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Development Strategy and International Capital Flows

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Abstract

The "Lucas Paradox" has triggered an extensive theoretical literature on the determinants of international capital flows between capital-abundant developed and capital scarce developing countries. Few papers have captured the substantial inflow to emerging economies with good economic performance. In this paper, we argue that the direction of capital flows to a developing country is determined by the country's development strategy. If the government in a labor-abundant country employs a comparative-advantage following strategy to facilitate the development of the labor-intensive sector, the economic performance will be good and capital return will be high. The country will attract capital inflows. If instead, the government, influenced by inappropriate development ideas, adopts a comparative-advantage-defying strategy to favor the development of the capital intensive sector with various interventions, the economic performance will be poor and capital return will be repressed. As a result, the capital outflow will happen, as described by Lucas Paradox. We develop a simple static model to formalize this idea and test the hypothesis with a comprehensive data set.

JEL Codes: F21; F41; L16; O11; O25

Key Words: comparative advantage, international capital flows, development strategy, industrial structure, financial repression

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"But, soon or late, it is ideas, not vested interests, which are dangerous for good or evil."

--- Keynes, 1935 [1964], p. 384.

1 Introduction

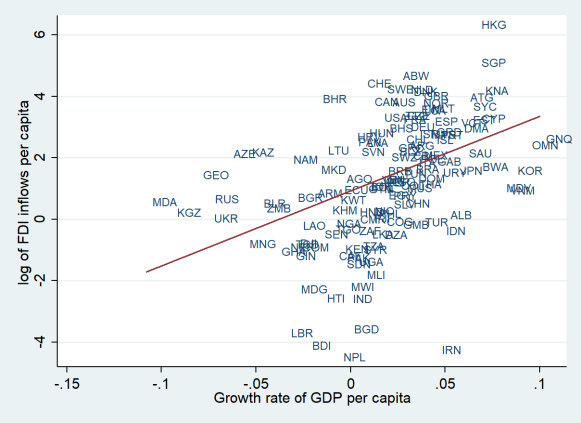
The modern economic development is a process of structural transformation characterized by continuous technological innovation and industrial upgrading, which increase labor productivity, and continuous improvement in infrastructure and institutions, which reduces transaction costs (Kuznets,1966; Lin 2011). All these efforts require capital. Under the assumptions of Neoclassical theory with perfect capital markets, common production function and diminishing returns to capital, capital flows from rich to poorer countries in which the stock of capital per capita is relatively low. Such a capital flow is a win-win for both rich and poor countries and particularly beneficial to the development of the poorer countries. Lucas (1990), however, finds that not much capital flows in the direction as predicted. It is referred to as the "Lucas paradox" and has inspired an extensive theoretical literature.

While existing literature has provided many plausible explanations for the reversed capital flows between poor and rich countries, it is almost silent on the fact that emerging economies with good economic performance attract capital inflows while capital outflows occur mostly in poor performing economies. We look at the foreign direct investment (FDI) inflows for a large sample of countries over the period 1971-2000[1] and find that there is a strong positive correlation between the growth rate of GDP per capita and inflows of FDI per capita, as shown in Figure 1. This correlation is robust whether including or excluding countries with extreme abundant natural resources[2].

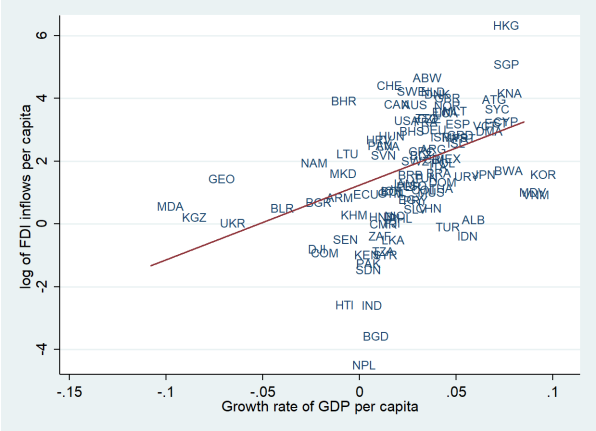
As an illustration of this relationship, Ghana, a country with an average growth rate of per capita GDP at -3.9%, received much less FDI inflows on average during 1970-2000 than Thailand, whose per capita GDP growth at the average annual rate of 3.4%. Zimbabwe, with the GDP per capita on average decreased annually by 4.4% during 1981-1990 even saw net

[1]We limit our empirical analysis to this period to make our results comparable to existing literature. In addition, variations in development strategy across countries, which is the main concern of this paper, are more significant before 2000 than the later period.

[2]The abundance of natural resources is measured by the Total natural resources rents (% of GDP) from the World Development Indicator (World Bank). We exclude the top 25% in Panel B of Figure 1, which includes the major oil exporters, such as Iraq and Saudi Arabia, countries earn large rents from coal, such as Mongolia, as well as other countries relying heavily on natural resources. Mining of natural resources requires capital-intensive equipments. A resources abundant developing country may attract foreign capital to exploit its resources.



(A) Full sample



(B) Sub-sample

Figure 1: Economic growth and FDI inflows in 1971-2000

capital outflows. This contradicts the neoclassical theory since capital flows out from some countries with a limited capital stock like Zimbabwe. Meanwhile, it challenges theories in which capital only flows from developing countries to developed countries as well, since some developing countries attract a large volume of capital flows, such as Thailand and China.

This pattern is consistent with results in Alfaro et al. (2014) and Gourinchas and Jeanne (2013), who find that private capital flows towards countries with high productivity growth. The key question is, then, what are the fundamental reasons that create variations in economic growth rate across countries and explain the positive correlation between economic performance and private capital inflows? A recently growing literature investigating the role of government in accelerating economic developing (Acemoglue et al., 2006; Itskhoki and Moll, 2014). Moreover, a series of papers by Lin and his coauthors (Lin, 2003; Lin, 2009; Xu and Lin, 2010) provide empirical and theoretical evidence on the impacts of development strategy on economic growth. We argue in this paper that the positive correlation is rooted in the government's strategy for development, which consists of a package of policy to support a certain type of industries in the economy. Particularly, if the government in a labor-abundant country employs a policy framework summarized as a comparative-advantage-following (CAF) strategy to facilitate the development of the labor-intensive sector, the capital return and growth will be high. Moreover, the strategy will enable the government to allocate more resources to infrastructure, which further enhance the return to capital. On the contrary, if the government, influenced by the prevailing development ideas in the post-WWII, adopts a comparative-advantage-defying (CAD) strategy (Chenery 1961), using various interventions to support favorably the development of capital-intensive sector, the capital return and growth will be repressed. Additionally, the government will have fewer funds to support in-

frastructure improvement, which further reduces capital return and is likely to drive capital out.

To illustrate the idea and guide the empirical analysis, we build a model with small open economies, in which labor and capital are employed to produce an agricultural good and two manufacturing goods with different capital intensity. Countries differ from each other in two dimensions. First, there is cross-country heterogeneity in factor endowment structure, similar to the assumption in the Heckscher-Ohlin model. In addition, the government has different targets when making policy decisions. After WWII, most developing countries gained political independence from colonial powers and started their modernization drives led by their revolutionary leaders (Lin 2003, 2009). Aspired to catch up the advanced countries as quick as possible and influenced by the prevailing idea of first-generation development economics, the structuralism, most developing countries adopted the import substitution strategy to to overcome the perceived "market failures" for the development of capital–intensive industries (Chenery, 1961; Krueger, 1990; ; Murphy et al., 1989; Lin, 2003, 2009; Prebisch, 1950). The model aims to capture the strategy adopted by most developing countries and many other socialist economies in the post-WWII.

Our model predicts that if the government in a labor-abundant country adopt the CAD strategy and promote its capital-intensive sector, it has to directly allocation resources to the priority sector. As a result, the total output is reduced and the output per labor in the manufacturing production relative to the output per labor for the whole economy is increased. The magnitude of reduction is positively correlated with the extent of the government's preference over the capital-intensive sector, which sheds lights on how we measure CAD strategy in the empirical analysis. Furthermore, the CAD strategy decreases the supply of infrastructure, either through the reduction of the tax base, or the reduced share of government spending on infrastructure due to subsidies to support firms in the capital-intensive sector. As a result, the return to capital is further decreased, reducing the attractiveness of capital inflows.

To test the main prediction of the model, we assemble a comprehensive data set that characterizes detailed capital flows, government policy, infrastructure, institutions, and other national characteristics on an annual basis for a large set of countries over the period 1971–2000. Given that FDI is the major component in capital flows to emerging markets, we mainly discuss the determinants of FDI flows. Our results indicate an essential role of development strategy in shaping international direct investment flows, compared with institutional quality, human capital, and other popular explanatory factors.

