumulative position of foreign investors over time, and are less volatile from year to year. Differencing the stock measures, while not ideal, does convey a sense of FDI flows by year. We present results of separate models, where differenced values are scaled against

[5] These models do still account for adverse selection effects in the selection equation.

GDP. These transformations did not appreciably alter our main findings. The same sectors exhibited anti-catalytic dynamics, at similar levels of statistical significance.

In their study on the relationship between democracy and the catalytic effect of IMF programs, Bauer et al. (2012) argue that the catalytic effect may not become apparent in the first year after program implementation. While our model allows us to make predictions about the catalytic effect in subsequent years (see Figure 1), we are also interested in smoothing the dependent variable as an additional check. We therefore created a three-year moving average of sectoral FDI/GDP, and tested this as an additional dependent variable. The moving average tests show anti-catalytic *and* catalytic effects in line with our theoretical framework. However, it should be emphasized that without a lagged dependent variable this model is a very different specification. In addition, we re-tested our findings across different IMF program types, substituting the IMF program variable for a dummy variable that captures country participation in a 'concessional' or 'non-concessional' IMF program. While we find stronger effects for concessional programs, it should be emphasized that sometimes our full specification would not converge using these data, so we employ basic specifications.

Beyond the BEA sectoral data, differenced dependent variables, and moving averages, we conducted a number of additional tests on our results – available on request. Some of the small, very open economies produce larger numbers for FDI/GDP, and these values have the potential to systematically influence models even while not being identified as strict outliers through normal procedures such as identifying influence and leverage. We therefore assembled additional models in which we dropped small states (with populations below two million) from the sample. These models were again consistent with our main results. As an additional precaution, we also estimated models without lagged dependent variables among the predictors.

Our original specifications may have yielded biased estimates because the lagged dependent variable is correlated with the error terms for earlier periods. Without the lagged dependent variable, some predictors yielded stronger associations. However, we view the imposed conservatism on a lagged dependent variable to be worth the cost in bias. We also repeated our models using an alternative specification that included only a minimal set of independent variables. These restricted models include only the lagged dependent variable, the GDP per capita variable, and the IMF program variable. Again, the results are consistent with the main models presented in our paper. IMF agreements are reliably associated with a decrease in some forms of FDI, in particular investments in sectors with low sunk costs-and high dependence on external finance.

Table A1. Descriptive statistics

Variable	Mean	S.D.	Min.	Max.	*N*
IMF Program (dummy)	0.32	0.47	0	1	1740
Logged and Scaled FDI Variables					
Coke, petroleum products and nuclear fuel	-5.47	2.10	-18.81	-2.49	190
Mining and quarrying	-4.97	2.48	-16.76	-.056	468
Wood and wood products	-5.96	1.48	-11.12	-2.56	309
Electricity, gas and water	-5.99	2.94	-14.00	-1.89	352
Trade	-4.47	1.60	-11.45	-.83	528
Business activities	-4.92	2.06	-11.63	-.78	409
Construction	-6.40	1.70	-11.46	-1.82	453
Chemicals and chemical products	-4.93	1.26	-8.38	-1.15	315
Finance	-3.64	1.42	-8.69	-.02	546
Machinery and equipment	-6.22	1.94	-11.58	-1.42	275
Textiles, clothing and leather	-6.41	1.67	-12.15	-2.13	323
FDI/GDP (standardized)	0	1	-3.16	9.90	1409
GDP Per Capita (thousands, $)	5.45	6.56	0.18	51.72	1676
GDP (log)	10.4	1.52	7.22	13.84	1676
Growth (%) (standardized)	0	1	-7.64	14.25	1495
Trade/GDP (log)	4.26	0.60	2.45	6.1	1493
Government consum. (billions)	15.27	28.30	0.04	195.42	1656
Chinn Ito Index	0	1.50	-1.88	2.42	1426
Checks	2.60	1.83	0	9	1643
USAID (billions)	0.05	0.17	-0.38	2.25	1740

Table A2. Countries in sample and number of observations by sector

	30200	20200	20900	30600	31000	30900	30100	10200	30500
Country	Construction	Textiles, Clothing and Leather	Metal and Metal Products	Finance	Community and Social Services	Health and Social Services	Electricity, Gas, and Water	Mining and Petroleum	Transport, Storage, and Communications
Albania	8	2	2	8	8	5	7	8	8
Argentina	13	24	25	25	5	0	17	25	25
Armenia	9	10	10	11	10	6	10	10	10
Azerbaijan	0	0	0	0	0	0	0	4	0
Bangladesh	0	14	14	10	0	10	11	14	14
Bolivia	11	11	11	11	0	0	0	12	11
Bosnia and Her.	6	3	6	6	3	0	3	6	6
Botswana	12	0	0	12	0	1	5	12	12
Brazil	6	21	21	21	21	6	21	21	21
Bulgaria	10	1	1	10	10	10	10	10	10
Cambodia	0	15	0	15	0	0	0	0	13
Chile	3	0	0	3	0	0	3	3	3
Colombia	7	0	0	7	7	0	7	7	7
Croatia	10	9	9	10	9	6	9	10	10
Cyprus	6	6	6	6	5	2	6	6	6
Czech Republic	11	11	11	11	11	11	11	11	11
El Salvador	9	0	0	9	0	0	9	9	9
Estonia	11	0	0	11	11	11	11	11	11
Greece	6	4	4	6	0	0	6	6	6
Hungary	12	12	12	12	0	1	12	12	12
Indonesia	4	4	4	0	0	0	0	4	4
Ireland	0	4	4	5	0	0	0	0	5
Israel	9	9	9	9	1	8	6	9	9
Kazakhstan	13	13	14	15	5	0	12	15	14
Kenya	3	0	0	3	0	2	3	2	3
Latvia	9	9	9	9	9	9	9	9	9
Lithuania	13	13	12	13	0	0	13	13	13
Madagascar	7	0	0	7	0	0	7	7	7
Malawi	3	0	0	7	1	1	0	0	7
Malaysia	17	0	0	17	0	0	0	17	1
Moldova	5	5	5	5	5	5	5	4	5
Morocco	7	0	0	7	0	0	0	7	7

