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Marginal Product of Capital under Financial Frictions*

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Abstract

We link the Lucas' Paradox to the interaction between sector and country-level financial frictions. First, we compute proper measures of the aggregate marginal product of capital (MPK), accounting for natural capital and relative capital prices, for a panel of 50 developed and developing countries over 1995-2008. Our aggregate MPK measures imply there are little incentives for capital to flow to capital-poor economies over the sample period. Next, we examine how sector and country-level financial frictions interact to shape the aggregate MPK of a country. To do so, we use industry-level data to construct an annual country-level measure of external financial dependence and assess its effects on aggregate MPK conditional on the level of financial development and alternatively, on legal origins, our instrumental variable. We find that external financial dependence positively relates to MPK in developed countries, regardless of their level of financial development while it negatively relates to MPK in developing economies. Financial development appears to be a necessary condition in order for production in financially dependent sectors to positively affect aggregate MPK in developing countries. Our results taken altogether suggest that sector and country level financial frictions act as inefficiencies precluding improvements of MPK in developing economies despite large differences in capital-to-labor rations with respect to developed countries.

Keywords: Financial Dependence, Financial Development, Marginal Product of Capital, Financial Frictions, Legal Origins, Lucas Paradox
JEL: E22, F11, F21, F32, F41, F63, O11, O16, O47

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1. Introduction

Standard trade theory predicts that large differences in capital ratios across countries should be reflected in large differences in *marginal product of capital* (MPK) and in capital flowing from capital-rich to capital scarce economies if capitals can move freely across economies. Nonetheless, since Lucas' findings, the validity of the assumptions behind these predictions has been largely debated. The "'Lucas Paradox"' arises from his analysis of the relationship between India and the U.S. in 1988 where he finds that the return to capital should be around 58 times higher in the former (Lucas (1990)). Given such differences, we should have seen all capitals flowing from the U.S. to India, but this has not been the case. This debate has gained importance among economists and policymakers in recent years because evidence suggests that even if the world has gradually been more financially integrated (e.g., Prasad et al. (2007)), not only have capitals not flown from rich to poor countries, as Lucas pointed out, but the pattern seems perverse, as capitals have been moving "up-hill", from poorer to richer countries. Thus, giving rise to the so-called global imbalances which have somewhat motivated recent protectionism proposals.

Since then, a vast theoretical and empirical literature has attempted to explain the up-hill pattern of capitals. For example, Lucas himself pointed out that large differences in capital-to-labor ratios doesn't mean that the same larger differences can be expected in the return to capital as poorer countries may lack of other factors that complement with capital (such as human capital). We argue that one explanation for the paradox is linked to the inability of the financial system to optimally allocate capital across different sectors which pins down aggregate capital productivity in relatively poorer countries. This is theoretically explored by Antras and Caballero (2009) (AC henceforth), who show that despite operating under a common financial system, those sectors that rely more on external finance will be more credit-limited than those that are able to generate sufficient internal funds. Under this scenario, AC claim that countries suffering from financial underdevelopment could circumvent the misallocation problem by specializing in production of sectors that are less harmed by the malfunctioning of the financial system (i.e., less financially dependent sectors) - allowed by international trade. This, in turn raises aggregate return to capital and attracts foreign capital inflows. Thus, a testable implication of AC's model is that *higher shares of production in less financially dependent sectors are related*

to higher aggregate MPK in countries with weaker financial intermediation systems.

Accordingly, in this paper we empirically evaluate this proposition by examining how these two types of financial frictions at the country and sector level interact and affect aggregate return to capital (proxied by aggregate MPK). We begin by computing capital-to-labor ratios and aggregate MPK for an unbalanced panel of 50 countries over the period 1995-2008, by accounting for the importance of "natural capital" in production (such as land), following Caselli and Feyrer (2007) (CF from now on). In line with CF's findings, we observe large cross-country differences in capital ratios and despite these differences MPK is very similar across countries (sometimes it is even lower for capital-poor countries). Furthermore, we find that this pattern is stable over time, which suggests an absence of incentives for capital to flow from rich to poor countries. Next, in order to test AC's hypothesis, our main effect of interest, we assess the effect of a country's specialization in the production of financially dependent sectors on MPK conditional on the development of the financial system. To do so, we use industry and country level data to compute an annual measure of the reliance on external finance of a country's manufacturing production, the weighted average dependence on external finance. We find that specialization in financially intensive sectors only has a positive effect on MPK in advanced economies and the main difference -between developed and developing- driving these results seems to be the existence of a sound financial system. More specifically, our results suggest that increasing production in financially dependent sectors has a positive effect on MPK only if a country achieves a certain level of financial development, otherwise it has a negative and significant effect. Splitting our sample between developed and developing countries shows that production in financially dependent sectors is only positive for the former, regardless of their financial development. On the contrary, the relation is negative for developing countries and the interaction term with financial development is positive, both coefficients being statistically significant at the highest levels of acceptance. This suggests that financial development is a necessary condition in order for production in financially intensive activities to generate a positive return on capital.