In particular, with the control of other popular explanatory factors in the existing literature except for development strategy, which is measured by the Technology Choice Index (TCI)

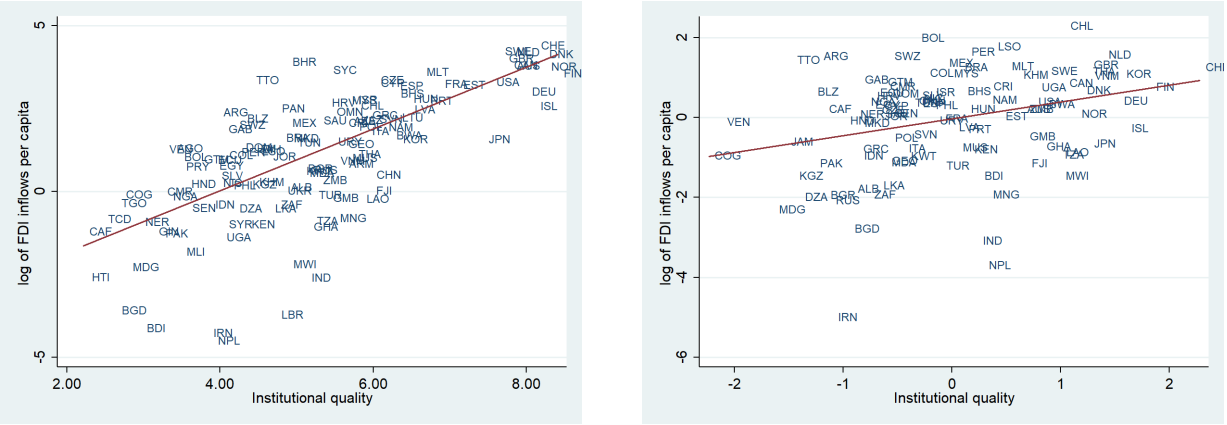
and constructed as suggested by our model, the coefficient on capital abundance indeed decreases but is still positive and statistically significant. However, once we control for TCI and infrastructure, the impact of capital abundance on direct investment becomes less significant, both statistically and economically. The magnitude of the coefficient on our development strategy index indicates that if everything else remains the same but we decrease the distortion of the economic structure of Bolivia to Malaysia's level in 1990, the per capita direct investment inflows to Bolivia will increase from 0.51 to 1.6 ($1000 in constant 2000 USD). On the contrary, the impact of development strategy on portfolio equity is shown to be statistically insignificant. The results are robust to the inclusion of additional variables, estimation with instruments, alternative measures of independent variables and alternative estimation techniques.

Our paper proceeds as follows. Section 2 provides an overview of the related literature. Section 3 presents a simple model. Data, empirical framework, and results are in Section 4, and Section 5 concludes.

2 Literature Review

This paper is closely related to the literature on the determinants of international capital flows triggered by the "Lucas Paradox". Two strands of literature have emerged. One group of literature argues that the direction of capital flows depends on certain characteristics, such as human capital (Lucas, 1990), institutions (Wei, 2000; Wei and Wu, 2002; Alfaro et al., 2008; Papaioannou, 2009; Ju and Wei, 2010), financial market (Antras and Caballero, 2009; Mendoza et al., 2008; Caballero et al., 2008) and financial openness (Reinhardt et al.,2013). With a cross-country regression of the long-run average of capital inflows per capita on the log of initial income per capita, Alfaro et al. (2008) find that institutional quality is the leading explanation among all alternative theoretical explanations. However, Azemar and Desbordes (2013) demonstrate that institutional quality does not make the Lucas Paradox "disappear". In fact, we look at the capital inflows in 1971-2000 and find the correlation between institution quality and capital inflows is very weak if we control the development strategy and supply of infrastructure. As illustrated in Figure 2, without any controls, the correlation between FDI inflows and institutional quality is significantly positively. However, when we plot the residual from the regression of capital inflows on institutional quality index against the residual from the regression of institutional quality on TCI, which is a proxy for development strategy, and road length, the fitted line becomes much flatter. It implies that the exogenous component of institutional quality is not a strong explanation for the variation

in FDI inflows.



(A) Without controls

(B) After controlling for development strategy

Figure 2: Institution quality and FDI inflows

Another fact that challenges the argument of institutional quality is the variation in each country's capital flows over time. Alfaro et al. (2008) show that there is almost no time variation in institutional quality. Meanwhile, when we plot the time evolution of FDI inflows for selected countries, we discover substantial changes over time as illustrated in Figure 3. One might argue that the over-time changes are driven by capital account liberalization episodes. We show in section 4 that this pattern is robust after controlling for capital account openness.

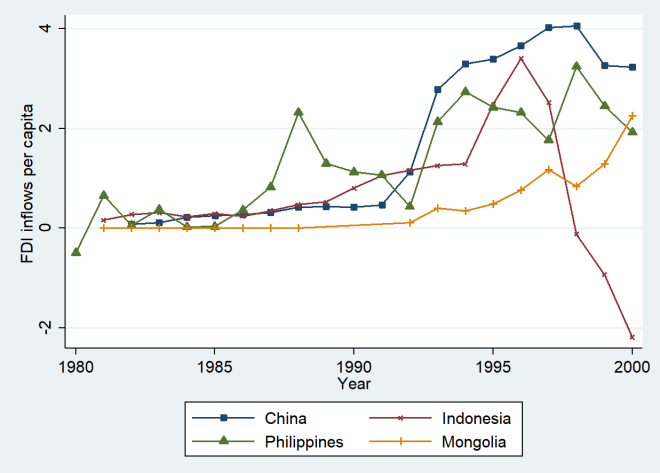


Figure 3: Evolution of FDI inflows over time

The other strand of the literature suggests capital should flow from capital-scarce developing countries to capital abundant advanced countries as shown in the Lucas Paradox (Jin, 2012; Barattieri, 2014). Jin (2012), for example, build a general-equilibrium framework under which

capital tends to flow toward economies more specialized in capital-intensive sectors due to the composition effects of industrial structure. While Jin's work highlights the importance of industrial structure, it fails to capture the capital inflows to fast-growing emerging countries, as illustrated at the very beginning of this paper. Some countries specialized in the labor-intensive sectors, such as emerging Asian countries, attract a large amount of capital inflow.

We are not the first to discuss the variation of capital flows among developing countries. A growing strand of literature has discussed the negative correlation between productivity growth and net capital inflows across emerging economies, which is referred to as "allocation puzzle" (Gourinchas and Jeanne, 2007). Some papers, motivated by China's experience, emphasized that the interaction of borrowing constraints and current account surplus (Sandri, 2014; Song et al., 2011; Buera and Shin, 2017). Market frictions are essential in these papers to explain the correlation between productivity growth and capital flows. However, market frictions are endogenously determined by government policies, so the existing literature fails to explain the fundamental question. We show in our empirical analysis that the impacts of market frictions on FDI inflows become insignificant with the control of development strategy.

We also contribute to the literature on the impacts of infrastructure on capital flows. The existing papers on infrastructure's contribution to FDI are mainly empirical work. Asiedu (2002), for example, find better infrastructure helps attract FDI to non-SSA countries but has no significant impact on FDI to SSA. To better understand how capital flows are affected by infrastructure, this paper not only builds a model in which infrastructure is endogenously determined by development strategy but also empirically investigates the impacts of infrastructure on FDI inflows based on a comprehensive data set with a coverage of 95 countries.

This paper lays on the foundation of a series paper on the discussion of development strategy, including Lin (2003, 2009, 2011), Xu and Lin (2010), Lin and Liu (2003), Chen and Lin (2013), Rodoeevic (2015) and Siddique (2016). These papers argue that high distortions and interventions on the economy of LDCs are not solely due to the corruption of the politicians and the bureaucrats but endogenously determined by the adoption of CAD strategy, motivated by modernization drive. In particular, the governments in most LDCs in the post-World War II intended to accelerate the growth of capital-intensive industries while their economies were capital scarce. Firms in industries with comparative disadvantages became nonviable in open competitive markets, and the government needed to subsidize/protect the nonviable firms in the priority sectors with various distortions in the market and interventions in resource allocation. These development strategies have played an important role in shaping the patterns of capital flow, income distribution, institutional quality, growth performance and other dimensions of development performance across countries but hasn't received sufficient

attention in the literature.

Our modeling of CAD strategy through interventions in capital markets following the literature on financial repression, a notation explicated by McKinnon (1973) and Shaw (1973). A number of government regulations or restrictions has been discussed in the literature, such as high reserve requirements, interest ceilings on deposits and loans, capital controls, and restrictions on the direction of credit allocation. There have been extensive studies on how an economy would benefit from financial market liberalization (e.g. Galindo and Schiantarelli, 2007; Ang and Mckibbin, 2007; Rousseau and Wachtel, 2011). Our paper contributes to this literature by discussing the impacts of government's repressive interventions in the financial market, resulted from the CAD strategy, on international capital flows, a new channel through which financial repression affects economic development.

Note that our paper abstracts from public capital flows. This selection of focus is based on the recent discussion of Gourinchas and Jeanne (2013) and Alfaro et al. (2014), who show that sovereign-to-sovereign transactions are primarily responsible for the observed negative correlation between growth and net capital inflows. A likely explanation for their observation is the purpose of official flows are aiming for humanitarian purposes (Lin and Wang 2017). Moreover, since MacDonald (2015) shows that FDI, which directly provides capital for the real economy, is directed towards countries with the highest growth rates, while portfolio investment, which is mostly short term and relates to speculative sectors, does not show this pattern, most of our discussion is focused on FDI. But we also show that our results of portfolio investment are consistent with MacDonald (2015).

3 Theoretical Model

The key distinction of our approach from standard models is that we consider multiple sectors with different factor intensity and emphasize the importance of development strategy, which shapes the industrial structure and affects capital returns. We start with a simple static model with a series of simplifying assumptions, but also discuss extensions in which we relax some assumptions.