Namibia	11	0	0	11	0	0	0	11	11
Nigeria	0	0	0	0	0	0	0	16	0
Oman	4	0	0	6	0	0	6	6	4
Pakistan	22	14	13	22	4	4	14	19	22
Panama	7	0	0	15	10	0	7	0	15
Papua New Guinea	0	0	0	21	0	0	0	21	21
Paraguay	13	13	7	13	5	0	9	0	13
Peru	29	0	0	29	0	0	29	29	29
Poland	13	13	13	13	0	0	13	13	13
Portugal	14	9	9	14	9	1	14	9	14
Romania	6	6	6	6	4	4	6	6	6
Singapore	29	29	29	29	0	0	0	18	29
Slovenia	15	15	15	15	15	15	15	12	15
South Africa	14	0	0	14	14	0	8	14	14
Sri Lanka	0	7	7	0	0	0	0	0	0
Thailand	8	8	8	8	0	0	0	8	8
Turkey	9	9	9	9	9	9	9	9	9
Uganda	9	0	0	9	9	0	9	9	9
Ukraine	15	9	15	15	15	15	9	9	15
Vietnam	8	0	0	8	0	0	0	8	8

Table A3. Sunk costs by sector

3-digit NAICS	Label	Frequency in Compustat	Percent	Median of ratio of property, plant, equipment, buildings (net) to sales	Observations	Median of ratio of property, plant, equipment, buildings (net) to thousands of employees
111	Agriculture and Forestry	592	0.18	0.341453	253	32.86805
112	Agriculture and Forestry	170	0.05	0.269116	42	73.86655
113	Agriculture and Forestry	165	0.05	2.196446	59	420.3389
211	Oil, Gas, and Mining	8,482	2.64	2.07457	2,562	1818.565
212	Oil, Gas, and Mining	4,070	1.27	1.065586	1,664	217.2533
213	Oil, Gas, and Mining	1,646	0.51	0.883883	1,000	135.4968
221	Utilities, Electricity, Gas, and Water	10,305	3.21	1.667908	8,738	684.0104
233	Construction	1,060	0.33	0.044044	411	13.67918
234	Construction	255	0.08	0.148556	126	22.48001
235	Construction	358	0.11	0.041327	125	4.722946
236	Construction	839	0.26	0.020163	625	13.10278
237	Construction	1,170	0.36	0.167428	571	37.15583
238	Construction	346	0.11	0.157366	181	20.19724
311	Food, Beverages, and Tobacco	4,073	1.27	0.221791	2,767	38.94499
312	Food, Beverages, and Tobacco	1,527	0.47	0.283924	1,093	71.06126
313	Textiles, Clothing, and Leather	907	0.28	0.261253	669	25.88216
314	Textiles, Clothing, and Leather	349	0.11	0.201518	259	23.69831
315	Textiles, Clothing, and Leather	2,423	0.75	0.106623	1,588	12.9209
316	Textiles, Clothing, and Leather	842	0.26	0.078477	481	16.27668
321	Wood and Wood Products	1,260	0.39	0.177201	739	28.20665
322	Publishing, Printing, and Recorded Media	2,116	0.66	0.504061	1,615	91.3403
323	Publishing, Printing, and Recorded Media	1,292	0.4	0.232724	774	27.95688
324	Coke, Petroleum Products, and Nuclear Fuel	1,546	0.48	0.40979	1,261	264.5873
325	Chemicals and Chemical Products	19,095	5.94	0.294358	7,146	70.21091
326	Rubber and Plastic	2,700	0.84	0.271294	1,301	43.50703
327	Non-metallic Mineral Products	1,643	0.51	0.435815	1,005	69.27027
330	Metal and Metal Products	22	0.01	0.050853	21	4.153892
331	Metal and Metal Products	2,974	0.93	0.368613	2,391	81.01945
332	Metal and Metal Products	3,762	1.17	0.224048	2,180	31.53371
333	Machinery and Equipment	9,875	3.07	0.186902	4,837	29.43444
334	Electrical and Electronic Equipment	27,629	8.59	0.164523	10,680	28.67482
335	Electrical and Electronic Equipment	3,964	1.23	0.192314	1,857	27.50151
336	Motor Vehicles and Transport Equipment	5,357	1.67	0.20178	3,759	29.70432

337	Motor Vehicles and Transport Equipment	1,316	0.41	0.177416	861	19.2516
481	Transport, Storage, and Communications	1,519	0.47	0.595862	1,193	90.4901
482	Transport, Storage, and Communications	723	0.22	1.738223	599	208.8555
483	Transport, Storage, and Communications	1,118	0.35	1.80072	785	419.8029
484	Transport, Storage, and Communications	1,297	0.4	0.343113	951	36.82
485	Transport, Storage, and Communications	112	0.03	0.428391	83	28.05458
486	Transport, Storage, and Communications	1,163	0.36	1.146403	953	727.3553
487	Transport, Storage, and Communications	41	0.01	0.931685	17	97.85175
488	Transport, Storage, and Communications	751	0.23	0.126344	403	20.98656
492	Transport, Storage, and Communications	352	0.11	0.292333	255	27.76857
493	Transport, Storage, and Communications	91	0.03	0.436491	43	68.80066
522	Finance	49,221	15.31	0.158724	36,735	41.13415
523	Finance	6,694	2.08	0.069155	3,855	29.78872
524	Finance	9,790	3.05	0.038811	7,924	17.67994
525	Finance	18,402	5.72	0.031142	16,416	0
531	Business Activities	7,781	2.42	0.19277	4,235	3.460638
532	Business Activities	1,758	0.55	1.129116	1,061	178.6226
533	Business Activities	2,062	0.64	0.105932	277	30.67777
561	Community, Social, and Personal Service	4,167	1.3	0.06182	2,181	8.488158
562	Community, Social, and Personal Service	1,383	0.43	0.648371	511	86.55309
611	Education	877	0.27	0.179357	433	22.0432
621	Health and Social Services	3,264	1.02	0.104457	1,279	14.81842
622	Health and Social Services	784	0.24	0.541421	498	44.17756
623	Health and Social Services	814	0.25	0.456469	490	15.58572
624	Health and Social Services	178	0.06	0.285701	85	8.508696
721	Hotels and Restaurants	1,946	0.61	1.219461	1,008	80.97986
722	Hotels and Restaurants	3,710	1.15	0.412447	1,954	13.9

