The role of external debt in the foreign direct investment-growth relationship

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THE ROLE OF EXTERNAL DEBT IN THE FDI-GROWTH RELATIONSHIP

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Abstract

This paper investigates the relevance of external debt as a factor inhibiting economic growth gains to be accrued from foreign direct investment (FDI). We develop a model which formalises a mechanism to allow for the influence of external debt in the transmission of FDI-generated externalities and conduct threshold regressions to test the existence of a debt contingency effect which limits the positive impact of inward FDI on growth. Using annual as well as five-year averaged data for 39 developing countries over the period 1984-2010, our findings support the hypothesis that FDI-induced growth is dependent on the external debt constraint. In particular, we show that beyond a certain threshold high indebtedness constrains economies from reaping growth benefits from FDI as they seek to reduce their debt levels. In this scenario, the evidence also shows that increasing financial development can mitigate the negative influence of high external debt on the FDI-growth nexus.

KEYWORDS
Foreign direct investment, external debt, economic growth, threshold estimation

JEL Classification: F21; F34; C24

1 | INTRODUCTION

It is now generally recognised that foreign direct investment (FDI) brings growth benefits to developing countries depending on the absorptive capacity of these economies to assimilate gains from technology transfer and spillover effects (Alfaro *et al*., 2004; Durham, 2004). While a burgeoning literature examines the importance of specific factors that influence host countries' absorptive capacity and explores a variety of explicit thresholds as contingencies in the FDI-growth nexus - in particular the importance of financial development and institutional environment – these issues are investigated while largely ignoring the constraint on growth that a country's debt burden could conceivably impose. But could there be a role of external debt in preventing economic growth gains from FDI? That is the question we take up in this paper.

Many developing countries have continually experienced a serious debt overhang problem since the 1980s, as a result of relying on borrowing from abroad to finance their domestic investments (World Bank, 2016). Attempts to restructure their debt obligations with foreign creditors have led to slower economic growth of these economies due to painful macroeconomic adjustments (see, e.g. Krugman *et al*., 2012; Reinhart & Rogoff, 2010). In this paper we argue that a debt contingency effect may limit the potential for such economies to extract growth-enhancing benefits from inward FDI. Indeed, the graphical representations of the ratio of net FDI inflows to GDP plotted against the economic growth of the 39 developing countries that make up our sample over the period 1984-2010 (Figure 1), disaggregated according to low and high indebtedness levels (Panel 'a' and 'b', respectively), show that the FDI-growth relationship is considerably weaker for countries with a high level of external debt. We take this empirical regularity to provide a stark stylised fact that motivates our study.

In the quest for specific factors that influence the absorptive capacity of host countries, previous studies have advanced hypotheses in relation to a variety of explicit thresholds. For example, Blomstrom *et al.* (1992) argue that the level of personal wealth acts as a threshold,

with a sufficiently high level of per capita income being necessary to ensure that FDI positively affects economic growth. Balasubramanyam *et al.* (1996) find that the degree of trade openness provides a critical threshold for FDI to induce higher growth. Borensztein *et al.* (1998) emphasise that only countries meeting a minimum level of human capital can benefit from FDI-led growth gains. More recently, Slesman *et al.* (2015) present robust evidence that portfolio equity (including FDI) and debt inflows have a positive impact on economic growth only in countries with high-quality institutions. Countries that fall below the identified threshold level of institutional quality record either negative or insignificant effects. Other studies suggest that variables such as financial market development, economic freedom as well as corruption could also constitute threshold factors affecting the FDI-growth nexus (see, among others, Alfaro *et al.*, 2004; Azman-Saini *et al.*, 2010a, 2010b; Hermes & Lensink, 2003; Okada & Samreth, 2014).

A separate strand of literature investigates the link between foreign debt and economic growth in the form a 'debt Laffer curve', pointing to a nonlinear relationship incorporating both a growth enhancing effect at lower levels of debt and a growth retarding effect (the overhang problem) at higher levels of debt (Cohen, 1993, 1995; Krugman, 1988; Pattillo *et al*., 2004; Reinhart & Rogoff, 2010). Given the nonlinearity of this relationship, the literature has also empirically explored whether a debt threshold exists in the debt-growth relation using various modelling strategies (Cordella *et al*., 2010; Eberhardt & Presbitero, 2015; Kumar & Woo, 2010).

However, to date, no study has considered the importance of an external debt threshold effect in the FDI-growth relationship. Yet, as Reinhart and Rogoff (2009) demonstrate in their book, *This Time is Different: Eight Centuries of Financial Folly*, a high level of indebtedness increases the sovereign risk of a country, which may limit the volume of FDI inflows as multinational enterprises (MNEs) seek safer environments elsewhere to avoid potential expropriation of their resources. Moreover, governments are inclined to generate revenue typically from financial repression in order to service their debt (Reinhart, 2012),

which can affect MNEs' incentives to interact with host country firms or intermediaries, thereby limiting the capacity of the host economy to accrue growth benefits from FDI.

Given the liability of countries to meet their foreign debt obligations, we argue that their ability to reap growth benefits from inward FDI might be contingent on their external indebtedness, in addition to other economic factors influencing absorptive capacity such as financial development. Our analysis attempts to reconcile the conflicting roles of debt and FDI in the process of economic development while accounting for the possibility that certain threshold conditions have to be met before growth benefits can be accrued from FDI. In particular, we posit that inward FDI promotes economic growth below a certain threshold of external debt but otherwise the growth benefits diminish beyond that level. In this process, we also highlight a role for financial development in terms of enhancing the capability of FDI to promote growth, thereby mitigating the negative influence of the debt constraint.

In specifying this inherently nonlinear FDI-growth relationship, we develop a theoretical model that, allowing for the influence of external debt through a mechanism which supports the view that governments use financial repression as a means for liquidating debt (Reinhart *et al.,* 2011; but see also Reinhart, 2012, and Reinhart & Sbrancia, 2015), illustrates how financial repression affects the FDI-growth relationship and, consequently, the relevance of an external debt contingency effect in the relationship through this mechanism. Next, using Hansen's threshold estimation methods (Caner & Hansen, 2004; Hansen, 2000) and controlling for a well-established set of growth determinants, we test the implications of our theoretical model on country level panel data for 39 developing countries over the period 1984-2010. We find a threshold level of external debt to be around 61-69 percent of GDP (consistent across different models) below which FDI exerts a positive and significant effect on economic growth. However, the growth-enhancing effect of FDI diminishes when economies face an increasing burden of external debt that goes beyond that tipping point. The external debt threshold effect is non-existent in financially more developed regimes relative to financially under-developed regimes, implying that increasing financial development mitigates the effect of the debt threshold on the FDI-growth nexus.

Our analysis makes a significant contribution to what has gone before since we are the first to present evidence of the existence of an external debt threshold which, as a result of unfavourable local economic conditions (debt overhang) and consequent financial repression, indexes the FDI-growth relationship. We also show that the negative influence of debt in the transmission of growth-inducing FDI effects can be alleviated by enhancing the host country's absorptive capacity through greater financial development.

The rest of the paper is organised as follows. Section 2 reviews relevant literature. Section 3 develops a model of FDI-debt-growth. Section 4 outlines the methodological approach for empirical testing. Section 5 presents the data and discusses the empirical results. Section 6 concludes.

2 | A SYNTHESIS OF RELATED LITERATURE

2.1 | Thresholds in the FDI-growth nexus

Theoretical studies tend to emphasise the importance of achieving a minimum threshold level of development for economic growth gains to be accrued (Azariadis & Drazen, 1990) while empirical studies test the existence of threshold effects in regressions using various proxies for absorptive capacity. One such proxy is the level of financial development which is considered to be important in the process of technological diffusion associated with FDI. Hermes and Lensink (2003) develop a model which predicts that the impact of FDI on growth is contingent on the development of host country financial markets. Their empirical evidence using cross-section and panel data for 67 developing countries suggests that FDI has a positive growth impact if the financial system is sufficiently developed. Alfaro *et al.* (2004) also emphasise the importance of local financial development by examining the effect of FDI on economic growth using cross-country data covering up to 71 countries over the period 1975-1995. They find that while the relationship between FDI and growth is ambiguous, the FDI-growth effect turns out to be positive and significant after including the interaction effect

of FDI with financial development, and conclude that the development of local financial markets is crucial in ensuring that FDI inflows have a positive impact on growth.

There are also studies suggesting that other factors such as human capital, economic freedom, institutional quality as well as corruption could be relevant thresholds in the relationship between FDI and growth. Borensztein *et al.* (1998) examine the importance of human capital in the relationship between FDI and per capita GDP growth using data for 69 developing counties over the period 1970-1989. They find that FDI contributes to growth only when the host country meets a minimum threshold level of human capital. Following Borensztein *et al.* (1998), other studies also investigate the importance of the threshold effect of human capital. Using data for States in the USA, Ford *et al.* (2008) find that FDI affects output growth if the States meet a minimum level of human capital. Using time-series data from 10 ASEAN countries over the period 1990-2008, Tu *et al.* (2012) also find a positive impact of FDI on economic growth when human capital is above a threshold level; otherwise FDI is more likely to erode growth as it tends to utilise local cheap labour and crowd out domestic investment.