3.1 The Environment

A. Production

Consider a small open economy, in which the price of goods is determined in the world market. There are three goods produced in the economy: Agriculture (A), Labor-intensive Manufacture ($M1$) and Capital-intensive Manufacture ($M2$), which is considered to be more advanced than the labor-intensive manufacturing. Labor (L) is used in the production of all three goods, while land (T) is a specific factor only used in the agriculture sector and capital (K) is employed in the two manufacturing sectors. All goods are produced with Cobb-Douglas production functions:

$$Y_{Mi} = G^{\theta}(K_{Mi})^{\alpha_i}(L_{Mi})^{1-\alpha_i}, i = 1, 2; \alpha_1 < \alpha_2 < 1 \tag{1}$$

$$Y_A = G^{\theta}(T)^{\alpha_A}(L_A)^{1-\alpha_A}, \alpha_A < 1 \tag{2}$$

where G is the infrastructure per capita, a common external input to all sectors. It is provided free of charge by the government and financed from tax. θ measures the elasticity of infrastructure and is assumed to be the same across sectors. The incorporation of infrastructure into the production function is in line with the literature on the impacts of infrastructure on economic growth (e.g. Barro, 1990; Glomm and Ravikumar, 1994; Rioja, 1999; Esfahani and Rmiez, 2003).

As a simplification, we consider a special case with $\alpha_A = \alpha_1$ and $\alpha_2 = 1$ in the following analysis. We show later that relaxing this assumption does not qualitatively change our main conclusions. The world price of good $M1$ is normalized to 1, and the price of good A and $M2$ are p_A and p_2 , respectively. The total endowment is exogenously given. Since land is used in the agriculture sector only, $T = \bar{T}$. Capital and labor market clearing requires that:

$$L_A + L_{M1} + L_{M2} \leq \bar{L} \tag{3}$$

$$K_{M1} + K_{M2} \leq \bar{K} \tag{4}$$

B. The Government

To discuss the heterogeneous development strategies across countries, we assume that the government has its preference, reflecting the political leader's idea of the model of development, and is rational in the sense that it takes actions to maximize its own preference.

A good example to validate this assumption is that many leaders of the newly independent nations after WWII in Asia, Latin America, and Africa adopted the import substitution strategy advocated by the prevailing first-generation development economics-the Structuralism-or the Soviet-type planning economy to develop capital-intensive industries similar to those in capital-abundant, advanced countries despite the scarcity of capital in their own endowment structure. This strategy was popular among the leaders in the developing countries at that time because they, believed the development of advanced capital intensive industries to be the way for their countries' modernization and, political independent, and for quickly catching up the advanced countries and the government needs to play a facilitating role to overcome market failure in the development of these industries (Chenery 1961, Murphy et al., 1989). The government performs as the central planner to maximize its objective function by choosing factor allocation. This problem takes the form:

$$\max_{\Omega}\{p_A Y_A + (1-\omega)(Y_{M1} + p_{M2}Y_{M2}) + \omega(p_{M2}Y_{M2})\}$$

subject to (3) and (4). Ω is the set of policy tools that the government chooses from, which include credit subsides (s) and direct credit allocation (K_{M2}). Y_A, Y_{M1} and Y_{M2} are produced with technology as shown in (1) and (2). τ is a proportional tax on total income to finance the supply of infrastructure. The government budget constraint is given by

$$\bar{L}G = \tau(p_A Y_A + Y_{M1} + p_{M2}Y_{M2}) \tag{5}$$

τ is exogenously given in our main discussion and we later discuss the implication of endogenous τ. Note that G depends on the volume of the tax base, which is the total income and is endogenous. ω captures the priority of capital-intensive sector in the government's development strategy. We define a policy as CAF strategy is ω=0 and as CAD strategy otherwise.

C. Factor Allocation and Diversification Cone

We first consider $\omega = 0$, i.e. the government does not give priority to the capital-intensive sector. If all sectors are produced, the maximization problem of the government yields equalization of marginal products of labor and capital across sectors:

$$w = (1-\alpha_1)p_A G^{\theta}(\frac{\bar{T}}{L_A})^{\alpha_1} = (1-\alpha_1)G^{\theta}(\frac{K_{M1}}{L_{M1}})^{\alpha_1} \tag{6}$$

$$r = \alpha_1 G^{\theta}(\frac{K_{M1}}{L_{M1}})^{\alpha_1 - 1} = G^{\theta}p_{M2} \tag{7}$$

Equation (6) determines the allocation of labor across agriculture sector and manufacturing sectors, while (7) determine the allocation of capital across industries within the manufacturing sector. With simple algebra, it can be shown that:

$$\frac{K_{M1}}{L_{M1}} = (\frac{p_{M2}}{\alpha_1})^{\frac{-1}{1-\alpha_1}} = \lambda_l \tag{8}$$

where λ_l is a constant. Wage (w) and rent (r) are determined by the marginal product of labor and capital in each sector according to equation (6) and (7) respectively.

The economy will stop producing the capital-intensive goods if capital abundance is low: $\frac{\bar{K}}{L_{M1}} < \lambda_l$, where L_A and L_M satisfies:

$$(1-\alpha_1)p_A G^{\theta}(\frac{\bar{T}}{L_A})^{\alpha_1} = (1-\alpha_1)G^{\theta}(\frac{\bar{K}}{L_{M1}})^{\alpha_1} \tag{9}$$

Combining (9) and (3), we obtain

$$L_A = \frac{\kappa}{1+\kappa}\bar{L}, \quad L_{M1} = \frac{1}{1+\kappa}\bar{L} \tag{10}$$

where κ is a constant and defined as $\kappa \equiv (p_A)^{\frac{1}{\alpha_1}}/\bar{K}$. It measures the relative abundance of the two sector-specific factors. The economy will not produce $M2$ if

$$\frac{\bar{K}}{\bar{L}} < \lambda_l/(1+\kappa) \tag{11}$$

3.2 Development strategy and economic outcomes

A. CAF Strategy

To capture the impacts in developing countries arising from the government's interventions due to its development strategy shaped by the political leader's idea of modernization after WWII, consider a South country with $\bar{K}^S/\bar{L}^S$ satisfies (11). When $\omega = 0$, South specializes in the production of $M1$ and A. The allocation of labor is determined as (9), and the equilibrium returns to capital and labor are pinned down by their marginal products in sector $M1$, which can be expressed as:

$$w^S_{CAF} = (1-\alpha_1)(G^S_{CAF})^{\theta}(\varphi^S)^{\alpha_1} \tag{12}$$

$$r^S_{CAF} = \alpha_1(G^S_{CAF})^{\theta}(\varphi^S)^{\alpha_1 - 1} \tag{13}$$

where $\varphi^i \equiv (\bar{K}^i + {p_A}^{1/\alpha_1}\bar{T}^i)/\bar{L}^i$, $i = N, S$. It measures the relative abundance of capital and land in each country. The tax base equals the sum of all output values of the economy and is given by:

$$E^S_{CAF} = (P_A Y_A + Y_{M1})^S_{CAF} = (G^S_{CAF})^\theta (\varphi^S)^{\alpha_1} \bar{L} \tag{14}$$

Then G is determined by the government budget constraint (5) as:

$$(G^S_{CAF})^{1-\theta} = \tau(\varphi^S)^{\alpha_1} \tag{15}$$

Given $\theta < 1$, G is an increasing function of $\bar{L}$, $\bar{K}$, and $\bar{T}$. However, if we keep the structure of endowment unchanged, i.e. increase all factors by the same proportion, G stays the same.

B. CAD Strategy

Now consider the government in the South prioritizes the production of the capital-intensive good, i.e $\omega > 0$. As discussed in the literature of financial repression, policy tools that affect the allocation of capital include interest rate ceilings, liquidity ratio requirement, capital controls, restrictions on directions of credit allocations, government ownership of banks and etc. (Mckinnon, 1973; Shaw, 1973). We skip details of the financial system, but focus on the behavior of government and its impact on production, and discuss two different type of policies, credit subsidies and direct credit allocation.

a) Credit subsidies

First, let's assume that the government employs credit subsidies to support the development of the capital intensive sector. One way though which the government implements this policy is to rent from the private banks at r and lend to entrepreneurs at a lower price $r(1-s)$, where s is the rate of subsidies. The corresponding government's problem is

$$\max_s \{p_A Y_A + (1-\omega)(Y_{M1} + p_{M2} Y_{M2}) + \omega(p_{M2} Y_{M2})\} \tag{16}$$

subject to the government budget. Since labor and capital still can freely move across sector, we have

$$r^S_{CAD} = \alpha_1 G^\theta (\frac{K_{M1}}{L_M})^{\alpha_1 - 1} = \frac{1}{1-s}(G^S_{CAD})^\theta p_{M2}$$

which yields

$$(\frac{K_{M1}}{L_{M1}})_{CAD} = [\frac{p_{M2}}{(1-s)\alpha_1}]^{\frac{-1}{1-\alpha_1}} = \lambda_l(1-s)^{\frac{1}{1-\alpha_1}} = \lambda_l'(s)$$

which together with the factor market clearing condition gives the allocation of labor and capital across sectors as functions of s. Since $\lambda_l' < \lambda_l$, although $\bar{K}^S/\bar{L}^S < \lambda_l/(1+\kappa)$, it's still possible that $\bar{K}^S/\bar{L}^S > \lambda_l'/(1+\kappa)$ if s is large enough and $\bar{K}^S/\bar{L}^S$ is not too small. But how large could s be? Substituting the firm's optimal choice of L and K into the government problem, we obtain the first-order condition as:

$$\omega = \frac{s^*\alpha_1\lambda_l'\bar{L}}{\alpha_1\lambda_l'\bar{L} + p_A^{\frac{1}{\alpha_1}}\bar{T}(1-\alpha_1)} \tag{17}$$

where s^* is the optimal solution of the government. However, whether the government could achieve its goal with credit subsidies depends on its total budget. For simplicity, assume the total government budget that could be allocated to credit subsidies is D[3], i.e. $srK_{M2} \leq D$. Substituting the expression of K_{M2} in the government budget constraint, the corresponding maximum subsidies rates s_{max} satisfies

$$\frac{s_{max}}{1-s_{max}} G^{\theta} p_{M2}[\bar{K} - \lambda_l(1-s_{max})^{\frac{1}{1-\alpha_1}}\bar{L} + p_A^{\frac{1}{\alpha_1}}\bar{T}] = D$$