Note: Sunk cost measures for companies with greater than US$100 million sales

Table A4. Dependence on external finance measures by sector

3-digit NAICS	Label	Frequency in Compustat	Percent	Median dependence on external finance	Observations	Median average ratio of short term debt to sales
111	Agriculture and Forestry	592	0.18	1.251875	253	0.044676
112	Agriculture and Forestry	170	0.05	0.997998	42	0.126992
113	Agriculture and Forestry	165	0.05	0.98087	59	
211	Oil, Gas, and Mining	8,482	2.64	1.005693	2,562	0.006555
212	Oil, Gas, and Mining	4,070	1.27	1.055607	1,664	0.000385
213	Oil, Gas, and Mining	1,646	0.51	1.097276	1,000	0.00327
221	Utilities, Electricity, Gas, and Water	10,305	3.21	0.962349	8,738	0.026945
233	Construction	1,060	0.33	3.16427	411	0.022719
234	Construction	255	0.08	1.321334	126	0.012939
235	Construction	358	0.11	1.845726	125	0.01411
236	Construction	839	0.26	5.977028	625	0.02386
237	Construction	1,170	0.36	1.216202	571	0.008063
238	Construction	346	0.11	1.181818	181	0.002973
311	Food, Beverages, and Tobacco	4,073	1.27	1.136258	2,767	0.017428
312	Food, Beverages, and Tobacco	1,527	0.47	1.107559	1,093	0.011929
313	Textiles, Clothing, and Leather	907	0.28	1.077125	669	0.011144
314	Textiles, Clothing, and Leather	349	0.11	1.126996	259	0.015526
315	Textiles, Clothing, and Leather	2,423	0.75	1.362105	1,588	0.026679
316	Textiles, Clothing, and Leather	842	0.26	1.476738	481	0.020291
321	Wood and Wood Products	1,260	0.39	1.073456	739	0.002899
322	Publishing, Printing, and Recorded Media	2,116	0.66	1.075791	1,615	0.008693
323	Publishing, Printing, and Recorded Media	1,292	0.4	1.114708	774	0.004414
324	Coke, Petroleum Products, and Nuclear Fuel	1,546	0.48	1.05137	1,261	0.016646
325	Chemicals and Chemical Products	19,095	5.94	1.205815	7,146	0.015218
326	Rubber and Plastic	2,700	0.84	1.123217	1,301	0.008522
327	Non-metallic Mineral Products	1,643	0.51	1.082786	1,005	0.013952
330	Metal and Metal Products	22	0.01	2.997099	21	0.000508
331	Metal and Metal Products	2,974	0.93	1.15895	2,391	0.013585
332	Metal and Metal Products	3,762	1.17	1.196051	2,180	0.013628
333	Machinery and Equipment	9,875	3.07	1.288925	4,837	0.015099
334	Electrical and Electronic Equipment	27,629	8.59	1.262428	10,680	0.003493
335	Electrical and Electronic Equipment	3,964	1.23	1.248663	1,857	0.016159
336	Motor Vehicles and Transport Equipment	5,357	1.67	1.15724	3,759	0.012408
337	Motor Vehicles and Transport Equipment	1,316	0.41	1.126667	861	0.003429
481	Transport, Storage, and Communications	1,519	0.47	0.984378	1,193	0.005363
482	Transport, Storage, and Communications	723	0.22	1.010749	599	0.000462

483	Transport, Storage, and Communications	1,118	0.35	1.00394	785	
484	Transport, Storage, and Communications	1,297	0.4	1.048046	951	
485	Transport, Storage, and Communications	112	0.03	1.007169	83	0.000053
486	Transport, Storage, and Communications	1,163	0.36	0.926957	953	0.018104
487	Transport, Storage, and Communications	41	0.01	1.024361	17	
488	Transport, Storage, and Communications	751	0.23	1.236436	403	0.001744
492	Transport, Storage, and Communications	352	0.11	1.109892	255	0.007402
493	Transport, Storage, and Communications	91	0.03	1.059704	43	0.013451
522	Finance	49,221	15.31	1.002657	36,735	1.085556
523	Finance	6,694	2.08	1.243974	3,855	
524	Finance	9,790	3.05	1.460822	7,924	
525	Finance	18,402	5.72	1.016244	16,416	0.104305
531	Business Activities	7,781	2.42	1.034168	4,235	0.003715
532	Business Activities	1,758	0.55	1.012201	1,061	0.085413
533	Business Activities	2,062	0.64	1.135323	277	
561	Community, Social, and Personal Service	4,167	1.3	1.259388	2,181	0.001234
562	Community, Social, and Personal Service	1,383	0.43	1.092168	511	0.003387
611	Education	877	0.27	1.334836	433	
621	Health and Social Services	3,264	1.02	1.376242	1,279	0.000122
622	Health and Social Services	784	0.24	1.604944	498	0.00277
623	Health and Social Services	814	0.25	1.267676	490	0.001222
624	Health and Social Services	178	0.06	1.059318	85	0.016003
721	Hotels and Restaurants	1,946	0.61	1.003673	1,008	0.008135
722	Hotels and Restaurants	3,710	1.15	0.997332	1,954	0.000003