More recent studies focus on the importance of other factors affecting the FDI-growth nexus. Taking economic freedom as a threshold, Azman-Saini *et al.* (2010b) use system GMM estimation with interaction effects in cross-country growth regressions for 85 countries over the period 1976-2004. They show that a country can gain significantly from FDI when it has a sufficiently high degree of economic freedom. Okada and Samreth (2014) consider the influence of corruption in the estimation of the FDI-growth regression using an interaction model and find that the threshold is around the 10^{th} percentile of the least corrupt countries in their large sample of 130 countries over the period 1995-2008. The impact of FDI on economic growth is negative if the corruption level is below the threshold but positive if the corruption level is above the threshold. In other words, a high level of corruption is associated with a positive impact of FDI on growth. They rationalise this counter-intuitive result by arguing that profit-seeking MNEs engage in FDI in countries with weak regulations or poor law enforcement.

A common limitation of the modelling specification adopted in the above studies pertains to the inclusion of multiplicative interaction terms in linear regressions, which implicitly imposes the *a priori* assumption that FDI monotonically rises (or declines) with absorptive capacity (Girma, 2005). Hansen (1996, 2000) and Caner and Hansen (2004) propose alternative estimation procedures which avoid the use of interaction terms. Applying Hansen-type methodology, Kim *et al.* (2013) use data for 85 countries over the period 1975-2010 to show that per capita income, human capital, financial development and corruption serve as effective thresholds in the positive impact of trade and FDI on domestic investment. Interestingly, they find that trade has an adverse effect on domestic investment in countries which lack sufficient absorptive capacity but FDI positively affects investment in countries with poor financial development, low human capital or a high level of corruption. Azman-Saini *et al.* (2010a) also apply Hansen's method with cross-country data from 91 countries over the period 1975-2005 to confirm that the positive effect of FDI on economic growth "kicks in" only if financial development is above a certain threshold. Huang *et al.* (2012) use Hansen's threshold estimations on provincial data for China over the period 1985-2008 and find that the level of regional innovation can be a threshold in the transmission effect from FDI to growth.

2.2 | The relevance of debt for investment and economic growth

Turning to debt issues, conventional wisdom suggests that foreign borrowing is an important source of finance for investment particularly in developing economies. As Todaro and Smith (2011) note, a large accumulation of foreign debt is particularly common in the early stages of economic development, when there are low levels of domestic savings, high current account deficits, and/or lack of capital imports. However, following the Third World Debt crisis of the early 1980s, many developing countries suffered from a serious problem of debt overhang. Krugman (1988) argues that debt overhang occurs when the expected repayment on external debt falls short of the contractual value of debt. If a country's debt level is

expected to exceed the country's capability of future repayment, then expected debt service is likely to be an increasing function of the country's output level. Some of the returns from investing in the domestic economy are effectively taxed away by foreign creditors, thus discouraging further investment. Furthermore, a high debt burden increases expectations that debt will tend to be financed by distortionary measures (e.g. financial repression or other punitive taxes or expenditure cuts), leading to lower or riskier investment, greater uncertainty about future returns, and potentially lower growth prospects (Calvo, 1998; Clements *et al*., 2003).

Numerous empirical studies have sought to provide evidence of the debt overhang hypothesis by testing the effect of debt on investment (Aguiar *et al*., 2009; Cohen, 1993) and growth (Eberhardt & Presbitero, 2015; Reinhart & Rogoff, 2010) with the aim of determining debt thresholds to convey nonlinear effects in the implied relationship. Reinhart and Rogoff (2010), for example, investigate the systematic relationship between debt, growth and inflation using a unique dataset covering 44 countries with 200 years of historical data incorporating more than 3,700 country-year observations. Their primary findings indicate that public debt undermines economic growth beyond a threshold of 90 percent of GDP for advanced countries while the corresponding threshold of external debt to GDP for emerging economies is 60 percent. As recently noted by De Vita *et al.* (2018), Reinhart and Rogoff's conclusion of a debt threshold of 90 percent of GDP above which countries experience a substantial decline in their GDP growth rate did not escape criticism, prompting a major controversy (see, e.g. Herndon *et al*., 2014).[1] Yet, Reinhart and Rogoff showed in subsequent papers (see Reinhart *et al*., 2012) that the growth rate in regimes of high debt, while positive, was still much lower than in regimes of low debt.

[1] Herndon *et al.* (2014) provided a strong critique to Reinhart and Rogoff's (2010) claim of a 90 percent threshold, pointing to coding errors and less than adequate data selection and methodological choices. In their replication Herndon *et al.* (2014) found that over 1946-2009, countries with public debt/GDP ratios above 90 percent averaged 2.2 percent real annual GDP growth, not -0.1 percent, as suggested by Reinhart and Rogoff.

2.3 | Identifying a mechanism by which debt acts as a threshold in FDI-induced growth

While the aforementioned studies have emphasised the effects of debt on investment or economic growth, and there have been also a few studies comparing elements of debt and FDI as ingredients of growth (Chung, 2010; Nicholson & Lane, 2013), attempts to explicitly characterise the debt-FDI-GDP growth nexus at either theoretical or empirical level have not been previously reported in the literature. In an attempt to identify possible mechanisms through which a country's indebtedness level could act as a threshold in the FDI-growth link, we draw - as our starting point - from three arguments that have been presented in the literature.

First, debt servicing costs eat up a major proportion of a country's foreign exchange earnings and, while capital inflows contribute to the build-up of foreign exchange reserves, depletion of such resources can undermine macroeconomic stability and growth (Corden, 1989). In this scenario, Ahlquist and Prakash (2010) demonstrate the importance of a debt threshold effect in the relationship between FDI and the costs of contract enforcement (typically between private actors such as MNEs and local entrepreneurs), arguing that highly indebted countries are vulnerable to FDI inflows. Using cross-country data for 98 developing countries over the period 1992-2002, they find that FDI inflows contribute to reducing the costs of contract enforcement as long as the level of external debt is below the threshold. Since contract enforcement is a relevant institutional characteristic (backed by rule of law) which facilitates private transactions that may ultimately drive economic growth, their analysis suggests an intuitive way of treating the external indebtedness of the host economy as a relevant constraint in analysing the growth benefits associated with inward FDI.

A second possible mechanism stems from the sovereign risk argument. In analysing the salient features of financial crises, Reinhart and Rogoff (2009) shed light on the possible debt-FDI-growth link by pointing out the importance of sovereign risk in the location decisions of MNEs. MNEs inevitably consider the reputation of target FDI markets given the

possibility that a debt-defaulting country might expropriate their plant and equipment.[2] Bayar and Kilic's (2014) empirical study for Turkey confirms that sovereign credit ratings (where external debt level is a crucial element for the ratings) influence FDI inflows. Earlier, Nunnenkamp (1991) suggested that sovereign risk and debt overhang were relevant factors in explaining the decline of FDI to developing countries during the 1980s. Although the presence of increased sovereign risk might suggest a possible reason why external debt could affect foreign investment (including FDI) flows, this alone may not be a convincing case in itself for considering debt as a threshold barrier in the FDI-growth nexus.

A final possible mechanism - which we develop formally in the full-blown model presented in the next section - could stem from the financial repression argument. The concept of financial repression was initially proposed by McKinnon (1973), who defined it as government policies capping interest rates, setting high reserve requirements on bank deposits, and compulsorily allocating resources. Such repressive policies, commonly used in developed countries but especially developing ones, tend to impede financial deepening and hinder efficiency of the financial system. As such, they are expected to impact economic growth negatively (McKinnon, 1973; Shaw, 1973).

We argue that governments opting for financial repression policies to manage public debt servicing may signal a desire to obtain rents from the financial system and foreign assets returns, thus creating investment disincentives for MNEs because the rates of return are lower than what could be obtained in a competitive market. This may induce a tipping point (or threshold) in the level of indebtedness beyond which, as a result of this financial repression mechanism, the transmission of FDI-generated externalities - and hence FDI-induced growth - is negatively affected.

In the next section, we develop a formal model of this mechanism, the inferences from which we then test empirically. As noted earlier, attempts to explicitly characterise the debt-

[2] In history, this kind of expropriation is not rare. For example, the Chilean government confiscated the US copper mining companies in 1977, and the OPEC nationalised foreign oil companies in the 1970s (Reinhart & Rogoff, 2009: 58).

FDI-GDP growth nexus at either theoretical or empirical level are absent in existing literature. This paper makes a unique contribution in these directions.

3 | A THEORETICAL MODEL

Our model has two features. First, in line with the view espoused by Reinhart *et al.* (2011) among others, it highlights the relation between external debt and financial repression; second, it illustrates how financial repression affects the FDI-growth relationship and, as a consequence, how external debt can affect the relationship through this mechanism.