It can be proved that this equation has a unique solution of s_{max}. However, it's possible that $s_{max} < s^*$if D is small. Actually it might even not be large enough to make $\frac{\bar{K}}{\bar{L}} > \lambda_l'/(1+\kappa)$ and no firm in the South produces $M2$.

b)Direct Credit Allocation

If s_{max} cannot be large enough to achieve the government's goal, the government might choose direct credit allocation instead, a common practice by the government in a planning economy or import-substitution economy (Lal 1994). As discussed in the literature of selective credit allocation, this type of policy generate no explicit cost or subsidy entries in the government budget, but takes the form of inefficient use of productive factors[4]. The corresponding government's problem is

$$\max_{K_{M2}} \{p_A Y_A + (1-\omega)(Y_{M1} + p_{M2}Y_{M2}) + \omega(p_{M2}Y_{M2})\} \tag{18}$$

[3]If we endogenize D, one would expect that changes in s affect D by changing total output, which is the tax base.

[4]Note that when government uses direct credit allocation as its tool to control capital, it might have to pay monitoring cost or other management cost, which might show up in the government budget.

where K_{M2} is the minimum level of capital that the government requires the capitalist to lend to entrepreneurs in the capital-intensive sector. Given that without government intervention, all capital would be allocated to the labor intensive sector, the credit constraint of the labor intensive sector would be binding, i.e. $K_{M1} = \bar{K} - K_{M2}$.

Now only labor is freely mobile across sectors. Equation (6) holds, which yields $L_A = \frac{p_A^{\frac{1}{\alpha_1}}\bar{T}}{K_{M1}} L_M$. Given $L_A + L_M = \bar{L}$, we have

$$L_A = \frac{p_A^{\frac{1}{\alpha_1}}\bar{T}}{\varphi_1}, \quad L_M = \frac{K_{M1}}{\varphi_1}$$

where $\varphi_1 \equiv \frac{K_{M1}+p_A^{\frac{1}{\alpha_1}}\bar{T}}{\bar{L}}$. Substitute the expression of employment in each sector into the government's objective function, we can get the first order condition of the government's problem as:

$$\omega = \frac{\alpha_1\bar{L} - p_2\bar{L}(\varphi_1^*)^{1-\alpha_1}}{\alpha_1\bar{L} + p_A^{\frac{1}{\alpha_1}}\bar{T}(1-\alpha_1)(\varphi_1^*)^{-1}} \tag{19}$$

with which we obtain

$$\frac{d\omega}{d\varphi_1^*} = \frac{(2\alpha_1 - \alpha_1^2)p_A^{\frac{1}{\alpha_1}}\bar{T}p_2\varphi_1^{-1-\alpha_1}\bar{L} - (1-\alpha_1)\alpha_1 p_2\varphi_1^{-\alpha_1}\bar{L}^2 - \alpha_1 p_A^{\frac{1}{\alpha_1}}\bar{T}\varphi_1^{-2}\bar{L}}{[\alpha_1\bar{L} + p_A^{\frac{1}{\alpha_1}}\bar{T}(1-\alpha_1)(\varphi_1^*)^{-1}]^2}$$

Given $\frac{p_A^{\frac{1}{\alpha_1}}\bar{T}}{\bar{L}} < \varphi_1 < \frac{\bar{K}+p_A^{\frac{1}{\alpha_1}}\bar{T}}{\bar{L}}$ and $\frac{\bar{K}}{\bar{L}} < \frac{\lambda_l}{(1+\kappa)}$, with simple algebra, one can prove that $\frac{d\omega}{d\varphi_1^*} < 0$. Therefore, $\frac{dK_{M2}^*}{d\omega} > 0$, i.e the larger weight the government puts on the capital intensive sector, the more capital is allocated to this sector. The returns to labor and capital are pinned down by their marginal product in the unconstrained sector, i.e.:

$$w_{CAD}^S = (1-\alpha_1)(G_{CAD}^S)^\theta(\varphi_1^*)^{\alpha_1} \tag{20}$$

$$r_{CAD}^S = G^\theta p_{M2} \tag{21}$$

c) Economic outcomes

Since the capability of collecting government income to fund the credit subsidies is limited in most developing countries, we illustrate the impacts of CAD development strategy on economic outcomes using the scenario with direct credit allocation as an example. The following proposition characterizes how the development strategy affects total output.

Lemma 1. *With everything else equal, countries with CAD strategy have lower total output compares with countries with CAF strategy. The more the government's sector preference is away from its comparative advantage, the lower the total output value is.*

The first part of the proposition is straightforward since the factor allocations deviate from their optimal level. To prove the second part of the proposition, substituting the solution of the government problem in (18) into expression of total output values of the economy yields

$$E^S_{CAD} = (G^S_{CAD})^\theta [(\varphi^*_1)^{\alpha_1} \bar{L} + p_{M2} K^*_{M2}] \tag{22}$$

Therefore,

$$\frac{dE^S_{CAD}}{d\omega} = (G^S_{CAD})^\theta [p_{M2} - \alpha_1 (\varphi^*_1)^{1-\alpha_1}] \frac{dK^*_{M2}}{d\omega} < 0$$

The inequality holds because $p_{M2} < \alpha_1 (\varphi^*_1)^{1-\alpha_1}$ and $\frac{dK^*_{M2}}{d\omega} > 0$. Lemma 1 immediately implies the following proposition.

Proposition 1. *With everything else equal, compared with countries with CAF strategy, countries with CAD strategy:*

1. *have lower infrastructure supply ($G^S_{CAD} < G^S_{CAF}$);*
2. *have lower capital returns ($r^S_{CAD} < r^S_{CAF}$)*

The first part of the proposition comes directly from equation (5), while the second part can be obtained by comparing (21) with (13). The assumption that $\bar{K}^S/\bar{L}^S < \lambda_l/(1+\kappa)$ implies that $\lambda_l > \varphi$, which together with $G^N_{CAF} < G^S_{CAD}$ results in the conclusion that $r^S_{CAD} < r^S_{CAF}$. It implicates that the CAD strategy reduces the return to capital, which is consistent with the financial repression literature, not only through the increase in the capital/labor ratio of $M1$, but also the decrease in the supply of infrastructure G.

Another important proposition of economy with CAD strategy is changes in the per labor output in manufacturing sectors, which can be formalized as:

Proposition 2. *With everything else equal, compared with countries with CAF strategy, countries with CAD strategy absorbed less labor in manufacturing sectors. In addition, the larger the distortion is, the higher the value of per labor output in manufacturing sectors, relatively to the output per labor in the whole economy.*

The proof is straightforward. With the expansion of the capital-intensive sector, the capital-labor ratio decreases compared to the case without government interventions. Wage reduces, with labor outflows from the labor-intensive sector. In addition, with CAD strategy,

$$\frac{[(Y_{M1}+p_{M2}Y_{M2})/L_M]_{CAD}}{[(p_AY_A+Y_{M1}+p_{M2}Y_{M2})/\bar{L}]_{CAD}}=\frac{{\varphi_1}^{\alpha_1}+p_{M2}\frac{K_{M2}}{L_M}}{{\varphi_1}^{\alpha_1}+p_{M2}\frac{K_{M2}}{\bar{L}}} \tag{23}$$

or we can rewrite this equation as

$$\frac{[(Y_{M1}+p_{M2}Y_{M2})/L_M]_{CAD}}{[(p_AY_A+Y_{M1}+p_{M2}Y_{M2})/\bar{L}]_{CAD}}=1+\frac{p_{M2}}{\bar{L}}p_A^{\frac{1}{\alpha_1}}\bar{T}\frac{\frac{1}{\bar{K}-K_{M2}}K_{M2}}{{\varphi_1}^{\alpha_1}+p_{M2}\frac{K_{M2}}{\bar{L}}} \tag{24}$$

Taking derivative of the fraction of on the right-hand side this equation with respect to K_{M2}, we obtain

$$\frac{d[\frac{1}{\bar{K}-K_{M2}}K_{M2}/({\varphi_1}^{\alpha_1}+p_{M2}\frac{K_{M2}}{\bar{L}})]}{dK_{M2}}>0$$

Therefore $\frac{[(Y_{M1}+p_{M2}Y_{M2})/L_M]_{CAD}}{[(p_AY_A+Y_{M1}+p_{M2}Y_{M2})/\bar{L}]_{CAD}}$ increases with ω.

C. International FDI flows

Now we are ready to discuss the impacts of development strategy on international capital flows. According to Proposition 1, $r^S_{CAD}<r^S_{CAF}$. Consequently, developing countries with CAD strategy is less likely to attract foreign capital flows than countries with CAF strategy.