Note: External finance measures for companies with greater than US$100 million sales

Table A5. IMF programs and overall Foreign Direct Investment/GDP

	(1) Outcome equation (1)		(2) Selection equation (2)
FDI/GDP	0.530***	IMF PROGRAM	2.134**
	(0.029)		(0.835)
GDPPC	0.086	RESERVES	-0.033***
	(0.078)		(0.012)
GDP	-1.093	INFLATION	0.029
	(0.827)		(0.042)
GROWTH	-0.021	GDPPC	-0.101***
	(0.025)		(0.021)
TRADE/GDP	0.013*	GDP	0.043
	(0.007)		(0.062)
GOVCON	-0.024	GROWTH	-0.042***
	(0.014)		(0.016)
WORLD FDI	-0.005***	IMF*RESERVES	0.040***
	(0.001)		(0.015)
KAOPEN	0.288**	IMF*INFLATION	-0.438**
	(0.121)		(0.201)
CHECKS	0.052	IMF*GDPPC	0.033
	(0.089)		(0.039)
USAID	0.006	IMF*GDP	-0.084
	(0.717)		(0.086)
IMF PROGRAM	-0.885**	IMF*GROWTH	0.015
	(0.447)		(0.022)
Observations	1,059		
Country FE	YES		
Year FE	YES		
LDV	YES		
Log p. likelihood	-3015		
lambda	0.64		
sigma	2.83		
rho			
Wald chi2	2202		
Prob. > chi2	0.000		
Wald test of indep.	4.24		
Prob. > chi2	0.040		

Country and year dummies not displayed. Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Selection equation findings/discussion

Table 2 presents probit estimates for the selection equation (Eq. 2) and employs the same specification as Baur et al. (2012). It confirms the general finding in the literature that IMF programs are, on average, associated with a decrease in foreign direct investment stock as a percentage of GDP. The Wald test of the independence of equations suggests that the same factors which influence participation in an IMF program also influence FDI inflows directly, lending support to our decision to use this econometric approach to address selection bias. The specification includes several of the leading determinants of IMF program participation; namely international reserves, consumer price inflation, GDP per capita, GDP, and lagged IMF participation. We rely on this relatively parsimonious specification in order to preserve sample size. Nonetheless, it performs relatively well, making accurate predictions 83.76% of the time.

In the selection equation, the coefficient on IMF program is the impact of being under an IMF program at time t-1 on the probability of continuing to remain under an IMF program at time t. The coefficients related to non-interacted terms are estimates of the impact of indicator X_i on the probability of participating in an IMF program when a country is currently not participating in an IMF program. The coefficients on these indicators are largely in the right direction; lagged participation predicts future participation, an increase in international reserves reduces the likelihood of participation, as does higher economic growth and national income.

The coefficients on the interacted terms are the difference between the impact of the X*i* indicators when a country is already participating compared to when a country is not already participating. Thus, the interactive terms help us to identify whether the factors that

determine initial participation are different from continuation. Two of the interactive terms are statistically significant, suggesting that this is the most likely the case.

Table A6 BEA log of Foreign Direct Investment/GDP part I

	(1) Total manufacturing	(2) Manufacturing food	(3) Manufacturing chemicals	(4) Manufacturing fabricated metals	(5) Manufacturing machinery	(6) Manufacturing computers electronics	(7) Manufacturing electrical appliances	(8) Manufacturing transportation equipment
FDI/GDP	-0.09***	-0.004	0.04	-0.12*	0.07	-0.03	-0.17	0.004
	(0.033)	(0.087)	(0.045)	(0.067)	(0.072)	(0.067)	(0.144)	(0.066)
GDPPC	0.02	-0.14	-0.06	0.03	0.13***	-0.14***	0.05	-0.29***
	(0.040)	(0.096)	(0.039)	(0.113)	(0.049)	(0.050)	(0.099)	(0.083)
GDP	0.17	3.16	1.67*	4.14**	-1.87	-3.05*	-3.78	5.95***
	(0.922)	(2.469)	(0.952)	(1.876)	(1.565)	(1.826)	(2.444)	(1.874)
GROWTH	-0.06	-0.33*	-0.03	-0.14	-0.18*	-0.08	-0.24	-0.16
	(0.056)	(0.167)	(0.073)	(0.171)	(0.109)	(0.135)	(0.225)	(0.158)
TRADE/GDP	0.19	-1.18*	-0.22	-0.19	-0.82*	0.71	0.40	-0.47
	(0.230)	(0.614)	(0.313)	(0.833)	(0.427)	(0.697)	(1.398)	(0.846)
GOVCON	0.01	0.01	0.01	0.06*	-0.01	-0.03	-0.04	-0.04
	(0.011)	(0.016)	(0.009)	(0.031)	(0.012)	(0.031)	(0.025)	(0.022)
KAOPEN	0.11***	0.08	0.02	-0.05	-0.03	0.36***	0.06	0.16
	(0.034)	(0.092)	(0.038)	(0.123)	(0.077)	(0.097)	(0.142)	(0.133)
CHECKS	0.03	-0.09	-0.12***	-0.03	-0.14**	-0.01	-0.19	0.10
	(0.030)	(0.087)	(0.039)	(0.110)	(0.058)	(0.092)	(0.158)	(0.077)
USAIB	-0.24	-0.41	-0.57	-1.07	0.58	0.75	-1.94	-2.13
	(0.216)	(0.247)	(0.383)	(0.759)	(0.476)	(0.761)	(1.461)	(3.292)
IMF PROG.	0.18	-0.03	0.13	0.16	0.05	0.26	-0.22	-0.04
	(0.107)	(0.224)	(0.094)	(0.303)	(0.226)	(0.292)	(0.399)	(0.231)
Observations	198	166	188	139	143	131	97	108
R-squared	0.934	0.748	0.924	0.762	0.945	0.963	0.870	0.858
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
LDV	NO	NO	NO	NO	NO	NO	NO	NO