To establish the link between financial repression and external debt, we draw from the model originally developed by Giovannini and de Melo (1991, 1993) who show how financial repression, like tax, exerts a negative impact on per capita growth. Their analysis of consumer optimisation is based on the overlapping generations (OLG) model used by Blanchard (1985). They show that governments can raise their revenue by levying an implicit tax θ (financial repression) on foreign asset (F) returns, thereby proportionally reducing the interest paid on domestic debt (D). Financial repression thus exerts a wedge (distortion) which drives the domestic interest rate (r) below the world interest rate (r^*), giving the relationship (Appendix I outlines the full structure of the model with derivation of this and subsequent relationships below):

$$(1 + r^*)(1 - \theta) = 1 + r \tag{1}$$

Assume that government revenue from the financial repression tax is set equal to the government expenditure (G) on domestic and foreign debts, so that $G = \theta(F + D)$. Moreover, rather than rely on levying a tax on private agents' income from investing in foreign assets, governments exercise the means of financial repression to affect foreign investment by driving a wedge between domestic and foreign interest rates. Assuming that government expenditure is financed by domestic borrowing (D) and external debt (E), the

government's budget constraint can be represented as $E + D = \theta D$. Normalising government expenditure to be unity, the relationship between financial repression and external debt can be expressed more simply as:

$$\theta = \frac{1}{1-E} \tag{2}$$

The implication of this model is that with high levels of external indebtedness, governments tend to rely more on the means of financial repression to reduce the burden of their external debt, particularly when they cannot easily raise revenue from other formal levies to repay the debt.

Turning to the relationship between FDI and economic growth, we use a classical Cobb-Douglas production function with constant returns to scale. Following Kinoshita and Lu (2006) and Hsu and Wu (2006), we assume that technological progress in the domestic economy is driven by the international diffusion of foreign technology, measured as a function of FDI, which yields the following relationship characterising technological change:

$$A_{t+1} = A_t + (A_t^*(\iota) - A_t)\varphi(k_t)\psi(M_t) \tag{3}$$

where $A_t^*(\iota)$ governs the process of technological diffusion while $A_t^*(\iota) - A_t$ represents technological advancement associated with the transmission of FDI-generated externalities; $k_t = K_t/L_t$, the ratio of capital to labour; $\varphi(k_t)$ is a function which embodies the influence of foreign capital, including FDI (with Inada conditions $\varphi'(\cdot) > 0, \varphi''(\cdot) < 0$ implying that the existence of foreign capital is necessary for spillover through technology leakage, while the extent of leakage is diminishing); and $\psi(M_t)$ is the function of domestic financial development (*M*). In specifying equation (3), we make two crucial assumptions. First, we relax the original assumption in the models of Kinoshita and Lu (2006) and Hsu and Wu (2006) that the entire capital is foreign, and instead regard capital K_t as a combination of both domestic and foreign capital. Thus, we allow for the possibility that MNEs do not

always bring their entire capital from abroad, and their ability to also raise capital from local financial markets can be regarded as part of domestic capital.[3] Foreign capital in this form augments domestic sources of investment, besides having potentially positive spillover effects on domestic factor productivity and knowledge capital. Second, the process of technological diffusion embodied in $A_t^*(\iota)$ is a function of the state of the economy so that positive spillover benefits from FDI are realised only under favourable local conditions, such as the level of debt being below a certain threshold. Formally, $A_t^*(\iota) > A_t$ if $\iota < \iota^{\gamma}$, which represents the threshold condition.

Intertemporal optimisation under a competitive environment[4] leads to equilibrium output per capita which can be expressed as a function of the production parameter (β), the domestic interest rate (r) and financial repression (θ):

$$y_t = \frac{Y_t}{L_t} = A_t^{\frac{2-\beta}{1-\beta}} \left[\frac{\beta(1-\theta)}{1+r}\right]^{\frac{1}{1-\beta}} \tag{4}$$

The growth rate of output per capita g^t is then represented (after substituting for θ as in (2)) approximately as:

$$g^t \cong \left(\frac{2-\beta}{1-\beta}\right) \ln\left\{1 + \frac{1}{A_{t-1}}(A_{t-1}^*(\iota) - A_{t-1})\varphi\left[\frac{A_{t-1}\beta\left(1-\frac{1}{1-E}\right)}{1+r}\right]^{\frac{1}{1-\beta}} \psi(M_{t-1})\right\} \tag{5}$$

From equation (5) it can be seen that growth rate is a function of the level of external debt (E) the economy owes to the rest of the world, which is influenced by financial repression (θ). In this model, as expressed by equation (3), aggregate economic growth is assumed to be positively influenced by technological diffusion and spillovers associated with FDI inflows.

[3] See Agbloyor *et al.* (2013) for a discussion of how MNEs conduct their business using host country banking systems. The relationship between FDI and host countries' financial market is well documented by several studies (e.g., Alfaro *et al*., 2010).

[4] The assumption of perfect competition in optimisation is for illustrative purposes; in reality, of course, this may not be appropriate and the analysis that follows departs from this requirement without changing our arguments or conclusions.

However, the distortionary impact of financial repression, in terms of its ability to reduce (or liquidate) the real debt burden, can effectively constrain the positive impact of FDI on growth by influencing the behaviour of MNEs and, consequently, their ability to contribute to host country development. As derived in Appendix I, the FDI-induced growth effect is positive only if the threshold condition $\iota < \iota^{\gamma}$ holds, not otherwise.

There are several possible reasons underlying the channel (of financial repression) through which a high debt burden could limit the FDI induced spillover effects on growth. For example, MNEs might be forced to curtail their operations in the host economy if prospects of negative real returns from investment are anticipated due to higher inflation.[5] More specifically, as shown in the above model, foreign affiliates that make use of local financial markets to raise capital find that their returns are effectively taxed through financial repression, and consequently they are more likely to scale back their operations and limit their interactions with local entrepreneurs. Thus, gains from FDI through such linkages are likely to be affected. Furthermore, irrespective of the financing conditions, the prospects of higher costs or lower competitiveness in the host economy may restrict foreign firms' reliance on domestic suppliers for (intermediate) inputs, thus limiting spillovers via backward linkages (Amendolagine *et al*., 2013; Damijan *et al*., 2003). Similarly, gains through forward linkages could be reduced if foreign firms find it less profitable to maintain their operations supplying intermediate goods and services to domestic firms. In general, the distortionary impact of financial repression that reduces the scope of engagement of foreign firms with local firms is likely to limit the potential gains from FDI inflows that come through spillovers or technological diffusion. Our analysis, therefore, suggests that high external debt has an adverse impact on the FDI-growth relationship.

The negative influence of debt overhang on the FDI-growth nexus, however, can be appreciably lower in countries with higher levels of financial development. Incorporated in

[5] In addition, as argued earlier, debt overhang increases the sovereign risk of host countries, which is likely to lower their international credit ratings and deter foreign investors and firms from investing in local markets. Credit rating agencies (e.g. Moody, S&P, and Fitch) consider the position of a country's public finances as an important factor for assessment of its sovereign credit rating.

the above model is the influence of financial development, the importance of which can be considered in terms of both its role in enabling FDI to promote growth as well as in mitigating the adverse effect of external debt on FDI. Roubini and Sala-i-Martin (1992) present evidence to suggest that countries with high levels of financial repression tend to be less financially developed. As a corollary, this implies that increasing financial development would undermine the ability of authorities to use financial repression as a means to reduce the level of external debt.[6] Furthermore, Haslag and Koo (1999) provide evidence to support the view that financial development serves to weaken the link between financial repression and growth. Although the impact of increased financial development on FDI-induced growth cannot be unambiguously determined in the presence of debt overhang *ex ante*, our analysis of the derivation of this effect – as formally shown in Appendix I – suggests that it can be positive under certain circumstances.

Taking these considerations into account suggests a complex nonlinear relationship characterising the link between FDI and economic growth, although it seems plausible to infer from the above theoretical analysis that: (i) debt overhang acts as a contingency factor inhibiting the positive influence of FDI on growth; and (ii) greater financial development serves to mitigate this negative effect while improving the host country's absorptive capacity to yield growth benefits from FDI. Collectively, (i) and (ii) form the threshold relations derived from equation (5) that we subject to empirical scrutiny, giving us two testable hypotheses. These threshold conditions are illustrated within the Hansen multiple threshold estimation technique described in the next section.

[6] Roubini and Sala-i-Martin (1992) present an endogenous growth model with money demand to show that financial development reduces the inflation tax base and therefore the ability of authorities to collect seigniorage from higher money growth.

4 | METHODOLOGY

To test the implications of the theoretical model we apply a multiple threshold estimation technique to determine, first, the existence of a debt threshold effect in the FDI-growth nexus and, second, whether such a threshold is only binding under a low financial development regime (or, alternatively, not binding under a high financial development regime). The latter requires determining a financial development threshold beforehand.

As noted above, several studies (e.g. Alfaro *et al*., 2004; Borensztein *et al*., 1998; Okada & Samreth, 2014) have used interaction terms in regression models to determine the existence of threshold effects and thus the role for spillover effects in the FDI-growth link. However, as emphasised by Girma (2005), Azman-Saini *et al.* (2010a) and Slesman *et al.* (2015), this modelling strategy has the drawback of imposing the *a priori* restriction that spillovers are monotonically increasing (or decreasing) with absorptive capacity. A more flexible estimation method is proposed by Hansen (1996, 2000), which entails determining threshold effects through a sample decomposition based on dividing the data sample according to the categories (debt regimes) chosen. This method, therefore, allows for parameter heterogeneity through sample-splitting by regime rather than by including interaction terms in estimation. Another advantage of Hansen's method is that a more accurate threshold effect can be obtained from estimation, while the traditional approach using interaction terms can only provide an approximation of the threshold value. We therefore use Hansen's method for our empirical analysis.