Now consider there exists a North country whose endowment structure lies in the diversification cone and produces all three goods. The return of capital in North is determined as:

$$r^N_{CAF}=\alpha_1(G^N_{CAF})^{\theta}{\lambda_l}^{\alpha_1-1} \tag{25}$$

where G^N_{CAF} is determined by (5) as

$$(G^N_{CAF})^{1-\theta}=\tau\lambda_l^{\alpha_1-1}[(1-\alpha_1)\lambda_l+\alpha_1\varphi^N] \tag{26}$$

Given $\lambda_l\leq\varphi^N$, we have $G^N_{CAF}>G^S_{CAF}$ if $\tau^N=\tau^S$. Further substituting equation (26) into (25) and (15) into (13), we get the expression for capital returns in the South and North as

$$r^N_{CAF}=\alpha_1(\tau^N)^{\frac{\theta}{1-\theta}}[(1-\alpha_1)\lambda_l+\alpha_1\varphi^N]^{\frac{\theta}{1-\theta}}\lambda_l^{\frac{\alpha_1-1}{1-\theta}} \tag{27}$$

$$r^S_{CAF}=\alpha_1(\tau^S)^{\frac{\theta}{1-\theta}}(\varphi^S)^{\frac{\theta+\alpha_1-1}{1-\theta}} \tag{28}$$

The relative magnitude of capital returns depends on the relative capital abundance in each country, and we have

$$r^S_{CAF} > r^N_{CAF} \quad iff \quad (\frac{\varphi^S}{\lambda_l})^{(\theta+\alpha_1)-1} > [(1-\alpha_1)+\alpha_1(\frac{\varphi^N}{\lambda_l})]^\theta \tag{29}$$

That is, the return to capital in the South is higher than that in the north if and only if the capital abundance is sufficiently low in the south, relative to that in the north. The intuition is straightforward. There are two opposite effects of the scarcity of capital, raising the labor-capital ratio in the manufacturing production and reducing the supply of infrastructure. The first outweighs the second when φ^S is sufficiently low relative to φ^N. When , $\varphi^N = \lambda_l$, i.e. the capital abundance in the North equals the lower bound of the diversification cone, $r^S_{CAF} > r^N_{CAF}$ holds. In this case, capital flows from the North to the South if the South employs the CAF strategy.

To compare r^S_{CAD} and r^N_{CAF} , note that $G^N_{CAF} > G^S_{CAF}$. In addition, since the total income in the South will be further reduced with CAD strategy as previously discussed, which results in even less supply of infrastructure. Meanwhile, since the capital intensity of manufacturing production in the South is distorted to be the same as that in the North, it requires $G^N_{CAF} < G^S_{CAD}$ to make capital flows towards the South with CAD strategy, which creates a contradiction and cannot hold. We summarize the discussion in this section with the following proposition.

Proposition 3. *With everything else equal,*

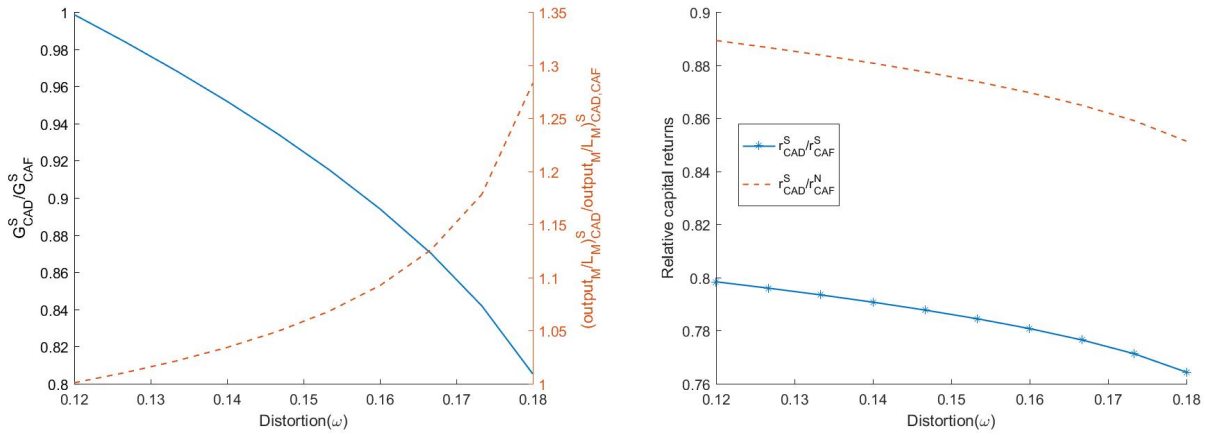
1. *among countries with the same endowment structure, countries with CAF strategy have higher returns to capital than countries with CAD strategy.*
2. *among countries with CAF strategy, countries with sufficiently low capital-labor ratio have higher capital returns than countries with abundant capital.*
3. *countries with scarce capital and CAD strategy have lower returns to capital than countries with abundance capital and CAF strategy.*

3.3 Further Discussions

A. Generalization of the model

In the above analysis, we focus on the case in which $\alpha_A = \alpha_1$ and α_2. Now we generalize the production in the economy as in equation (1) and (2). None of the propositions of our

benchmark model is qualitatively changed. Figure (4) illustrates the impacts of development strategy on economic outcomes with a numerical example, in which the parameters satisfy our assumption about the factor abundance in South and North, as well the condition in equation (29). As in Panel A, an increase in the distortion of the economy towards the capital intensive sector decreases the provision of infrastructure for a given tax rate. In addition, the relative production per labor in the manufacturing sector, compared with the whole economy, increases with the magnitude of distortion. Panel B in Figure (4) presents the impacts of development strategy on the returns to capital (proposition 3) and reveals two important messages. First, the values along the two lines are below zero, which implies that the South country with CAD development strategy has the lowest capital returns. Second, the dashed line is above the solid line, indicating that the capital return in the South is larger than that in the North if both countries employ the CAF development strategy.



(A) G and Relative labor absorption (B) r across countries

Figure 4: Development Strategy and economic outcomes

B. Alternative Policy Interventions

Rather than repressing the price of capital, the South government might instead provide production subsidy to firms in the capital-intensive sector to reach its goal of accelerating the development of capital-intensive sector. The amount of subsidy satisfies:

$$\alpha_1 (G^S_{CAD})^{\theta_1} (\frac{K_{M1}}{L_{M1}})^{\alpha_1 - 1} = \alpha_2 p_{M2} (1+s) (G^S_{CAD})^{\theta_2} (\frac{K_{M2}}{L_{M2}})^{\alpha_2 - 1}$$

$$(1-\alpha_1) (G^S_{CAD})^{\theta_1} (\frac{K_{M1}}{L_{M1}})^{\alpha_1} = (1-\alpha_2) p_{M2} (1+s) (G^S_{CAD})^{\theta_2} (\frac{K_{M2}}{L_{M2}})^{\alpha_2}$$

With market clearing condition, it's easy to show that $s > 0$. Assume government pay the output subsidy with income tax, we have:

$$\tau E^S_{CAD} = G^S_{CAD} + sp_{M2}Y_{M2,CAD}$$

Therefore, G^S_{CAD} is lower than G^S_{CAF} since both the total income and the share of total income that contributes to the supply of infrastructure decrease with the CAD strategy. It indicates that the returns to capital is still lower in countries with CAD strategy and our previous conclusion still hold.

C. Endogenous τ

Now let's consider endogenous τ. For any given value $\bar{K}$ and $\bar{L}$, the problem of a government with CAF strategy can be simplified as

$$\max_{\tau}(1-\tau)E(\tau)$$

No matter what the production structure of the economy is, total output of the economy E could always be written as $E(\tau) = \tau G^{\theta} Z$, where Z is a constant that determined by other parameters in the model, such as $\bar{K}$,$\bar{L}$, and α_i. Therefore, $G^{1-\theta} = \tau Z$. The F.O.C of the government optimization problem is $\tau^* = \theta$. This result is consistent with Barro (1990), Glomm and Ravikumar (1994) and other one-sector growth models with infrastructure. It does not change any propositions of our benchmark model but provides explanations, to some extent, of the heterogeneity in the share of total income to supply infrastructure across countries. If we consider a world in which the infrastructure-intensity is different across sectors, countries specialized in different sectors optimally choose various levels of tax to finance G. Countries with distortions in their economic structure might result in a further loss due to their failure of adjusting the tax ratio.

D. Implications for the Growth Rate

Our primary focus of this paper is to discuss the impacts of development strategy on capital returns across countries, but it provides implications for the link between capital flows and economic growth as well. Lin and Xu (2010) develop a dynamic model in which CAD strategy is accompanied by lower economic growth. Therefore, one would see countries with CAD strategy see both fewer capital inflows and lower growth rate. A more formal discussion would be an extension of Acemoglu and Guerrieri (2008) model of capital deepening to incorporate

the supply of infrastructure into the production functions, which is beyond the objective of this paper.

4 Empirical analysis

4.1 Data

We assemble a comprehensive data set that characterizes different types of capital inflows, capital outflows, institutional quality, financial capital control and other national characteristics on an annual basis for a large set of countries over the period 1971–2000.