Fixed effects estimates (uncorrected for selection effects). Robust standard errors in parentheses
*** p<0.01, ** p<0.05

Table A7 BEA log of Foreign Direct Investment/GDP part II

	(9) Manufacturing other manufacturing	(10) Manufacturing all industries	(11) Mining	(12) Utilities	(13) Wholesale trade	(14) Information	(15) Depository institutions	(16) Finance insurance	(17) Professional scientific services	(18) Holding companies
FDI/GDP	-0.11*	0.01	0.25***	0.28	0.06	0.08	0.11	0.03	-0.11	0.26
	(0.062)	(0.021)	(0.073)	(1.159)	(0.052)	(0.053)	(0.118)	(0.032)	(0.072)	(0.188)
GDPPC	0.10	0.07**	0.23*	-3.15	-0.02	0.14**	-0.04	0.09**	0.02	0.04
	(0.127)	(0.028)	(0.137)	(2.188)	(0.042)	(0.066)	(0.065)	(0.038)	(0.071)	(0.187)
GDP	-4.53	1.74**	-2.97	22.21	1.20	-0.76	6.73***	1.13	2.68	-1.20
	(3.222)	(0.725)	(2.159)	(36.248)	(1.253)	(2.065)	(1.598)	(0.939)	(2.163)	(5.431)
GROWTH	-0.51	-0.01	-0.02	-0.33	-0.04	0.003	-0.21**	-0.03	0.07	-0.13
	(0.396)	(0.061)	(0.164)	(2.199)	(0.096)	(0.158)	(0.085)	(0.091)	(0.160)	(0.273)
TRADE/GDP	0.36	0.13	1.47**	-3.10	0.63	-0.95	-1.03**	-0.10	-0.64	-0.51
	(1.165)	(0.240)	(0.660)	(4.594)	(0.544)	(0.711)	(0.392)	(0.385)	(0.571)	(2.078)
GOVCON	0.04	0.02**	0.05**	0.04	0.02	0.03*	0.01	0.04***	-0.01	0.01
	(0.030)	(0.010)	(0.022)	(0.602)	(0.018)	(0.018)	(0.013)	(0.012)	(0.018)	(0.049)
KAOPEN	-0.16	0.04	-0.01	0.21	0.10	-0.01	-0.02	0.08*	0.13	0.01
	(0.299)	(0.028)	(0.119)	(0.323)	(0.067)	(0.101)	(0.044)	(0.044)	(0.084)	(0.442)
CHECKS	0.07	0.05*	0.10	0.02	0.12**	-0.01	0.01	0.01	-0.07	-0.05
	(0.104)	(0.028)	(0.071)	(0.656)	(0.060)	(0.088)	(0.048)	(0.035)	(0.068)	(0.189)
USAIB	-2.33	-0.15	0.49	-19.14	-1.02***	-0.50	0.27	0.94***	0.60	-0.45
	(1.386)	(0.139)	(0.812)	(15.957)	(0.284)	(0.617)	(1.233)	(0.257)	(0.386)	(0.906)
IMF PROG.	0.07	0.23**	0.11	-0.87	0.09	0.27	0.14	0.13	-0.31	0.22
	(0.275)	(0.109)	(0.283)	(1.540)	(0.152)	(0.280)	(0.192)	(0.107)	(0.284)	(0.546)
Observations	74	202	132	31	191	149	94	167	169	67
R-squared	0.913	0.955	0.933	0.990	0.799	0.915	0.959	0.957	0.858	0.946
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
LDV	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Fixed effects estimates (uncorrected for selection effects). Robust standard errors in parentheses
*** p<0.01, ** p<0.05

Table A8 Log of FDI (raw/unscaled)

	(1) Construction	(2) Textiles, clothing and leather	(3) Metal and metal products	(4) Finance	(5) Community, and social services	(6) Health and social services	(7) Electricity, Gas, and Water	(8) Mining and petroleum	(9) Transport
FDI/GDP	0.001	0.004	-0.05**	-0.004	-0.02	0.40***	0.06	0.05	0.05
	(0.034)	(0.022)	(0.025)	(0.017)	(0.097)	(0.143)	(0.053)	(0.038)	(0.039)
GDPPC	-0.03	-0.05***	0.01	-0.01	-0.22***	0.09	0.15**	0.06	-0.03
	(0.027)	(0.019)	(0.028)	(0.011)	(0.075)	(0.121)	(0.073)	(0.050)	(0.016)
GDP	0.33	0.73**	-0.55	0.55**	-0.45	-0.47	-0.33	-0.46	0.17
	(0.392)	(0.309)	(0.409)	(0.244)	(0.991)	(2.066)	(0.451)	(0.381)	(0.248)
GROWTH	0.03	0.08*	0.08*	0.02	-0.04	0.01	0.01	0.01	0.07*
	(0.041)	(0.040)	(0.049)	(0.024)	(0.151)	(0.182)	(0.097)	(0.048)	(0.040)
TRADE/GDP	0.08	0.54***	-0.0008	0.05	0.99	1.65	-1.14**	-0.001	0.03
	(0.232)	(0.166)	(0.187)	(0.097)	(0.850)	(1.686)	(0.475)	(0.214)	(0.147)
GOVCON	-0.03*	0.002	-0.002	-0.001	-0.03	0.12**	-0.004	-0.01*	-0.0003
	(0.016)	(0.004)	(0.003)	(0.003)	(0.036)	(0.050)	(0.006)	(0.005)	(0.003)
KAOPEN	0.13***	0.04	0.05	0.10***	0.13	-0.11	-0.04	-0.0003	0.05*
	(0.045)	(0.026)	(0.031)	(0.022)	(0.130)	(0.303)	(0.080)	(0.043)	(0.030)
CHECKS	0.05	0.02	-0.03	0.01	-0.18**	-0.05	0.08**	0.03	-0.02
	(0.037)	(0.022)	(0.027)	(0.016)	(0.088)	(0.097)	(0.037)	(0.025)	(0.019)
USAIB	-1.72***	0.09	-0.90*	-0.28	-0.48	0.33	0.41	0.37	0.41*
	(0.467)	(0.387)	(0.467)	(0.382)	(1.302)	(0.556)	(0.488)	(0.469)	(0.230)
IMF PROG.	-0.58***	0.08	-0.27**	-0.23**	0.03	0.07	-0.25	0.02	0.14
	(0.190)	(0.182)	(0.117)	(0.093)	(0.156)	(0.198)	(0.186)	(0.121)	(0.120)
Observations	370	269	254	453	172	109	298	381	439
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
LDV	YES	YES	YES	YES	YES	YES	YES	YES	YES
ll	-360	-134	-173	-226	-123	-102	-390	-394	-350
lambda	0.37	-0.031	0.15	0.18	.	.	0.12	-0.0078	-0.012
sigma	0.51	0.29	0.36	0.30	.	.	0.63	0.46	0.37
rho	0.73	-0.11	0.42	0.59	.	.	0.19	-0.017	-0.033
Wald chi2	26512	52106	41278	63272	.	.	118393	10644	79226
Wald test	7.65	0.058	6.43	7.07	.	.	1.68	0.013	0.032