To illustrate Hansen's procedure, assume that the FDI-debt-growth relationship is specified as:

$$\begin{aligned} Y_{it} &= \tau_1' x_{it} + \varepsilon_{it}, \qquad DEBT_{it} \leq \gamma \\ Y_{it} &= \tau_2' x_{it} + \varepsilon_{it}, \qquad DEBT_{it} > \gamma \end{aligned} \tag{6}$$

where Y_{it} represents GDP growth per capita; x_{it} stands for all the independent variables including FDI; and $DEBT_{it}$ is treated as a threshold variable conditioning the impact of FDI on economic growth. Subsequently, in our analysis, to test whether the debt threshold is binding (not binding) in the low (high) financial development regime, we postulate the following model where financial development (*FIN* hereafter) is introduced as a threshold variable in place of *DEBT*, *viz.*,

$$\begin{aligned} Y_{it} &= \rho_1' x_{it} + \varepsilon_{it}, \qquad FIN_{it} \leq \sigma \\ Y_{it} &= \rho_2' x_{it} + \varepsilon_{it}, \qquad FIN_{it} > \sigma \end{aligned} \tag{7}$$

In estimating the model represented by either (6) or (7), the sample is effectively split into two regimes, depending on whether the value of *DEBT* /*FIN* is above a threshold level γ/σ or not (thus distinguishing between high and low regimes in accordance with the threshold values of *DEBT* or *FIN*). Focusing on (6) for expositional convenience, to represent the model in a form of a single equation with the 'sample-split', we let $\delta_n = \tau_2 - \tau_1$ denote the threshold effect, indicating a 'small threshold' when δ_n approaches zero. Now introduce a dummy variable $d_{it}(\gamma) = \{DEBT_{it} \leq \gamma\}$, where $\{\cdot\}$ is the indicator function. Then, set $x_{it}(\gamma) = x_{it} d_{it}(\gamma)$ and $Y_{it} = \tau' x_{it} + \delta_n' x_{it}(\gamma) + \varepsilon_{it}$, where $\tau = \tau_2$. The unified equation now allows for the subset parameters to differ between the two regimes.

The first step in the estimation is to calculate the sum of squared residuals (RSS). The RSS is denoted by $S_n(\gamma) = \sum_{t=1}^{T} \sum_{i=1}^{N} \varepsilon_{it}^2 = S_n\big(\hat{\tau}(\gamma), \hat{\delta}(\gamma), \gamma\big)$. $S_n(\gamma)$ is linear in τ and δ, when γ is conditional on a specific threshold value (γ_0) which yields the conditional OLS estimators $\hat{\tau}(\gamma)$ and $\hat{\delta}(\gamma)$. In order to obtain the threshold point $\hat{\gamma}$, the estimation requires minimisation of $S_n(\gamma)$: $\hat{\gamma} = arg_{\gamma_0} \min S_n(\gamma)$. The way to find the minimised RSS is through a grid search on 667 quintiles from 0.15 percent to 99.85 percent with every quintile changed by 0.15 percent.

The second step is to test the hypothesis of no threshold. In this case, the null is $H_0: \gamma_1 = \gamma_2$, against the alternative which effectively suggests that the specification is nonlinear. Hansen (1996) demonstrates that calculating a bootstrapped *p*-value is asymptotically valid. The null of 'no nonlinearity' (i.e. no threshold) is rejected when the *p*-value is below the desired critical value (e.g. 0.05 or 0.1). The bootstrapped *p*-value is determined by setting the number of replications (e.g. 1,000).

The next step, after determining the existence of a threshold, is to form the confidence interval for the threshold parameter. The null hypothesis in this case is $H_0: \gamma = \gamma_0$, and the Likelihood Ratio (LR) statistic is computed as $LR_n(\gamma) = n\frac{S_n(\gamma) - S_n(\hat{\gamma})}{S_n(\hat{\gamma})}$. The null is rejected when the value of the LR statistic exceeds the critical value of the underlying distribution. However, the LR test does not have a standard chi-squared distribution asymptotically. The approach to testing is to check against the correct critical value from the table of asymptotic critical values provided in Hansen (2000: 582).

The final step in Hansen's estimation procedure is to compute the parameter estimates and their standard errors. We use the heteroscedasticity corrected White-robust standard errors to test the significance of the estimates.

5 | DATA AND EMPIRICAL ANALYSIS

5.1 | Data

We use an unbalanced panel of data for the estimation of the Hansen threshold model. The data are compiled for 39 developing countries over the time period 1984-2010. The sample period is dictated by data availability. Specifically, a start date at 1984 is motivated by the fact that institution data from the International Country Risk Guide (ICRG) only go back to 1984. The end date of 2010 is justified by the fact that data for the human capital variable from the updated Barro and Lee's (2013) dataset, extends only up to 2010 (and the alternative human capital measure from the World Bank database is inadequate, with too many missing

values for low and lower-middle income countries). The list of countries included in the sample is given in Appendix II.[7] We limit our sample to less developed economies (classified as low and lower-middle income categories according to the World Bank classification of countries) since traditionally these countries have relied on external debt and FDI as a means to promote economic growth. Furthermore, restricting our choice to these income groups of countries reduces the degree of heterogeneity commonly associated with using cross-country data while ensuring that there is sufficient variation in debt levels across the countries. Additionally, rather than employ cross-sectional data averaged over the entire time period (as used in some recent studies applying threshold methods – see, e.g. Kim *et al*., 2013), we use panel data with annual frequency as well as five-year averages because debt levels tend to vary significantly over time even within the same country while other variables can be changing more slowly or smoothly (e.g. institutional quality). The use of panel data (with sufficiently large cross-section and time dimensions) also provides us with a larger sample size which is likely to give more precise and realistic threshold values compared to using cross-sectional data.

Economic growth, the dependent variable, is represented by the growth of real GDP per capita (measured in US dollars at constant prices in 2005). FDI, the main independent variable, is measured by the ratio of net FDI inflows to GDP (as is customary, see e.g. Cushman & De Vita, 2017). External debt (as a proportion of GDP) is used as the threshold variable. The data for these variables, as well as for inflation and trade openness, are sourced from UNCTAD.[8]

Following previous studies, we include a set of control variables in the threshold regressions to represent the influence of financial repression, financial development (also

[7] Our sample strategy was to begin with a larger set of less developed economies but owing to many missing values over the time period considered we ended up with a final sample of 39 countries.

[8] As reported by UNCTAD, net FDI inflows can be negative when gross inflows are offset by reverse investment or disinvestment.

used as a threshold variable subsequently), financial crisis, human capital, trade openness, institutions and conflict.[9]

Financial repression - which provides a channel through which external debt affects the relationship between FDI and economic growth (as illustrated by our theoretical model) - is proxied by inflation. Although there are more direct measures of financial repression (such as reserve ratios and interest rate controls) lack of available data for low income countries means that we have to rely on the inflation rate (measured by the annual change in consumer price index, CPI) as a more indirect measure of financial repression. As argued by Haslag and Koo (1999) and Roubini and Sala-i-Martin (1992), inflation is a reasonable proxy for financial repression as it serves to reduce the real burden of debt the government owes to the private sector. However, as a robustness check, we consider interest rate spread between the savings and lending rates as an alternative proxy.

Financial development, a determinant of growth in its own right (Herwartz & Walle, 2014), represents the absorptive capacity of a country to assimilate the growth benefits from inward FDI (Alfaro *et al.*, 2004, 2010; Hermes & Lensink, 2003). We capture the effect of financial development using M_2, a measure of money in circulation outside banks including time (savings and foreign currency) deposits. As part of robustness, we also consider the ratio of private credit to GDP, reflecting the availability of domestic credit provided by financial institutions to the private sector.

We also account for the effect of financial crises using a dummy variable which takes value 1 for the year a country experienced a financial crisis and 0 otherwise, as reported by Laeven and Valencia (2012). Financial crises, which affected a handful of developing countries over the sample period (the major episodes being the 1997-98 East Asian crisis and the 2007-08 crisis), constitute a major disruption for the affected economies and, owing to capital flight, for their external debt obligations. For example, Korea experienced a reduction

[9] Other control variables could not be entertained owing to data deficiencies, such as government expenditure for which there were too many missing values for less developed countries (LDCs). While we use an unbalanced panel, it was sensible not to include variables with substantial missing values so as to avoid loss of degrees of freedom.

of one third of its short-term debts which stopped rolling over in 1998 after the 1997 crisis (Radelet & Sachs, 1998).

Additional growth determinants typically used as control variables (see, e.g. De Vita & Kyaw, 2009) include initial GDP, human capital measured by the average year of schooling (Barro & Lee, 2013), and trade openness (the ratio of the sum of imports and exports to GDP). Furthermore, given that some developing countries experienced a high propensity for civil conflict (considered to be harmful to economic growth), following Borensztein *et al.* (1998) we control for the effect of conflict using the Armed Conflict Dataset of the Uppsala Conflict Data Programme (UCDP), with scores ranging from 0-3, representing different intensities of conflict from low to high.