Measuring Development Strategy

Because the government's development strategy is not observable directly, Lin (2009) propose a technology choice index (TCI) as a proxy for the development strategy implemented in a country. The definition of the TCI is as follows:

$$TCI_i = \frac{AVM_i/LM_i}{GDP_{it}/L_i}$$

where AVM_i is the added value of manufacturing industries and GDP_i is the total added value of the country. LM_i is the labor in the manufacturing industry and L_i is the total labor force. As discussed in Proposition 2 in the model section, TCI is increasing in the extent of distortion in the development strategy towards the more capital-intensive sector. Therefore, for a given income level and other conditions, a higher value of TCI implies a further deviation from the comparative advantage, or more seriously the economy is distorted by the CAD strategy. Meanwhile, CAD strategy reduces the returns to capital. Figure 5 presents the relations between TCI and the return to capital. We get the data on value added and employment in manufacturing from UNIDO, and information on GDP and the total working-age population is from the World Bank's World Development Indicator (WDI).

Measuring Infrastructure

The infrastructure data is from Canning (1998). The original database provides physical infrastructure stock in 152 countries for 1950-1995, with an update to 2005 in the most recent version. It contains six measures of hard infrastructure, including the length of road,

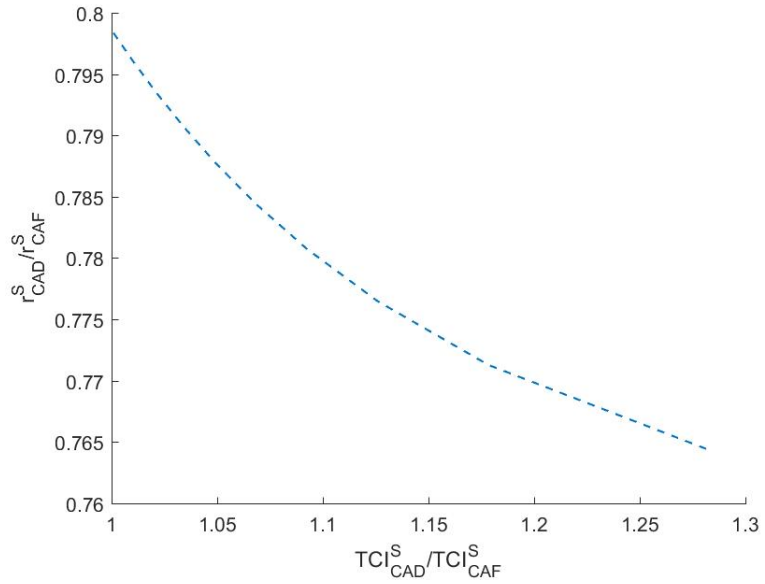


Figure 5: TCI andCapital Returns

paved roads, and railway lines, the total number of telephones, the number of main telephone lines, and electricity generating capacity. Given Canning's conclusion on the sensitivity of infrastructure stocks to country population, per capita GDP, land area, and the urbanization ratio, we use the paved road per capita as the measure of infrastructure in our main regression. We employ the principle component method to construct a more comprehensive index as a robustness check. One advantage of Canning's data is that it provides information on physical stock. Unlike investment data, it is not sensitive to the heterogeneity in the effectiveness of governments across countries in actually producing infrastructure (Summers and Heston, 1991; Canning, 1998). However, the weakness of this data is that quality information is only for a short period of time and is not used in this paper.

Measuring Capital Flows

Data on capital flows are from the International Financial Statistics (IFS) issued by International Monetary Fund (IMF). It provides comprehensive information on FDI, portfolio equity investment, and debt flows. We focus on private capital and excludes debt flows in our analysis, and treat FDI and portfolio equity separately, given that our model sheds lights on the impacts of development strategy on production capital only. Both inflows and net flows are considered. As suggested by Rothenberg and Warnock (2011), capital inflows and outflows require to be studied separately since they may be related to different factors.

Other Controls

The institutional variables that we used in the model came from two sources, the Worldwide Governance Indicators (WGI) and Index of Economic Freedom. The former database consists of six composite indicators, including Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. It covers over 200 countries since 1996. These indicators are based on variables from different data sources with individual perceptions. The Index of Economic Freedom is published by the Fraser Institute. It provides information on five topics: Size of Government, Legal System, and Security of Property Rights, Sound Money, Freedom to Trade Internationally and Regulation. It is a compilation of 42 variables from third-party sources, such as the International Country Risk Guide and the World Bank's Doing Business project. In our main regression, we only employ the index from the second database on Legal System and Security of Property Rights but provide results based on other indicators as robustness checks.

Reinhardt et al. (2013) find that the prediction of the standard neoclassical theory holds only when taking into account the degree of capital account openness, conditional on a set of fundamentals. Therefore, we include the capital control measures developed by Quinn (1997, updated to 2006) in the regression. Data for national accounts, population, GDP, price levels, income classification, investment, and consumption are from the World Bank's World Development Indicators. We get the capital abundance from the Penn World Table.

Before proceeding to formal analysis, it is instructive to document the strong link that exists. Let's take a look at simple comparisons of the variables of our main interests across countries,which reveals some interesting patterns that are almost ignored in existing literature. First, there are significant variations in the capital inflows and outflows among developing countries, as Table 1 presents. Since most developing countries started liberalizing their capital accounts in the 1980s, Table 1 only shows the current account as the percentage to GDP, and annual flows of FDI and portfolio equity during 1985-2005 for selected countries. Africa countries, on average, attracted much fewer capital flows of both types than Asian countries and Latin American countries in our sample. These Africa countries, however, were featured with very low per capita GDP. The heterogeneity in capital flows among countries within each region is very significant as well. India, for example, attracted less FDI inflows than China on average during the sample period.

In addition, the value of TCI and length of paved roads per capita vary dramatically across different regions. As Figure 6 illustrates, African countries, on average, deviates more from

Table 1: Capital flows for selected countries (1985-2005)

Countries	Current account deficit	Annual average inflows per capita ($1,000 in 2000 constant USD)			
	(as % of GDP)	Net FDI flows	Net portfolio flows	FDI inflows	Portfolio inflows
Asia					
China	-0.8	1.619	0.148	1.919	0.148
India	0.97	0.179	0.228	0.231	0.23
Philippines	1.43	1.207	0.284	1.397	0.3
Indonesia	1.99	0.796	0.298	1.068	0.3
Malaysia	-1.42	15.347	0.937	17.116	0.944
Latin America					
Argentina	0.94	11.493	-0.488	13.885	0.602
Brazil	1.11	5.748	1.314	6.544	1.512
Mexico	2.4	11.312	2.424	12.031	2.424
Venezuela	-4.37	5.494	0.755	7.758	0.891
Costa Rica	3.87	10.81	-0.049	11.961	0.038
Colombia	1.29	4.273	0.191	5.408	0.191
Africa					
Mauritius	0.67	2.542	0.152	3.499	0.572
Senegal	6.62	0.425	0.003	0.606	0.003
Kenya	5.98	0.176	-0.018	0.204	0.002
Zambia	11.99	1.891	0.014	1.874	0.014
Ethiopia	2.33	0.024	0	0.024	0
Malawi	9.1	0.132	0.014	0.134	0.014

their comparative advantage (higher TCI) and have a shorter length of paved roads than countries in the other two regions. The variations across countries within each region are quite large, especially for TCI in Africa and infrastructure for Latin America. More importantly, countries with low infrastructure stock and high TCI experienced much lower capital inflows than other developing countries as shown in Figure 7, which is consistent with our model predictions.

4.2 Empirical Approach

We employ the following regression to examine the impacts of development strategy and infrastructure on capital flows:

$$y_i = \beta_1 E_i + \beta_2 TCI_i + \beta_3 I + \gamma \mathbf{X_i} + \epsilon_i$$

where y_i is capital flow in country i, E_i is the capital abundance in the country and is included to capture the Lucas Paradox. The positive significance of this variable demonstrates the presence of the paradox. TCI_i and I_i are the indicator of development strategy and

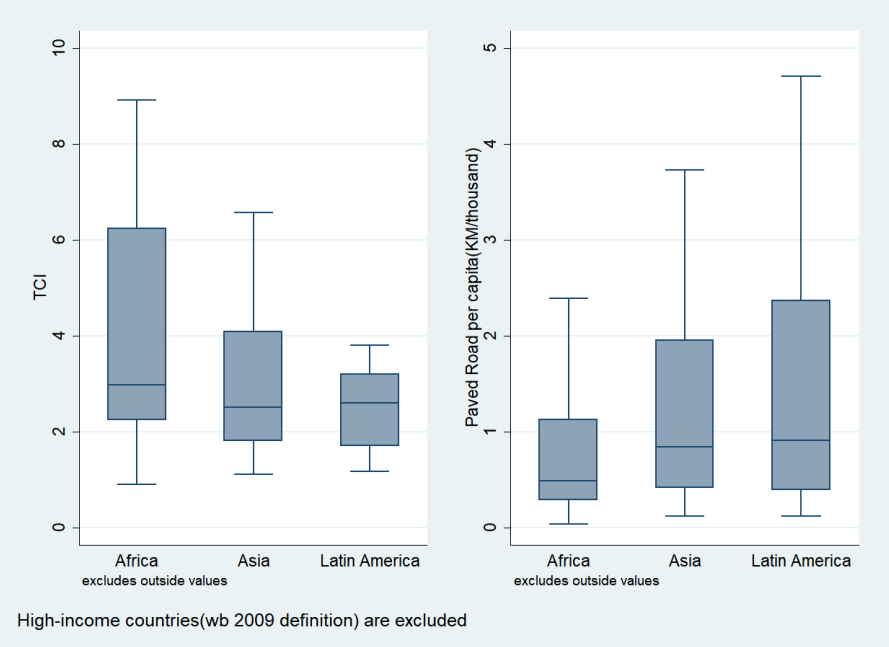
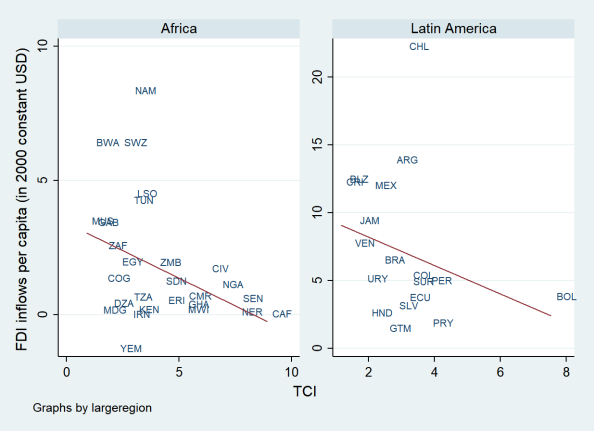
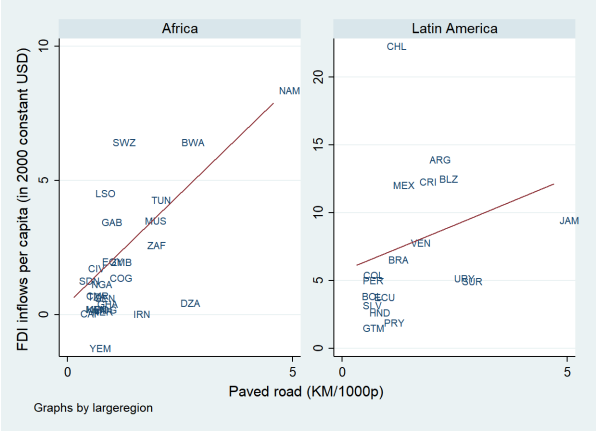