Prob. > chi2	0.0057	0.81	0.011	0.0078	.	.	0.19	0.91	0.86
R-squared					0.936	0.935			

Robust standard errors in parentheses
*** p<0.01, ** p<0.05

Table A9 Change in FDI/GDP

	(1) Construction	(2) Textiles, clothing and leather	(3) Metal and metal products	(4) Finance	(5) Community, and social services	(6) Health and social services	(7) Electricity, Gas, and Water	(8) Mining and petroleum	(9) Transport
FDI/GDP	0.003	0.01	-0.05**	-0.003	-0.02	0.40***	0.06	0.05	0.05
	(0.034)	(0.022)	(0.025)	(0.017)	(0.098)	(0.143)	(0.053)	(0.038)	(0.039)
GDPPC	-0.03	-0.05***	0.01	-0.01	-0.21***	0.10	0.16**	0.07	-0.02
	(0.027)	(0.019)	(0.028)	(0.011)	(0.075)	(0.120)	(0.073)	(0.050)	(0.016)
GDP	0.01	0.35	-0.86**	0.32	-0.84	-0.87	-0.61	-0.63*	-0.0002
	(0.377)	(0.293)	(0.395)	(0.217)	(1.024)	(2.023)	(0.458)	(0.382)	(0.237)
GROWTH	0.02	0.07*	0.07	0.01	-0.05	0.01	-0.01	-0.001	0.06
	(0.042)	(0.041)	(0.050)	(0.024)	(0.149)	(0.181)	(0.096)	(0.048)	(0.039)
TRADE/GDP	0.03	0.49***	-0.06	0.03	0.90	1.54	-1.19**	-0.04	0.0006
	(0.229)	(0.162)	(0.189)	(0.098)	(0.841)	(1.678)	(0.472)	(0.213)	(0.145)
GOVCON	-0.02	0.002	-0.001	-0.0002	-0.03	0.13**	-0.003	-0.01	0.0004
	(0.016)	(0.004)	(0.003)	(0.003)	(0.036)	(0.049)	(0.006)	(0.005)	(0.003)
KAOPEN	0.13***	0.04	0.05*	0.10***	0.13	-0.09	-0.04	-0.004	0.05*
	(0.044)	(0.025)	(0.031)	(0.021)	(0.131)	(0.301)	(0.080)	(0.042)	(0.030)
CHECKS	0.05	0.02	-0.03	0.01	-0.17**	-0.05	0.08**	0.03	-0.02
	(0.038)	(0.023)	(0.028)	(0.016)	(0.085)	(0.097)	(0.037)	(0.025)	(0.018)
USAIB	-1.73***	0.08	-0.89*	-0.29	-0.52	0.30	0.40	0.32	0.41*
	(0.464)	(0.391)	(0.467)	(0.378)	(1.290)	(0.555)	(0.488)	(0.468)	(0.231)
IMF PROG.	-0.59***	0.05	-0.27**	-0.24***	0.04	0.09	-0.25	0.002	0.13
	(0.186)	(0.138)	(0.119)	(0.090)	(0.155)	(0.198)	(0.183)	(0.119)	(0.119)
Observations	370	269	254	453	172	109	298	381	439
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
LDV	YES	YES	YES	YES	YES	YES	YES	YES	YES
ll	-358	-134	-175	-225	-122	-101	-389	-393	-346
lambda	0.38	-0.013	0.16	0.18	.	.	0.13	-0.00055	-0.0048
sigma	0.51	0.29	0.36	0.30	.	.	0.63	0.46	0.37
rho	0.75	-0.047	0.43	0.61	.	.	0.21	-0.0012	-0.013

chi2	1934	5050	1886	530	.	.	900	176	265
chi2_c	8.09	0.022	6.33	7.96	.	.	2.03	0.000068	0.0050
p_c	0.0044	0.88	0.012	0.0048	.	.	0.15	0.99	0.94
R-squared					0.582	0.467			

Selection equation not displayed. Robust standard errors in parentheses
*** p<0.01, ** p<0.05