Finally, following Slesman *et al.* (2015), we include a set of three institutional quality controls to represent the effects of democracy, rule of law, and control of corruption, using data from the ICRG. Not only do institutions influence growth (Acemoglu *et al.*, 2005), they may also have an influence through financial development (Fergusson, 2006). Table 1 lists each variable used in the empirical analysis, its definition and associated source.

Table 2 reports some descriptive statistics of the data for the full sample. External debt (as a percentage of GDP) averages around 57 percent with a large variance and a spread of values ranging from 10 percent (for Uganda in 2006) to a mighty 319 percent (for Nicaragua in 1994). FDI inflows (percentage of GDP) average around 2.3 percent but also vary considerably across the sample (from -15 percent for Sierra Leone in 1986 to 42 percent for Liberia in 2010). The mean of real GDP growth (per capita) over the sample is 1.76 percent with a range across the panel exceeding 46 percent (from -25 percent for Sierra Leone in 1996 to +21 percent for Congo in 1999). Economic growth also displays considerable variation across the countries. Countries' mean growth rates range from –3.34 percent (DR Congo) to 7.54 percent (Myanmar). Significantly, we find that 23 percent of the countries average negative growth over the sample period. Other variables (including inflation and the measures of financial development), as reported in Table 2, reveal substantive differences across countries and over time.

[Tables 1 and 2 here]

5.2 | Empirical Results

5.2.1 | Threshold effect of external debt

The first inference drawn from the theoretical analysis is a debt contingency effect which limits the positive influence of FDI on growth. Table 3 reports the basic set of results determining the threshold effect of external debt. In total, two set of results are presented, the first using annual data and the second with five-year non-overlapping averages. The regressions include relevant proxies representing the independent influence of FDI, financial repression, financial development and other control variables (initial GDP, human capital, conflict, trade openness, institutional quality and crisis) which are common in all the estimations.[10]

[Table 3 here]

In both sets of regressions, the bootstrapped *p*-value, determined with 1,000 replications and a trimming percentage of 0.15 percent, confirms that the null of no threshold is rejected. Hence, our findings suggest that a debt threshold exists and the sample is therefore split into low-debt and high-debt regimes on the basis of the value of the threshold for further estimation. In both cases, the sample-split reveals a higher number of observations in the first sub-sample (low debt regime) than in the second sub-sample (high debt regime).

In Model 1 (Table 3), estimated with annual data, the threshold point is at a value of -0.3826 which, interpreted in terms of the debt value, is around 68 percent of GDP. The estimated results for the sub-samples (low-debt and high-debt regimes) show that FDI has a positive and significant influence on economic growth when the external debt threshold is below 68 percent of GDP. The results indicate that, below this threshold level (low-debt

[10] We also entertained variants of the model specifications which excluded the effect of institutions and/or financial development, and the results were consistent. Hence, we only report the results with the full set of covariates for each regression.

regime), a 1 percent rise in inward FDI increases the growth rate of GDP per capita by around 0.19 percent; whereas if the level of debt/GDP is above 68 percent (high-debt regime), the FDI effect is insignificant. In both regimes (i.e. regardless of the level of external debt) inflation has a significant and negative impact on growth, while rule of law has a significant and positive effect on growth. Furthermore, in the low debt regime, initial GDP and crisis have a negative effect on growth but financial development (M_2) and democracy have a positive effect. In the high debt regime, trade openness has a positive impact on growth but inflation and human capital exert a negative impact on growth.

In Model 2, which utilises five-year non-overlapping averaged data, the results do not change much as the threshold of debt/GDP is around 69 percent (with a threshold point estimate of -0.4866) and FDI exerts a significantly positive effect on growth below that threshold, but otherwise its effect is insignificant (in the high debt regime). The results indicate that, in the low-debt regime, a 1 percent rise in FDI increases the growth rate of GDP per capita by 0.07 percent over the five-year period. The control variables exhibit similar effects as in Model 1, with few exceptions. For instance, human capital has a significant but positive impact on growth in the low debt regime although retains its negative effect in the high debt regime; and rule of law exerts a positive effect on growth in the high debt regime only.

Taken together, the results confirm the existence of a debt contingency effect in the relationship between FDI and growth. The positive impact of FDI on growth is significant and robust as long as the level of external debt is below the threshold rate, estimated to be around 68-69 percent of GDP. When external debt exceeds this threshold, the effect of FDI on growth is not statistically significant. Among the control variables, the negative effect of inflation on growth stands out as being the most significant. These results provide support for the prevalence of a financial repression effect having a direct negative impact on growth. It is also noteworthy that financial crisis undermines growth in the low debt regime, but its influence is not significant in the high debt regime. An explanation for this seemingly counter-intuitive (though plausible) outcome is that growth is generally retarded in the high

debt regime and, therefore, the crisis effect on growth could be negligible. The results also indicate that the direct effect of financial development on growth is not robustly significant, although this is not inconsistent with the theoretical predictions of the model which suggests that its role is more indirect in terms of enabling the FDI-induced growth effect via its influence on the absorptive capacity of recipient economies.

5.2.2 | Threshold effect of financial development versus external debt

A second inference drawn from the theoretical model is that financial development serves to mitigate the negative influence of the debt contingency effect on the FDI-growth nexus. As a consequence, we infer that the effect of debt overhang on the FDI-growth relationship diminishes with increased financial development. In turn, FDI should have a more significant impact on growth in financially more developed regimes than in financially less developed regimes.

To test this assertion empirically, we proceed as follows. First, we determine the absence of a threshold effect of debt on growth if financial development is high enough. Second, we check that FDI has a significant and positive effect on growth in financially more developed regimes. Testing these effects using the Hansen approach requires that financial development (FIN) is treated as a threshold variable, as given by equation (7). Once a threshold of FIN is determined (i.e. the null of linearity - of the threshold of FIN - is rejected), the sample can be split according to high- and low-FIN regimes. Next, to test the null hypothesis of no threshold effect of debt in the high-FIN regime, attention is focused solely on the high-FIN sub-sample to determine the existence (or lack) of a debt threshold.

Given our primary interest in determining threshold values of FIN while using the same data and model specification as in Table 3, we report only the *p*-value of each threshold in Table 4. The proxy for FIN is M_2, and the evidence shown in the upper panel of Table 4 confirms the existence of a threshold effect of FIN, which is statistically significant at the 1 percent level on both sets of data. Accordingly, the sample is split into low- and high-FIN regimes. Crucially, as shown in the lower panel, the results suggest that a debt threshold is

not binding in the high-FIN regime as the bootstrapped *p*-values are above 0.1. This result confirms that the influence of the external debt threshold limiting the transmission of FDI effects on growth diminishes as financial development increases. Furthermore, the estimation results confirm that FDI has a positive and statistically significant effect on growth in the high-FIN regime but an insignificant effect in the low-FIN regime.

[Table 4 here]

Collectively, the results (of Tables 3 and 4) confirm the existence of a debt contingency effect in the FDI-growth nexus, revealing a positive association between the two variables below a debt-to-GDP ratio of 68-69 percent but an insignificant effect above that threshold. Additionally, the results confirm that a higher level of financial development can mitigate the debt overhang effect on the FDI-growth nexus. These findings indicate that financial development serves as a catalyst representing the absorptive capacity which host countries should aim to achieve as a minimum threshold level before they can accrue growth benefits from FDI inflows.

5.2.3 | Robustness check

To check the robustness of our results we consider alternative proxies for financial development and financial repression, represented by private credit over GDP and interest rate spread (between deposit and lending rates), respectively. Data availability for these measures (both collected from the World Bank) restricts the sample size for robustness estimation. Additionally, to account for potential endogeneity of some explanatory variables (such as FDI, financial development and trade openness) we use the Caner and Hansen (2004) threshold estimation method which allows for the use of instrumental variables.

Previous studies (Alfaro *et al*., 2004; Kim *et al*., 2013) have treated FDI as potentially endogenous since fast growing economies tend to attract more FDI inflows. Furthermore, the endogeneity of financial development and trade openness cannot be ruled out as these

variables are also influenced by economic growth and those factors (such as macro policies and legal foundations) which are not accounted for in the regressions. We use lagged values of FDI, trade openness and financial development, as well as initial GDP, real interest rate, legal origins (British and French) and population as instruments. Our criteria for the validity of instruments is based on using: (i) the Hansen's J test to check that the chosen instruments are orthogonal to the error terms; and (ii) the Kleibergen-Paap rk Wald F statistic to check whether there is a weak instruments problem.[11]

Table 5 reports the main findings. First, the results indicate that the choice of instruments is valid given that the *p*-value of the Hansen's J test is greater than 0.05, and there is no weak instruments problem since the F value is larger than 10. Second, the *p*-values of nonlinearity confirm the existence of a debt threshold which is found to be around 61-68 percent of GDP. Finally, FDI has a positive and significant effect on growth in the low debt regime while its effect remains insignificant in the high debt regime.

[Table 5 here]

To sum up, our results are consistent and robust with regard to using the Caner and Hansen (2004) threshold estimation method to address the potential endogeneity of the explanatory variables in the threshold estimation and after introducing alternative proxies to represent the effects of financial development and financial repression.