Figure 6: TCI and paved roads length by regions



(A) TCI and FDI flows



(B) Paved roads and FDI flows

Figure 7: TCI, infrastructure and capital inflows

infrastructure, respectively. $\mathbf{X_i}$ is a vector that includes explanatory variables in the existing literature on Lucas Paradox, such as institutional quality, human capital endowments, TFP, capital account control, information frictions, and etc. We focus on the period between 1971-2000, which makes our results comparable with Alfaro et al. (2008). Given the evolution pattern of our key variable, i.e. TCI, institutional quality, and infrastructure, we divide 1971-2000 into three periods and calculate the ten-year average for each period. We then pool all data together but add a period dummy to control for common trend pattern across countries.

4.3 Main Results

Table 2 and Table 3 reports our main results for FDI inflows and net flows, respectively, and present similar patterns. Column (1) in both tables demonstrates the Lucas Paradox that both direct investment and portfolio equity flows to more capital-abundant countries relative more than to less capital-abundant countries. We then look at the role of each variable one at a time from Column (2) to Column (5). Consistent with the existing literature, the magnitude of coefficient for the capital abundance cuts in half when we add the measure for human capital, institutional quality, development strategy or infrastructure. In column (6)

Table 2: Main results for FDI inflows

	ln (FDI inflow per capita)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital abundance	5.750**	2.902*	2.056*	3.286**	2.684**	2.725**	1.924	1.960*
	(3.02)	(2.05)	(2.01)	(3.05)	(2.72)	(2.97)	(1.69)	(2.17)
ln(TCI)		-1.481***					-0.935***	-0.652**
		(-9.61)					(-3.72)	(-2.98)
ln (Road)			0.963***				0.528**	0.324
			(8.20)				(2.80)	(1.56)
Human capital				1.986***		1.383***		0.815**
				(10.15)		(5.41)		(2.78)
Institution					0.778***	0.551***		0.429***
					(9.86)	(5.06)		(3.78)
Distance to equator						-0.227**		-0.325***
						(-2.96)		(-4.10)
Landlock						-0.254		0.0857
						(-0.63)		(0.21)
Period dummy	Y	Y	Y	Y	Y	Y	Y	Y
Constant	0.391	0.839***	-6.065***	-2.962***	-3.417***	-4.066***	-2.870*	-4.296***
	(1.64)	(4.34)	(-7.54)	(-7.77)	(-7.89)	(-8.61)	(-2.16)	(-3.60)
N	192	192	192	192	192	192	192	192
R-square	0.216	0.480	0.464	0.497	0.501	0.565	0.519	0.609

to (8), we check the impacts of our explanatory variables in a multiple regression framework.

Table 3: Main results for FDI net inflows

	ln (FDI net inflows per capita)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital abundance	5.310**	2.877**	2.257**	4.047***	3.294***	3.434***	2.023**	2.010***
	(3.17)	(2.73)	(3.06)	(3.93)	(3.97)	(4.38)	(2.71)	(3.85)
ln(TCI)		-1.324***					-0.864***	-0.697**
		(-8.22)					(-3.92)	(-3.17)
ln (Road)			0.933***				0.519**	0.534**
			(7.89)				(3.19)	(3.09)
Human capital				1.728***		1.222***		0.394
				(6.26)		(3.67)		(1.01)
Institution					0.705***	0.505***		0.342**
					(7.46)	(4.59)		(3.25)
Distance to equator						-0.190*		-0.327***
						(-2.45)		(-4.10)
Landlock						-0.173		0.258
						(-0.41)		(0.62)
Period dummy	Y	Y	Y	Y	Y	Y	Y	Y
Constant	0.282	0.824***	-5.800***	-2.448***	-2.987***	-3.571***	-2.749*	-4.481***
	(1.14)	(4.03)	(-7.17)	(-4.95)	(-5.90)	(-6.40)	(-2.40)	(-3.93)
N	163	163	163	163	163	163	163	163
R-square	0.175	0.412	0.393	0.369	0.380	0.437	0.451	0.520

We should emphasize that after controlling for institutional quality and other explanatory variables except for TCI and infrastructure (Column 6), the coefficient on capital abundance indeed decrease but are still positive and statistically significant. This is consistent with Azemar and Desbordes (2013) who find the institutional quality is not sufficient to make the Lucas Paradox disappear. In fact, with language and colony history as the instruments of institutional quality, the coefficient of the institution becomes insignificant for FDI inflows. However, once we control for TCI and infrastructure, the impact of capital abundance on direct investment becomes less significant, both statistically and economically.

The coefficient of the index of development strategy, TCI, is significant in all specifications in Table 2 and Table 3. It is consistent with our model prediction that countries with a development strategy to defy the more its comparative advantage attract less direct investment. In addition, paved roads contribute positively to direct investment inflows and net flows. One might note that once we add the full set of controls, as presented in column (8) in Table 2, the magnitude of the partial impact of TCI on direct investment is still significant at the 5% level, but the impact of roads decreases much and becomes statistically insignificant even at 10% level . This does not contradict our model predictions since the main channel for the impact on international capital flow is development strategy and infrastructure's impact is secondary as infrastructure is endogenous to development strategy. Consistent with the

model's expectation, lnTCI and lnRoad are highly correlated and the correlation coefficient is estimated at around -0.65, which captures the close relationship between these two variables.

To get a sense of the economic magnitude of the effect of TCI on direct investment inflows, let's do a simple thought experiment. Based our preferred estimation in column (7), if everything else remains the same but we decrease the TCI of Bolivia (7.9) to Malaysia's level (1.5) in 1990, the per capita direct investment inflows to Bolivia will increases from 0.51 to 1.6 (($1000 in constant 2000 USD). This implies a significantly large effect of development strategy on FDI flows.

Table 4 repeats the same exercise to check the determinants of portfolio equity flows. The pattern is different from that in Table 2 and 3. It is the quality of institutions, rather than development strategy or other factors that work as the primary explanatory variable of portfolio equity inflow and net flows. This is consistent with existing literature on the important role of institutions on flows of financial assets. It also provides supportive evidence that the development strategy and infrastructure affect total capital flows mainly through changing flows of production capital.

Table 4: Main results for portfolio flows

	ln (portfolio inflows per capita)				ln (portfolio net flows per capita)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital abundance	8.495***	2.489	4.177*	3.223*	8.506**	0.188	3.710	1.200
	(4.93)	(1.71)	(2.25)	(2.08)	(3.17)	(0.07)	(1.11)	(0.39)
ln(TCI)			-0.815	0.280			-1.067	-0.248
			(-1.27)	(0.71)			(-1.39)	(-0.52)
ln (Road)			0.560	-0.392			0.347	-0.500
			(1.28)	(-1.07)			(0.61)	(-1.24)
Human capital		0.855		1.189*		0.132		0.391
		(1.90)		(2.50)		(0.19)		(0.51)
Institution		0.944***		1.026***		1.213***		1.212***
		(4.43)		(4.52)		(3.88)		(3.92)
Distance to equator		-0.0918		0.0525		-0.0743		0.0422
		(-0.72)		(0.34)		(-0.37)		(0.20)
Landlock		-0.676		-0.638		-1.134		-1.227
		(-0.94)		(-0.88)		(-1.45)		(-1.57)
Period dummy	Y	Y	Y	Y	Y	Y	Y	Y
Constant	-2.591***	-8.858***	-6.195	-7.634***	-3.013***	-8.912***	-4.834	-6.114*
	(-4.53)	(-9.00)	(-1.89)	(-3.70)	(-4.81)	(-7.37)	(-1.17)	(-2.57)
N	96	96	96	96	71	71	71	71
R-square	0.253	0.608	0.395	0.618	0.189	0.528	0.317	0.537

4.4 Robustness

A. Potential Endogeneity

One might be concerned about the endogeneity of development strategy and supply of infrastructure. For example, our indicator of development strategy, TCI might be determined by an omitted third variable, which is unobservable but has important impacts of capital flows. To address this issue, we first add additional control variables into our main regression and present the results in Table 5. Column (1) and column (4) investigates the impact of trade openness, defined as the share of years open during the corresponding period. It is significant and positive, consistent with the literature on the interaction between trade and capital flows. But adding this term does not change much the coefficients of TCI and infrastructure. Another factor that might be important is the proximity to world markets. As shown in column (2) and (4), our results are robust to the inclusion of foreign market potential index computed using Redding and Venables (2004)'s method. Moreover, financial openness can explain part of the international capital flows as discussed in Reinhardt et al. (2013). Our results are robust to the inclusion of this variable as shown in column (3) and (6).