Finally, evaluating a causal effect on a macro empirical setting is particularly challenging due to the several potential sources of endogeneity. In particular, the cross-country differences in aggregate return to capital and the level of financial development may have various common unobservable determinants. Therefore, we identify the causal effect of the interaction between financial development and the weighted average dependence on external fi-

nance by instrumenting financial development with the legal origins of the country, as has been largely done in the literature (Djankov et al. (2008)). In particular, our approach is closest to Aghion et al. (2005), who instrument the interaction between financial development and initial per-capita GDP with the interaction of the later and legal origins. Our instrumental variable approach confirms our findings.

The contribution of this paper lies in providing new empirical evidence on how production of financially intensive sectors shapes MPK and how this strongly depends on the countries' financial sector's soundness. Hence, our paper contributes to explaining why more capitals don't flow from capital-rich to capital-poor countries. The rest of the paper is organized as follows. Next Section briefly discusses the closely related literature in a non-exhaustive manner. In Section 3 we present some stylized facts and we describe the data, Section 4 presents the econometric strategy, shows the empirical results and explores robustness checks and Section 6 concludes.

2. Related Literature

This paper is closely connected to different fields. Our analysis relates to a strand of the literature where financial development is studied as a comparative advantage which determines production specialization patterns of different countries, such as Rajan and Zingales (1998), Beck (2003, 2002), Do and Levchenko (2007) and Manova (2013). It is also closely related to the literature that emphasizes the links between capital misallocation and financial frictions, such as Kiyotaki et al. (1997), Banerjee and Duflo (2005), Moll (2014), Midrigan and Xu (2014) and Buera et al. (2011) among others, who have studied the effect of finance on capital allocation. Particularly, our findings echo the conclusions in a recent paper by Gopinath et al. (2017). They study the allocation of capital and overall productivity in Southern Europe and find that the dispersion in the return to capital has increased due to increased capital inflows (allowed by the integration) that were not efficiently intermediated given the relative financial underdevelopment in these countries, while this has not been the case for European countries with deeper financial markets.

Last but not least, this paper joins the large literature on global imbalances and the Lucas Paradox.[1] Explanations for the paradox have relied on

[1]See Gourinchas and Rey (2014) for a survey on the literature on the international capital flows and global imbalances.

two types of arguments. The first is related to international capital market imperfections and restrictions on international capital flows that prevent capital from moving freely and being efficiently allocated across countries (such as sovereign risk and informational asymmetries), as in Reinhart and Rogoff (2004), Gertler and Rogoff (1990), Portes and Rey (2005) and Reinhardt et al. (2013). The second type of arguments relies on the idea that once the returns to capital are adjusted from risk and other factors that affect the total factor productivity, they might not end up being as high as suggested by the relative scarcity of capital in poor countries. Some explanations for these factors are related to the fundamentals of an economy that preclude equalization of marginal return to capital across countries despite relative differences in capital endowments. This would be for example, missing factors of production (e.g., lack of human capital and productive infrastructure), the importance of land in production, technological differences, lack of sound institutions, policy induced distortions (such as tariffs, taxes, capital controls and non-trade barriers) and other *inefficiencies* affecting the overall production structure (such as corruption, risk of expropriation, poor contract enforceability, low rule of law and the lack of a sound financial system).