6 | CONCLUSION

In this paper, we have proposed a theoretical mechanism to allow for the influence of debt overhang in a model of FDI-growth and shown that the distortionary impact of financial repression (as a means to reduce the burden of debt) can limit the positive effect of FDI on

[11] According to the "rule of thumb" (Staiger & Stock, 1997), a weak instruments problem exists if the F-statistic is less than ten.

growth. We also conduct empirical analysis to highlight the existence of a debt contingency effect in the FDI-growth relationship.

Using threshold estimations on panel data for 39 less developed economies, and controlling for a well-established set of growth determinants, our empirical results reveal a robust influence of a debt threshold effect on the association between FDI and economic growth. A threshold level of external debt is found to be around 61-69 percent of GDP (consistent across different models) below which FDI exerts a positive and significant effect on growth. Such a growth-enhancing effect diminishes when economies face an increasing burden of external debt that goes beyond that threshold level.

Our results also indicate that the external debt threshold effect is non-existent in financially more developed regimes relative to financially under-developed regimes, implying that increasing financial development serves to mitigate the effect of the debt threshold on the FDI-growth nexus. This highlights a role for financial development absorptive capacity in terms of enhancing the capability of FDI to promote growth.

The main policy implications of our findings are that: (i) host countries should avoid an excessive build-up of external debt as a crucial requirement for developing economies that rely on FDI as a catalyst for economic growth and development; and (ii) development, concomitantly, needs to cater for improving the financial absorptive capacity of the recipient economies to accrue growth-enhancing benefits from FDI.

A final caveat is in order. Despite a large sample, our estimations were constrained by data availability, with a sample period ending at 2010. Data permitting, future studies could profitably expand our analysis by investigating how the FDI-debt-growth relationship fared in the aftermath of the 2008-09 financial crisis and the subsequent global recession. Future research could also specifically consider the effect on the FDI-growth nexus of the Heavily Indebted Poor Country (HIPC) initiative and related Multilateral Debt Relief Initiative (MDRI), both aimed at relieving the world's poorest countries of unmanageable debt burdens. This extension appears particularly opportune given that nearly half of the countries in our sample are eligible for the assistance.

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Appendix I

Assume that private agents with identical consumption-investment behaviours maximise their utility over two periods. In the first period, agents receive their incomes (considered as fixed and exogenous after-tax-revenue), invest in domestic and foreign assets, and use the rest for consumption. Agents then utilise their second-period income and after tax return from first-period investment for consumption. It is assumed that the country is small and so its savings or investment cannot affect the world interest rate. Government expenditure increases private agents' utility, but it enters exogenously as an additive function as private agents cannot control it. Government raises its revenue through financial repression, represented as a tax θ on the value of foreign investment.[12]

The representative private agent's utility U and consumption in the two periods, C_1 and C_2, are given as follows:

$$U = \max_{C_1 C_2} U_i(C_1 C_2) + U_g(G) \tag{1}$$

$$C_1 = W_1 - (D + F) \tag{2}$$

$$C_2 = W_2 + (1 + r^*)(1 - \theta)F + (1 + r)D \tag{3}$$

where W_1 and W_2 are the private agent's incomes in the two periods; G is government spending; r and r^* are the domestic and world interest rates respectively; D and F are the holdings of domestic and foreign assets by private agents; and θ is revenue (tax) from financial repression. For simplicity, uncertainty and transaction costs are not taken into account. Also, for same reason, there is no distinction between interest and principal

[12] To simplify the model, the only source of tax revenue for government expenditure is through financial repression which has a distortionary effect on capital flows.

repayment. Private agents require the same return from both types of assets, hence D and F are perfect substitutes.

Assuming perfect capital mobility, investors require that after tax returns on domestic and foreign assets are equal so that equilibrium in the private agents' portfolio implies that:

$$(1 + r^*)(1 - \theta) = 1 + r \tag{4}$$

This suggests that the tax θ on foreign asset returns proportionally reduces the interest paid on domestic debt, and financial repression therefore exerts a distortion which drives the domestic interest rates below the world interest rate.

Maximising utility with respect to consumption in equations (1)-(3) yields the first-order condition:

$$U_1(C_1C_2) = (1 + r^*)(1 - \theta)U_2(C_1C_2) \tag{5}$$

where U_1 and U_2 are the marginal utilities with respect to the first and second period consumptions, respectively. This condition highlights the impact of financial repression on the intertemporal terms of trade faced by private agents.[13]

Assuming that government expenditure is financed by domestic borrowing (D) and external debt (E), the respective budget constraints in the first and second periods are:

$$G = D + E \tag{6}$$

$$(1 + r^*)E + (1 + r)D = (1 + r^*)\,\theta F \tag{7}$$

[13] The model here does not seek to explain the relationship between financial repression and cost of distortion on the optimal decisions of private agents. For more details, see Giovannini and de Melo (1991).

Equation (7) illustrates that income from the financial repression tax has to be equal to the cost of government's domestic and foreign debts. Using (4), (6) and (7), we get

$$G = \theta(F + D) \tag{8}$$

Equation (8) implies that the distortionary effect of interest rate renders government an income which is proportional to the total holdings of assets by private agents in the first time period. More importantly, the model highlights that governments can exercise the means of financial repression to affect foreign investment by driving a wedge between domestic and foreign interest rates, rather than rely on levying a tax on private agents' income from investing in foreign assets. Therefore, assuming that $G = \theta D$ approximately holds and using (6), the government's budget constraint is transformed into:

$$E + D = \theta D \tag{9}$$

For simplicity, we normalise government expenditure to be unity, so that the relationship between financial repression and external debt is expressed as:

$$\theta = \frac{1}{1-E} \tag{10}$$

Turning to the relationship between FDI and economic growth, we assume that each firm has access to the following production technology:

$$Y_t = A_t K_t^{\beta} L_t^{1-\beta} \tag{11}$$

where A_t stands for technology; K_t denotes capital (both domestic and foreign) and we allow for the possibility that MNEs can use host countries' financial market to raise capital;

L_t labour is entirely supplied by residents in domestic country; and $\beta \in (0,1)$. Following Kinoshita and Lu (2016) and Hsu and Wu (2006), assume technological progress of domestic country is driven by international diffusion of foreign technology, which in our context measures as the function of FDI externality and local economic conditions:

$$A_{t+1} = A_t + (A_t^*(\iota) - A_t)\varphi(k_t)\psi(M_t) \tag{12}$$

Assuming a linear additive utility function of the OLG model (for simplicity, the model here does not include the utility gain from government expenditure):

$$U = \ln C_1 + \delta \ln C_2 \tag{13}$$

The lifetime budget constraint faces each private agent is:

$$C_1 + \frac{C_2}{1+r} = (1 - tax)W_1 \tag{14}$$

The optimal consumption path (C_1, C_2) is derived by maximising (13) subject to (14) to yield the first order conditions:

$$C_1 = \frac{(1-tax)W_1}{1+\delta} \tag{15}$$

$$C_2 = \frac{\delta(1+r)(1-tax)W_1}{1+\delta} \tag{16}$$

In equilibrium

$$\frac{C_1}{C_2} = \frac{1}{\delta}\frac{1}{1+r} \tag{17}$$

Given that the host country has domestic and foreign capital, and MNEs can borrow from the domestic financial market, the return on foreign capital is determined from equation (4): $r^* = \frac{1+r}{1-\theta} - 1$. Then, combining (11), (13), and (17), the equilibrium capital and output equations can be specified as follows:

$$k_t = \left[\frac{A_t\beta}{1+R}\right]^{\frac{1}{1-\beta}} = \left[\frac{A_t\beta(1-\theta)}{1+r}\right]^{\frac{1}{1-\beta}} \tag{18}$$

$$y_t \equiv \frac{Y_t}{L_t} = A_t^{\frac{2-\beta}{1-\beta}}\left[\frac{\beta(1-\theta)}{1+r}\right]^{\frac{1}{1-\beta}} \tag{19}$$

To obtain the growth rate of output per capita g^t, divide both sides of equation (19) by y_{t-1} and take the logarithmic form, substituting also for A_t using (12):

$$g^t \equiv ln\left(\frac{y_t}{y_{t-1}}\right) = \left(\frac{2-\beta}{1-\beta}\right) ln\left(\frac{A_t}{A_{t-1}}\right)$$
$$= \left(\frac{2-\beta}{1-\beta}\right) ln\left[1 + \frac{1}{A_{t-1}}(A^*_{t-1}(\iota) - A_{t-1})\varphi(k_{t-1})\psi(M_{t-1})\right] \qquad (20a)$$

which yields the approximate relationship:

$$g^t \cong \left(\frac{2-\beta}{1-\beta}\right) \ln\left\{1 + \frac{1}{A_{t-1}}(A^*_{t-1}(\iota) - A_{t-1})\varphi\left[\frac{A_{t-1}\beta\left(1-\frac{1}{1-E}\right)}{1+r}\right]^{\frac{1}{1-\beta}}\psi(M_{t-1})\right\} \tag{20b}$$