Table 5: Robustness-extra controls

	ln (FDI inflows per capita)			ln (FDI net flows per capita)		
	(1)	(2)	(3)	(4)	(5)	(6)
Capital abundance	0.0615	1.120	0.342	0.504	1.240	0.733
	(0.09)	(1.37)	(0.43)	(0.68)	(1.59)	(1.00)
ln(TCI)	-0.730**	-0.858***	-0.869***	-0.749**	-0.815***	-0.775***
	(-2.69)	(-3.46)	(-3.98)	(-2.72)	(-3.72)	(-3.73)
ln (Road)	0.514**	0.494*	0.421*	0.522*	0.543**	0.502**
	(2.61)	(2.59)	(2.45)	(2.52)	(3.22)	(3.26)
Open	1.142**			0.820*		
	(3.09)			(2.17)		
Market		0.283			-0.0297	
		(1.94)			(-0.16)	
Capital Account Openness			1.970***			1.319**
			(4.04)			(2.68)
Period dummy	Y	Y	Y	Y	Y	Y
Constant	-3.521*	-6.060***	-2.727*	-3.415*	-2.576	-3.038**
	(-2.56)	(-3.43)	(-2.35)	(-2.34)	(-1.22)	(-2.78)
N	146	199	199	123	170	170
R-sq	0.556	0.507	0.555	0.466	0.434	0.460

Another source of endogeneity is reserve causality. It is possible that capital flows affect the government's choice of both industrial policies and the supply of infrastructure. In addition,

international capital might flow into the construction of infrastructure, which raises the supply of infrastructure. To deal with this concern, we run IV regression with two sets of instruments. First, we employ the lag term of each variable as their instruments. As shown in column (1)-(6) in Table 6, our results are still robust. One might worry the lag term is still correlated with unobserved variables. Therefore, we repeat the exercise using the natural resource abundance as the instrument of development strategy. As discussed in Lin (2003, 2009), the CAD strategy is inefficient and requires the government to mobilize enough resources to support it. A country with more abundant natural resources will be able to adopt a CAD strategy with a larger deviation of industrial structure from the optimal determined by the endowment structure. In column (7) and (8), we use the lagged share of total natural resources rents in total GDP provided be WDI as the instrument of TCI. Our conclusion about the impact of TCI on FDI inflows is robust.

Table 6: Robustness-results with IV

	Lag as IV						Nature resources as IV	
	ln (FDI inflows per capita)			ln (FDI net flows per capita)			ln (FDI inflows per capita)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(TCI)	-1.874***		-1.593***	-1.498***		-1.065***	-1.326**	-1.026*
	(-9.70)		(-3.47)	(-8.95)		(-3.46)	(-2.97)	(-1.67)
ln (Road)		0.975***	0.244		0.921***	0.448		
		(6.10)	(0.77)		(5.64)	(1.76)		
Capital abundance	4.512***	3.770**	3.896**	5.542***	4.188*	4.109**		1.724
	(4.05)	(2.65)	(3.04)	(4.13)	(2.24)	(2.64)		(1.00)
Constant	2.723***	-5.851***	0.753	2.141***	-5.647***	-1.342	2.703***	2.250**
	(8.95)	(-4.76)	(0.28)	(8.42)	(-4.85)	(-0.66)	(6.00)	(3.12)
N	114	114	114	95	95	95	132	132
R-sq	0.521	0.489	0.54	0.484	0.457	0.519	0.438	0.423

B. Zeros in Capital Inflows Data

In Table 7, to address the concern that the logarithm transformation eliminates all zero flows in data while zeros are not randomly distributed, we first try the Poisson Pseudo Maximum Likelihood (PPML) estimation of our baseline regression. It allows us to introduce the dependent variables in levels instead of logarithms, which results in larger sample size and is widely used in the estimation of gravity models. As shown in column (1)-(8), the sign and magnitude of the coefficients of our concern are quite similar to our previous results. Meanwhile, PPML estimation still excludes observations with negative values. This might be a concern for the regression of net capital inflows. Adding a constant to the data prior to logarithm transformation is not an ideal way to address this issue since it becomes unclear about the

interpretation of the magnitude of the coefficients. However, the sign and significance of the coefficients in column (9) and (10) are similar to the baseline results, indicating that our qualitative conclusion is robust to the inclusion of countries with negative net FDI inflows.

Table 7: Robustness-zero flows

	FDI inflow per capita				FDI net flows per capita				ln (adj FDI net flows per capita)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ln(TCI)	-1.046***		-1.226*	-0.688***	-0.978***		-0.732**	-0.631***	-0.0262**	-0.0330***
	(-6.76)		(-2.36)	(-3.78)	(-7.11)		(-2.90)	(-3.81)	(-2.91)	(-3.70)
ln (Road)		0.273	-0.157	-0.403*		0.504***	0.226	0.347**	-0.0202*	0.00344
		(1.00)	(-0.38)	(-2.21)		(3.92)	(1.14)	(2.64)	(-2.27)	(0.39)
Capital abundance	0.852	1.187	0.937	0.652	1.396**	1.630***	1.370**	1.498***	0.0145	0.00496
	(1.18)	(1.67)	(1.31)	(1.13)	(2.77)	(3.45)	(2.96)	(5.10)	(0.24)	(0.09)
Human capital				0.766**				0.179		-0.0203
				(2.61)				(0.62)		(-1.53)
Institution				0.751***				0.457***		0.0068
				(9.64)				(6.10)		(0.74)
Distance to equator				-0.206***				-0.407***		-0.0210***
				(-3.57)				(-6.94)		(-3.88)
Landlock				-0.552				0.394		0.0177
				(-1.71)				(1.50)		(1.63)
Period dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Constant	1.574***	-0.247	2.685	-1.049	1.530***	-2.012*	-0.0591	-2.841***	5.657***	5.549***
	(7.99)	(-0.12)	(0.91)	(-1.09)	(7.03)	(-2.08)	(-0.04)	(-3.73)	(91.16)	(127.19)
N	212	212	212	212	181	181	181	181	191	191

C. Other Concerns

We also experiment with alternative measures of infrastructure. Besides the length of paved road, Canning (1998) provides information on the length of rail lines, the number of telephone main lines, and the capacity of electricity generating. We construct an indicator that contains information on all four measures with the principal component analysis. As shown in Table 8, the regression with the new measure of infrastructure presents a similar pattern as in our previous results. Infrastructure, on its own, has positively significant impacts on direct investment flows. But once we control the impact of TCI, its coefficient becomes insignificant.

Countries with extremely abundant natural resources might still attract large capital inflows for the exploitation of natural resources, despite their government's strategy of favoring the development of capital intensive sector.. The inclusion of these countries thus biases our estimated results towards zero. Column (3) and (6) in Table 8 presents the results when we

Table 8: Robustness-other concerns

	ln (FDI inflows per capita)			ln (FDI net flows per capita)		
	(1)	(2)	(3)	(4)	(5)	(6)
Capital abundance	7.063***	4.778***	3.267**	7.012**	5.022**	2.462
	(5.01)	(4.08)	(3.29)	(3.17)	(2.88)	(1.86)
Infrastructure	0.406***	0.104	0.429*	0.448***	0.152	0.483**
	(4.93)	(0.86)	(2.23)	(5.09)	(1.00)	(2.68)
ln(TCI)		-1.383***	-0.980***		-1.194**	-0.893***
		(-3.82)	(-3.86)		(-3.06)	(-3.97)
Constant	0.725*	0.766*	-2.248	0.803*	0.819*	-2.504*
	(2.34)	(2.57)	(-1.66)	(2.40)	(2.47)	(-2.01)
N	90	90	184	73	73	155
R-sq	0.387	0.522	0.540	0.300	0.425	0.459

exclude the major oil-exporting countries in our sample. As one would expect, the magnitude of the coefficient on TCI becomes more negative, compared with column (7) in Table 2 and Table 3.

5 Conclusion

In this paper, we show that the development strategy, which is shaped by the government's development idea, is critical to explain the heterogeneity in economic performance and capital inflows across developing countries. Our results not only fill the gap in existing literature in terms of heterogeneity of capital inflows among developing countries but also have important policy implications in the current context. As mentioned in Hallward-Driemeier and Nayyar (2017), the increasing global competition, the results of technological advances and globalization, reinforce the need to understand the complementarities between economy-wide and more sector- or location-specific industrial policies. Our results show the power of development idea and emphasize the importance of following comparative advantages while making "targeted" industrial policies and providing the improvement of infrastructure to facilitate the process of structural transformation. Haste makes waste. The government's good intention to accelerate the development of advanced capital-intensive industries beyond its comparative advantage often results in undesirable economic phenomena in developing countries, including the Lucas Paradox.

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