According to this, the Lucas Paradox isn't perhaps a paradox anymore given that many developing economies are beset by different problems that make that risk-adjusted return to capital is much lower than the return anticipated on the basis of their relative scarcity of capital. Some papers in this line and to which our paper specially relates are Alfaro et al. (2008), Prasad et al. (2007), Caselli and Feyrer (2007) and Antras and Caballero (2009). The first authors specifically study the determinants of the direction of capital flows and find that the main reason why more capitals don't flow to capital-poor countries is their weak institutions. Our results particularly echo Prasad et al. (2007), who study the relation between foreign capital and growth. Using industry level data, they find that when countries don't have a sufficiently developed financial system, foreign capital inflows don't play any role in the growth of financially dependent sectors, suggesting that foreign flows are not efficiently intermediated. They argue that financial development is a necessary precondition in order to be able to absorb foreign capital, and propose financial underdevelopment of poorer countries as a candidate for the explanation of up-hill trends of international capital flows. Caselli and Feyrer (2007) find that once one accounts for the importance of "natural capital" in production (such as land) and differences in the relative price of capital, MPK is remarkably similar across countries. They conclude that there is no reason to expect more capitals flowing from capital-rich to

capital-poor countries given that the return to capital isn't relatively higher in the later. Hence, they reject the view that impediments to international capital flows play a major role in precluding capital flowing into poor countries. Instead, they attribute the lower capital ratios in these countries to the lack of capital complementary factors, higher relative prices of capital and higher overall *inefficiencies*. We empirically examine these overall inefficiencies through the lens of Antras and Caballero (2009) who theoretically explore how financial underdevelopment creates a misallocation of capital across sectors, which is biased against the sectors that rely more on external finance than on internally generated cash flow (i.e., financially dependent sectors).

3. Data

We work with a set of 50 developed and developing countries over 1995-2008. Data at the sector level come from Klapper et al. (2006) and UNIDO. Data at the country level come from different sources: The World Bank's World Development Indicators (WDI available online); Version 8.0 of the Penn World Tables (PWT); "The Changing Wealth of Nations" database from the World Bank ; Chinn and Ito's (2009); the International Country Risk Guides (ICRG) from the PRS Group; and the IMF's International Financial Statistics (IFS). The selection of the sample was done based on data availability. Only countries for which we observed more than 5 years were kept in order to have a more balanced panel. Additionally, Low income countries were kept out of the analysis given their very specific characteristics and lack of data availability after 2000.[2] Appendix D contains full definitions and sources of all variables included in the analysis.

In what follows we describe the construction of the two key variables in this paper: MPK at the country-year level, which we use as a proxy for the return to capital in a given country; and in order to capture the cross-sector heterogeneity of financial frictions that affect a country in a given year, we construct a "weighted average external financial dependence" by using sector level data.

Aggregate Marginal Product of Capital

MPK is constructed following the methodology in Caselli and Feyrer (2007) and using data from PWT version 8.0 and from the World Bank.

[2]For instance, most of the capital inflows that many of these countries receive comes from Official Flows (e.g., Foreign aid), which does not flow following a reward or return motive. See Alfaro et al. (2014) for more differences on official and private flows.

We extend their analysis and construct time-varying "proper" measures of MPK in an unbalanced panel of 50 countries during 1995-2008. The authors propose a measure of MPK by assuming that under perfect competition conditions in the capital markets, MPK equals the return to capital, which multiplied by total capital stock should equal total capital income. Total capital income can be easily calculated using total income (proxied by GDP) and a *proper* measure of the share of capital in total income. They argue that this proper measure should exclude non-reproducible capital from the "naive" common share of capital that is usually calculated (i.e., one minus the share of labor). This is especially important in the sense that non-reproducible capital (which is essentially land and its products) accounts for a larger share of total production in developing countries than in developed countries (reproducible capital being lower in the former than in the latter).[3] This in turn, creates an upward bias in the common naive measure of MPK in developing, capital-poor, countries. Furthermore, the fact that capital is scarcer (in poorer countries) makes it relatively more expensive and this creates a second upward bias in the MPK of capital-poor countries if they are not taken into account in the estimation. Therefore, MPK for country i at time t is constructed using the stock of reproducible capital (K_{it}), relative price of capital (P^k/P^c), share of labor compensation in GDP and total wealth W_{it} (defined as natural wealth plus reproducible capital), as follows:

$$MPK_{it} = \frac{[GDP \times P^c \times (1 - LaborShare)]_{it}}{(W \times P^k \times K)_{it}}$$

Tables 9 and 10 the in the Appendix report the different MPK measures averaged for each country. Since we will also use the naive measures in the robustness analysis, we will follow the notation in CF in what follows. Hence in the rest of the document "PMPKL" will be used in order to make reference to this *proper* measure of MPK, which includes the relative prices correction and the proper share of capital in total income correction.