Table A10 FDI/GDP three year moving average

	(1) Construction	(2) Textiles, clothing and leather	(3) Metal and metal products	(4) Finance	(5) Community, and social services	(6) Health and social services	(7) Electricity, Gas, and Water	(8) Mining and petroleum	(9) Transport
FDI/GDP	-0.002	-0.03	-0.04	0.03	0.03	0.26***	-0.07	0.05	0.08
	(0.037)	(0.021)	(0.028)	(0.026)	(0.077)	(0.092)	(0.058)	(0.048)	(0.055)
GDPPC	-0.09**	-0.06***	-0.02	0.02	-0.20**	0.09	0.33***	0.11*	-0.06*
	(0.041)	(0.018)	(0.036)	(0.021)	(0.082)	(0.092)	(0.114)	(0.068)	(0.032)
GDP	0.01	0.21	-1.15*	0.24	0.19	-0.14	2.13*	-0.81*	0.68
	(0.671)	(0.302)	(0.633)	(0.335)	(1.348)	(2.333)	(1.101)	(0.486)	(0.624)
GROWTH	0.16***	0.06	0.03	0.02	0.28**	0.14	-0.16	0.10	0.19***
	(0.061)	(0.043)	(0.055)	(0.038)	(0.135)	(0.155)	(0.136)	(0.063)	(0.067)
TRADE/GDP	-0.43	0.84***	-0.14	-0.05	-1.35	-1.15	-0.42	-0.46*	0.09
	(0.314)	(0.213)	(0.326)	(0.192)	(0.963)	(0.795)	(0.698)	(0.275)	(0.308)
GOVCON	-0.02	-0.0006	-0.004	0.01**	0.04	0.16***	-0.02*	-0.01	-0.003
	(0.021)	(0.003)	(0.004)	(0.004)	(0.038)	(0.035)	(0.010)	(0.006)	(0.008)
KAOPEN	0.31***	0.02	0.14***	0.21***	0.22**	0.10	0.24**	-0.03	0.43***
	(0.059)	(0.041)	(0.039)	(0.032)	(0.107)	(0.140)	(0.107)	(0.054)	(0.069)
CHECKS	0.11***	0.10***	-0.01	0.01	0.11	-0.002	0.04	0.07**	0.01
	(0.036)	(0.026)	(0.029)	(0.022)	(0.081)	(0.065)	(0.057)	(0.032)	(0.037)
USAIB	-2.51***	-0.46**	-0.66**	-1.89***	-1.46	0.63	-0.56	0.52	0.48
	(0.794)	(0.222)	(0.284)	(0.341)	(1.418)	(0.747)	(0.675)	(0.573)	(0.471)
IMF PROG.	-0.71***	-0.26***	-0.42**	-0.08	-0.06	0.07	0.39	0.54***	0.49**
	(0.181)	(0.095)	(0.170)	(0.105)	(0.138)	(0.170)	(0.719)	(0.168)	(0.198)
Observations	334	245	230	416	151	94	264	346	400
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
LDV	YES	YES	YES	YES	YES	YES	YES	YES	YES

ll	-328	-134	-147	-281	-67.7	-38.8	-396	-408	-476
lambda	0.28	0.028	0.16	0.067	.	.	-0.19	-0.22	-0.13
sigma	0.51	0.31	0.36	0.34	.	.	0.79	0.56	0.57
rho	0.56	0.091	0.43	0.20	.	.	-0.24	-0.39	-0.24
chi2	22697	69203	.	20289	.	.	.	5539	44149
chi2_c	7.05	0.31	3.03	1.81	.	.	0.14	4.26	1.99
p_c	0.0079	0.58	0.082	0.18	.	.	0.71	0.039	0.16
R-squared					0.966	0.952			

Selection equation not displayed. Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A11. Concessional and non-concessional programs

VARIABLES	(1) Construction	(2) Metal	(3) Finance	(4) Construction	(5) Metal	(6) Finance
FDI/GDP	-0.004	-0.05	0.0003	-0.01	-0.05	-0.002
	(0.041)	(0.034)	(0.021)	(0.040)	(0.035)	(0.021)
GDPPC	-0.03	-0.01	-0.01	-0.03	0.01	-0.01
	(0.028)	(0.025)	(0.014)	(0.028)	(0.025)	(0.014)
GDP	0.31	-0.61	0.41**	0.19	-0.73*	0.44**
	(0.406)	(0.407)	(0.200)	(0.424)	(0.430)	(0.203)
GROWTH	0.03	0.07	0.01	0.02	0.08	0.003
	(0.057)	(0.048)	(0.026)	(0.056)	(0.049)	(0.026)
TRADE/GDP	0.08	-0.26	-0.05	0.09	-0.14	-0.02
	(0.262)	(0.249)	(0.117)	(0.255)	(0.250)	(0.114)
GOVCON	-0.03*	-0.002	0.0005	-0.03**	0.0007	0.0007
	(0.017)	(0.005)	(0.003)	(0.016)	(0.005)	(0.003)
KAOPEN	0.11**	0.04	0.09***	0.12**	0.04	0.09***
	(0.049)	(0.045)	(0.023)	(0.049)	(0.046)	(0.023)
CHECKS	0.04	-0.01	0.01	0.05	-0.02	0.01
	(0.029)	(0.025)	(0.014)	(0.030)	(0.025)	(0.014)
USAID	-1.76***	-1.08***	-0.37*	-1.79***	-0.88***	-0.32
	(0.343)	(0.276)	(0.202)	(0.350)	(0.274)	(0.199)
CONCESSIONAL	-0.47**	-0.50***	-0.28***			
	(0.196)	(0.156)	(0.098)			
NON-CONCESS.				-0.28**	-0.09	-0.13*
				(0.140)	(0.110)	(0.069)
Observations	370	254	453	370	254	453
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
LDV	YES	YES	YES	YES	YES	YES
rho	0.70	0.23	0.39	0.38	0.32	0.49
Wald chi2	4327	7990	9979	4357	7724	9888
Wald test of indep.	5.79	1.07	4.30	5.12	5.09	11.2
Prob. Chi2	0.016	0.30	0.038	0.024	0.024	0.00083

Selection equation not displayed. Full specification models did not converge. Above models use basic treatment effects – no interactions in selection equation. Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table A12. Treatment effects (no interactions in Eq. 2)