In deriving (20a,b), we have used the fact that $ln\left(\frac{x}{y}\right) = ln\left(1 + \frac{x-y}{y}\right)$. Assume now that $k_t = k_t^f + k_t^d$ where k_t^f is foreign capital and k_t^d is domestic capital. Differentiating (20a) with respect to k_{t-1}^f yields the first-order condition:

$$\frac{\partial g^t}{\partial k_{t-1}^f} = \frac{[A_{t-1}^*(\iota) - A_{t-1}]\varphi'(k_{t-1}^f + k_{t-1}^d)\psi(M_{t-1})(2-\beta)}{A_{t-1}\left\{1 + \frac{1}{A_{t-1}}[A_{t-1}^*(\iota) - A_{t-1}]\varphi\left(k_{t-1}^f + k_{t-1}^d\right)\psi(M_{t-1})\right\}(1-\beta)} \tag{21}$$

Given $A_t^*(\iota) > A_t$ if $\iota < \iota^\gamma$, it follows that $\frac{\partial g^t}{\partial k_{t-1}^f} > 0$ provided the threshold condition holds. Differentiating further with respect to k_{t-1}^f yields a second-order condition that is negative, given that $\varphi''(\cdot) < 0$ by the Inada conditions. Note that the expression in curly brackets in the denominator of (21) must be positive as it is the argument of the logarithmic function in (20a). This allows for the possibility that FDI spillovers can be negative but only in a limited sense when the debt threshold condition is not met so that $A_t^*(\iota) \leq A_t$ $(\iota > \iota^\gamma)$, in which case the FDI-induced growth effect is not positive, though the adverse impact on growth could be mitigated through increased financial development. To illustrate the latter effect requires establishing a second-order partial condition by differentiating (21) with respect to M_{t-1} and invoking the quotient rule. This yields

$$\frac{\partial^2 g^t}{\partial k_{t-1}^f \, \partial M_{t-1}} = \frac{(2-\beta)(1-\beta)\varphi'\left(k_{t-1}^f + k_{t-1}^d\right)\psi'(M_{t-1})A_{t-1}[A_{t-1}^*(\iota) - A_{t-1}]}{\left\{A_{t-1}\left\{1 + \frac{1}{A_{t-1}}[A_{t-1}^*(\iota) - A_{t-1}]\varphi\left(k_{t-1}^f + k_{t-1}^d\right)\psi(M_{t-1})\right\}(1-\beta)\right\}^2} \tag{22}$$

Although the sign of this second-order condition (22) cannot be unambiguously determined *ex ante*, it is positive if $A_t^*(\iota) \leq A_t$ and $\psi'(M_{t-1}) < 0$, which is plausible under a high-debt, financially repressive regime that relies on increasing money supply growth to reduce the real burden of debt. The condition is also positive if $A_t^*(\iota) > A_t$ and $\psi'(M_{t-1}) > 0$, which is more likely in low-debt regimes as financial development is focused on improving FDI-induced growth through better financial intermediation.

Appendix II

Country list			
Bangladesh	Burundi	Cambodia	Cameroon
Central African Republic	Congo	DR Congo	Egypt
El Salvador	Gambia	Ghana	Guatemala
Haiti	Honduras	Indonesia	Kenya
Laos	Lesotho	Liberia	Mali
Morocco	Mozambique	Myanmar	Nepal
Nicaragua	Pakistan	Papua New Guinea	Paraguay
Philippines	Moldova	Rwanda	Senegal
Sierra Leone	Sri Lanka	Sudan	Tajikistan
Togo	Uganda	Zimbabwe	

TABLE 1 Variables, definition and source

Variable	Definition	Source
Economic growth	Growth of real GDP per capita (measured in US dollars at constant prices in 2005).	World Bank
FDI	Ratio of inward FDI flows to GDP. FDI inflows are recorded on net basis (capital transactions' credits less debits between direct investors and their foreign affiliates) and can be negative when gross inflows are offset by reverse investment or disinvestment.	United Nations Conference on Trade and Development (UNCTAD)
External debt	The ratio of external debt to GDP, representing the indebtedness level of the host economies.	UNCTAD
Human capital	Educational attainment, measured by average years of schooling (for population aged 15 and over).	Barro and Lee (2013)
Civil conflict	An index ranging from 0 to 3, representing different intensities of conflict from low to high.	Uppsala Conflict Data Programme (UCDP)
Initial GDP	Initial level of GDP.	UNCTAD
Financial crises	Captured by a dummy variable which takes value 1 for the year a country experienced a financial crisis and 0 otherwise.	Laeven and Valencia (2012)
Financial development	Measured using M2 which represents money in circulation outside banks including time (savings and foreign currency) deposits. As robustness, we use the ratio of private credit to GDP which refers to the availability of domestic credit provided by financial institutions to the private sector.	World Bank
Rule of law	An index ranging from 0 to 6, representing the strength and impartiality of the legal system as well as the popular observance of the law from low to high.	International Country Risk Guide (ICRG)
Democracy	An index ranging from 0 to 6, representing the level of democracy from low to high.	ICRG
Control of corruption	An index of corruption control, ranging from 0 to 5, representing the level (actual or potential) of corruption in various forms (excessive patronage, nepotism, job reservations) from high to low.	ICRG
Financial repression	Proxied by inflation (annual change in consumer price index, CPI). As a robustness check, interest rate spread between savings and lending rates is used.	World Bank
Trade openness	The ratio of the sum of imports and exports to GDP.	UNCTAD

TABLE 2 Summary statistics

Variable	Observations	Mean	St. Dev.	Min	Max
GDP growth per capita (%)	856	1.7609	4.3237	-24.7831	20.6168
FDI (% of GDP)	911	2.2954	6.6166	-65.4109	85.9631
Debt (% of GDP)	911	57.0323	42.4887	10.0009	319.2577
Human capital	782	4.3166	1.9894	0.5636	11.1
Conflict	911	0.7146	1.0710	0	3
Crisis	911	0.0472	0.2122	0	1
M_2 (% of GDP)	899	21.5692	32.8815	-81.702	544.2376
Private credit (% of GDP)	883	19.1298	12.4869	0.7241	103.6323
Democracy	738	3.0318	1.4245	0	6
The rule of law	738	2.65378	1.0801	0	6
Corruption	815	2.207466	0.99109	0	5
Inflation (%)	911	0.8153	9.2609	-0.1145	237.731
Trade openness (% of GDP)	911	64.1725	38.3518	12.4078	315.0892

TABLE 3 Threshold estimations using external debt as threshold

	1		**2**	
	Non-averaged annual data		**Non-overlapping five-year averages**	
***p*-value of threshold**	0.002***		0.013**	
	q<=-0.3826	q>-0.3826	q<=-0.4866	q>-0.4866
FDI	0.1642***	0.0809	0.0715***	0.0507
	(0.0376)	(0.0684)	(0.0238)	(0.0327)
Initial GDP	-0.0040***	-0.0175	-0.0046**	-0.0211
	(0.0015)	(0.0148)	(0.0020)	(0.0269)
Human capital	0.0037	-0.0275***	0.0100**	-0.0311***
	(0.0043)	(0.0081)	(0.0048)	(0.0112)
Conflict	0.0055	0.0035	0.0057	0.0108
	(0.0133)	(0.0066)	(0.0167)	(0.0893)
Trade openness	-0.0006	0.0289**	0.0013	0.0345
	0.0053	(0.0136)	(0.0072)	(0.0359)
Crisis	-0.0295**	0.0117	0.0560	0.0118
	(0.0126)	(0.0164)	(0.2697)	(0.0109)
Inflation	-0.0091**	-0.0179*	-0.0244***	-0.0138
	(0.0041)	(0.0103)	(0.0046)	(0.0129)
M_2	0.0309**	0.0099	0.0509***	0.0126
	(0.0128)	(0.0166)	(0.0093)	(0.0117)
Rule of law	0.0066***	0.0227***	0.0029	0.0320***
	(0.0016)	(0.0057)	(0.0022)	(0.0117)
Democracy	0.0005***	-0.0064	-0.0012	-0.0048
	(0.0016)	(0.0048)	(0.0023)	(0.0057)
Control of corruption	-0.0022	0.0042	0.0014	0.0008
	(0.0018)	(0.0043)	(0.0024)	(0.0057)
Constant	-0.0542	-0.3829***	0.0201	-0.4098**
	(0.0353)	(0.1049)	(0.0520)	(0.1799)
N	545	164	94	35

Note: ****p*-value < 0.01; ** *p*-value < 0.05, * *p*-value < 0.1. Estimation is by Hansen's (2000) method. The dependent variable is per capital GDP growth (log differenced). All explanatory variables (except institutions, conflict and crisis) are represented in natural logarithm form. Robust standard errors are reported (in parenthesis below coefficient estimates) to correct for heteroskedasticity. 'q' is the threshold value determined by using external debt, which represents the point at which the split into low-debt and high-debt regimes. N denotes the number of observations.