Weighted average external financial dependence

The construction of this variable combines 2-digits industry-level data on external financial dependence following the definition in Rajan and Zingales (1998) (R&Z, from now on) and production for each country and year at the industry-level. The proxy for each industry's financial dependence is calculated by Klapper et al. (2006) using data on U.S. companies over 1990-1999 from Standard and Poor's Compustat database and it is available in

[3] See appendix A for details.

Maskus et al. (2012).[4] Production data come from the Industrial Statistics Database (2010) collected by the United Nations Statistical Division and the contribution of the manufacturing sector in total production, from the WDI database (online) of the World Bank. The objective is to obtain a time varying measure of the extent of the country's reliance on external finance.

The idea behind this, which has been studied empirically by R&Z and many others, is that for technological reasons, some industries rely more on external finance than others.[5] R&Z define the dependence on external finance as the share of investment that a firm can't finance with its internal cash flows and is calculated as the capital expenditures minus cash flow from operations divided by capital expenditures of a firm. They compute this external dependence for 36 industries varying from tobacco (the industry with the lowest dependence on external finance -which is actually negative) to drugs, the industry with the highest dependence, using U.S. firm-level data from Compustat. The underlying assumption is that the degree of reliance on external finance across industries persists across countries. The argument for this is that given that large companies in the U.S. function under a relatively well-developed financial system, the measures observed for these can be a good proxy for the technological dependence of industries on external finance in other countries. Additionally, the advantage of using US data as a proxy is that it provides an exogenous measure of external dependence for the rest of the countries.

In this way, we use the time-invariant external dependence of each of the 22 2-digits industries (ISIC rev. 3) in the manufacturing sector and calculate the *weighted average external financial dependence* ($ExternalDep_{it}$) for each country i in year t. In order to do so, we multiply the industry's dependence on external finance by the fraction that each industry k contributes to the total manufacturing production in each country and year over the period 1995-2008 as follows,

$$External\ Dep_{it} = \sum_{k=1}^{22} \left[External\ Dep_k \times \frac{Value\ Added_{kit}}{Value\ Added\ Manuf_{it}} \right]$$

where $ExternalDep_k$ is the external dependence index by industry Klapper et al. (2006). Country level averages of this variable are reported in

[4]Note that while the measure used in this analysis comes also from a newer paper from R. Rajan, the original and widely used R&Z's measure is calculated using the same data during the 1980's for 3 and 4-digits ISIC rev. 2 industries.

[5]See for example Beck (2002) and Manova (2013).

Tables 9 and 10 the in the Appendix.