VARIABLES	(1) Construction	(2) Metal	(3) Finance
FDI/GDP	-0.005	-0.05**	-0.003
	(0.035)	(0.025)	(0.017)
GDPPC	-0.03	0.01	-0.01
	(0.028)	(0.028)	(0.011)
GDP	0.09	-0.85**	0.39*
	(0.409)	(0.396)	(0.215)
GROWTH	0.03	0.07	0.01
	(0.044)	(0.050)	(0.025)
TRADE/GDP	0.03	-0.08	-0.003
	(0.239)	(0.192)	(0.097)
GOVCON	-0.03*	-0.0007	0.0005
	(0.016)	(0.003)	(0.003)
KAOPEN	0.13***	0.05*	0.10***
	(0.046)	(0.031)	(0.021)
CHECKS	0.05	-0.02	0.01
	(0.039)	(0.027)	(0.016)
USAID	-1.80***	-0.89*	-0.31
	(0.480)	(0.465)	(0.379)
IMF PROGRAM	-0.45**	-0.25***	-0.19**
	(0.192)	(0.094)	(0.073)
Observations	370	254	453
Country FE	YES	YES	YES
Year FE	YES	YES	YES
LDV	YES	YES	YES
Log p. likelihood	-367	-183	-236
lambda	0.27	0.13	0.14
sigma	0.49	0.36	0.29
rho	0.56	0.37	0.48
Wald test of indep.	5.46	11.3	9.88
Prob. Chi2	0.019	0.00077	0.0017

Selection equation not displayed. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A13. FDI, 1995-2008

VARIABLES	(1) Construction	(2) Metal	(3) Finance
FDI/GDP	-0.003	-0.02	-0.003
	(0.042)	(0.026)	(0.017)
GDPPC	0.001	-0.05	0.01
	(0.039)	(0.044)	(0.016)
GDP	0.32	-1.98***	0.56*
	(0.623)	(0.566)	(0.318)
GROWTH	0.04	0.17**	0.03
	(0.075)	(0.071)	(0.036)
TRADE/GDP	0.31	-0.86**	-0.16
	(0.367)	(0.357)	(0.149)
GOVCON	-0.02	0.07**	-0.004
	(0.017)	(0.026)	(0.011)
KAOPEN	0.04	0.03	0.07***
	(0.065)	(0.041)	(0.025)
CHECKS	0.08**	0.04	0.02
	(0.033)	(0.028)	(0.018)
USAID	-1.87***	-1.01**	-0.25
	(0.367)	(0.419)	(0.447)
IMF PROGRAM	-0.50***	-0.40***	-0.26***
	(0.148)	(0.154)	(0.096)
Observations	311	210	365
Country FE	YES	YES	YES
Year FE	YES	YES	YES
LDV	YES	YES	YES
Log p. likelihood	-307	-141	-175
lambda	0.28	0.23	0.18
sigma	0.50	0.38	0.30
rho	0.57	0.60	0.60
Wald	2984	46044	20161
Wald test of indep.	10.0	5.98	7.48
Prob. > chi2	0.0016	0.014	0.0062

Selection equation not displayed. Model 1 did not converge using the full specification ordinary treatment effects are used. Models 2 and 3 use the full specification. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Sectoral FDI codes three-digit NAICS concordance

Bold=First level
Regular=Second level
Italics=Third level
Underline=Fourth level

	FDI Categories	Corresponding NAICS 3-digit codes
10000	**Primary**	
10100	Agriculture, hunting, forestry and fishing	110
10200	Mining, quarrying and petroleum	210
10210	*Mining and quarrying*	
10211	Mining of uranium and thorium ores	
10212	Mining of coal and lignite, Extraction of peat	
10213	Mining of metal ores	
10220	*Petroleum*	
10230	*Other mining and quarrying*	
20000	**Secondary**	
20100	Food, beverages and tobacco	311 (311 to 312)
20110	*Tobacco*	
20120	*Food products and beverages*	
20200	Textiles, clothing and leather	313 (313 to 316)
20210	*Textiles*	
20220	*Clothing*	
20230	*Leather and leather products*	
20300	Wood and wood products	321
20400	Coke, petroleum products and nuclear fuel	324
20500	Publishing, printing and reproduction of recorded media	322 (322 to 323)
20600	Chemicals and chemical products	325
20700	Rubber and plastic products	326
20800	Non-metallic mineral products	327
20900	Metal and metal products	331 (331 to 332)
20910	*Basic metals*	
20920	*Fabricated metal products*	
21000	Machinery and equipment	333
21100	Electrical and electronic equipment	334 (334 to 335)
21200	Precision instruments	
21300	Motor vehicles and other transport equipment	336
21310	*Unspecified motor vehicles and other transport equipment*	
21320	*Motor vehicles, trailers and semi-trailers*	
21330	*Other transport equipment*	
21400	Other manufacturing	339

21500	Recycling	
30000	**Tertiary**	
30100	Electricity, gas and water	220
30200	Construction	230
30300	Trade	420 (42, 44, and 45)
30310	*Unspecified trade*	
30320	*Automotive trade and repair*	
30330	*Wholesale trade*	
30340	*Distributive trade*	
30400	Hotels and restaurants	720
30500	Transport, storage and communications	480 (48 to 49)
30510	*Unspecified transport, storage and communications*	
30520	*Transport and storage*	
30530	*Post and communications*	
30600	Finance	520
30610	*Unspecified finance*	
30620	*Financial intermediation*	
30630	*Insurance and pension funding*	
30640	*Activities auxiliary to financial intermediation*	
30700	Business activities	530
30710	*Unspecified business activities*	
30720	*Real estate*	
30730	*Rental Activities*	
30740	*Computer and related activities*	
30750	*Research and development*	
30760	*Other business activities*	
30800	Education	610
30900	Health and social services	620
31000	Community, social and personal service activities	560
31010	*Sewage and waste disposal, sanitation activities*	
31020	*Unspecified community, social and personal services*	
31030	*Membership organizations NEC*	
31040	*Recreational, cultural and sporting activities*	
31100	Other services	810
31200	Public administration and defence	920
40000	**Total**	