TABLE 4 Threshold results (using financial development and external debt as thresholds)

	1		**3**	
Data	*Non-averaged annual data*		*Non-overlapping five-year average*	
p-value of FIN threshold	0.000 ***		0.001***	
Regimes	low-FIN	high-FIN	low-FIN	high-FIN
FDI	0.0702	0.1145***	0.0524	0.0543**
	(0.0573)	(0.0061)	(0.0424)	(0.0218)
N	524	185	102	27
p-value of debt threshold		0.247		0.595
Threshold effect of debt		No		No

Note: *** *p*-value < 0.01; ** *p*-value < 0.05, * *p*-value < 0.1. Estimation is by Hansen's (2000) method. The dependent variable is GDP growth per capita. FIN is financial development (proxied by log of M_2) used as a threshold to determine the split into high-FIN and low-FIN regimes. The other explanatory variables (the results of which are not reported apart from FDI) are the same as in Table 2. N denotes the number of observations. The *p*-value of debt threshold shown is for the sub-sample of high-FIN regime only.

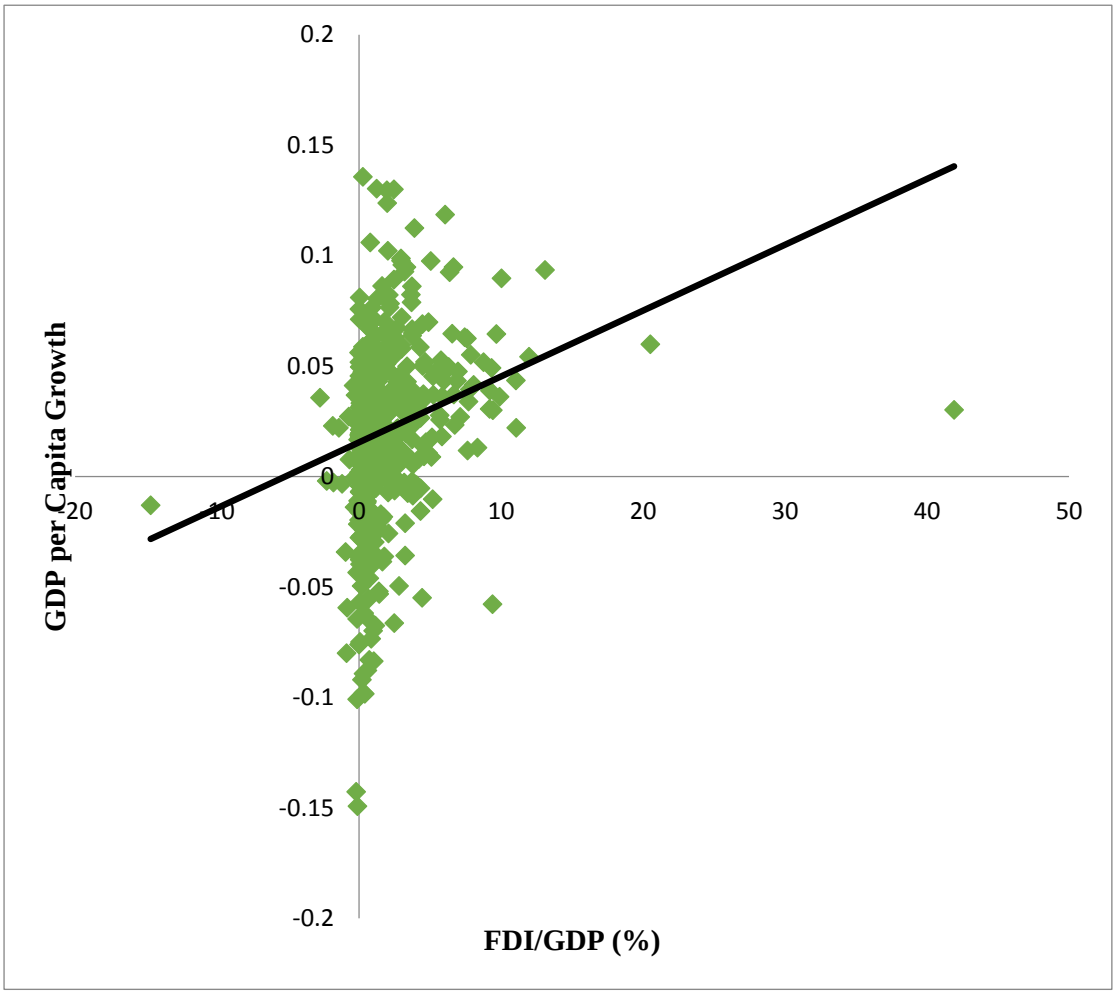
TABLE 5 Threshold estimations for robustness check

	1		**3**	
	Non-averaged annual data		**Non-overlapping five-year averages**	
p-value of threshold	0.0390**		0.0230**	
	q<=-0.4376	q>-0.4376	q<=-0.4020	q>-0.4020
FDI	0.1085***	0.0913	0.2138***	0.0309
	(0.0409)	(0.0132)	(0.0338)	(0.0640)
N	276	100	79	27
Kleibergen-Paap rk Wald F statistic	66.387		11.042	
p-value of Hansen J statistic	0.1614		0.0622	

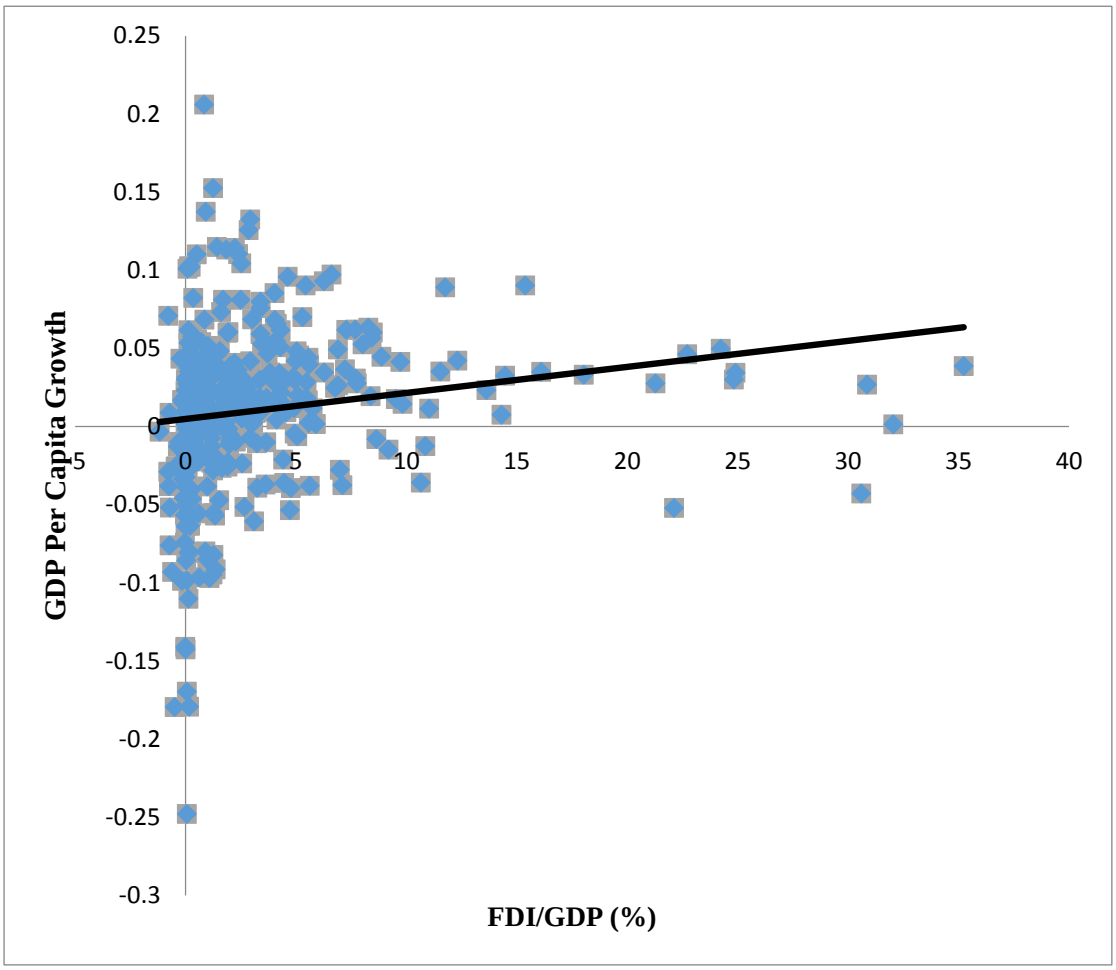
Note: *** *p*-value < 0.01; ** *p*-value < 0.05, * *p*-value < 0.1. Estimation is by Caner and Hansen's (2004) method. The dependent variable is GDP growth per capita. The explanatory variables are the same as in Table 2 except that financial development and financial repression are proxied by private credit/GDP and interest rate spread, respectively. The estimates are reported for FDI only with heteroscedastic-robust standard errors in parenthesis. 'q' is the threshold value determined by using external debt, which determines the point of the sample split into high-debt and low-debt regimes. N denotes the number of observations.

FIGURE 1 FDI-Growth nexus with low and high indebtedness levels. Panel (a) illustrates the scatter plot with low indebtedness being based on country-year observations below the sample mean of external debt (as a percentage of GDP) of 57.03 percent. Panel (b) illustrates the scatter plot with high indebtedness being based on country-year observations above the sample mean of external debt (as a percentage of GDP) of 57.03 percent.

(a)



(b)


0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-5
0
5
10
15
20
25
30
35
40
GDP Per Capita Growth
FDI/GDP (%)