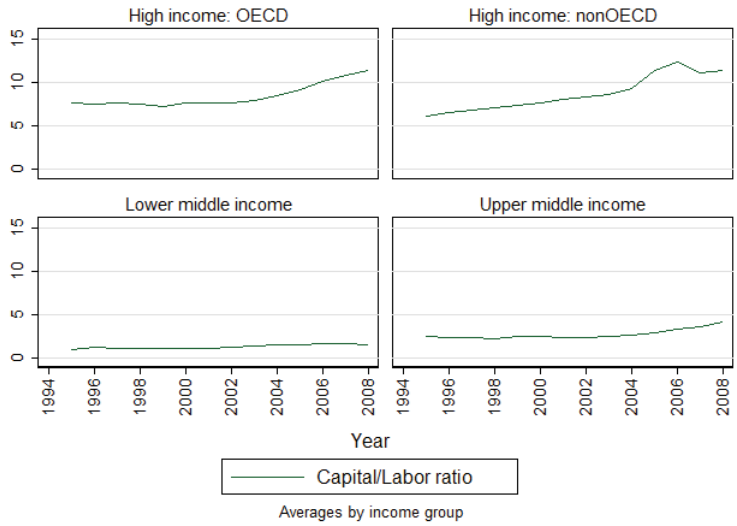
3.1. Stylized facts

Summary statistics are displayed in Table 8 in the Appendix, where the variables are averaged by income groups (this is also the case for all figures presented in this section).[6] A first glance at data allows us motivating the econometric analysis in this paper. In this, sense Figure 1 shows the evolution of capital-to-labor ratios over 1995-2008 for the different groups, as measured by reproducible capital (in million dollars) per worker. The first salient fact that can be seen is the high differences of capital ratios among groups and how these differences are maintained over time. Together with the information in Table 8 in the Appendix one can sum up Figure 1 in a rough way: High income countries (OECD and non OECD) have on average three times as capital as Upper Middle countries; these in turn have on average twice as capital as Lower Middle countries and their capital-to-labor ratios growth over the period has been rather modest.[7] One can also say that capital ratios have steadily increased over 1995-2008 for all groups. Especially, the highest capital growth has taken place in Lower and Upper Middle income countries and in High non OECD countries -where it has more than doubled. All in all, differences in capital ratios between rich, middle income and poor countries, were huge in 1995, and continued to be huge in 2008.

Given these differences in capital ratios, it would be reasonable to expect the same big differences in the reward to capital between countries. Nonetheless, Figure 2 is in line with the findings in Caselli and Feyrer (2007), where the return to capital (as proxied by the MPK) doesn't reflect the big cross-country capital differences. MPK, being on average, even lower there where it is scarcer: in Lower Middle, and significantly lower in Low income countries (figures for these are not shown). Additionally, the evolution of MPK differences among developed and developing is fairly stable over time, although some modest improvements are noticeable for developing countries after the year 2000. The figures for High income Non-OECD countries are very volatile, which is due to the fact that only 4 countries make part of this

[6] Detailed statistics by country are presented in the appendix C.

[7] Although Low income countries were excluded from the analysis, as already mentioned, it is worth noting that these are lagging very far behind having on average eight times less capital than Lower Middle countries.



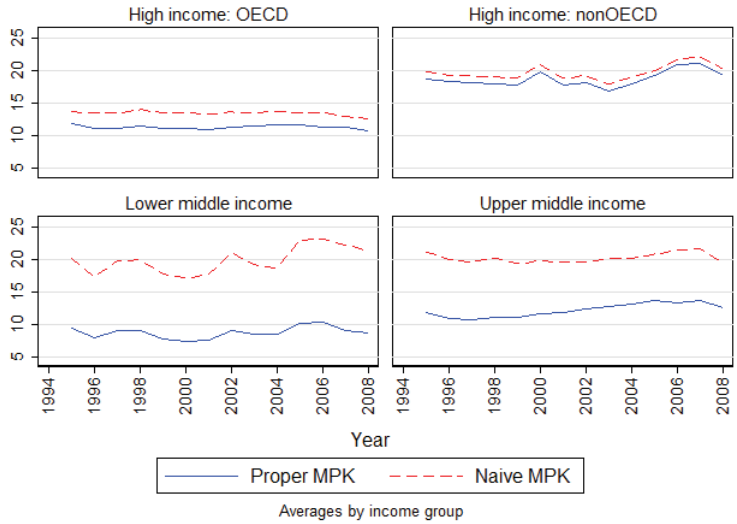
Notes: Capital ratios in million USD are averaged by income group. Source: Author's calculations, using data from Penn World Tables PWT version 8.0 and The Changing Wealth of Nations database (World Bank).

Figure 1: Evolution of capital-to-labor ratios around the world

group.[8]

CF state that a proper measure of MPK must account for the higher relative importance of other types of capital (i.e., non reproducible capital) in production in capital-poor countries. Otherwise, naively measured MPK, is overestimated both in rich and poorer countries, but significantly more in the latter. Furthermore, they emphasize the importance of accounting for the fact that capital goods are relatively cheaper in capital-richer countries, which also overestimates MPK in capital-poor countries. Accordingly, Figure 2 depicts a Naive MPK (the red dotted line) and a Proper MPK measure which takes into account the importance of non reproducible capital in production, both measures having been corrected by the relative differences in capital prices.

[8]Where all the volatility in High income Non-OECD countries is explained a single country: Singapore. The variance of this variable for the latter is 3 to 4 times larger than for the other 3 countries (Cyprus, Hong Kong and Israel).

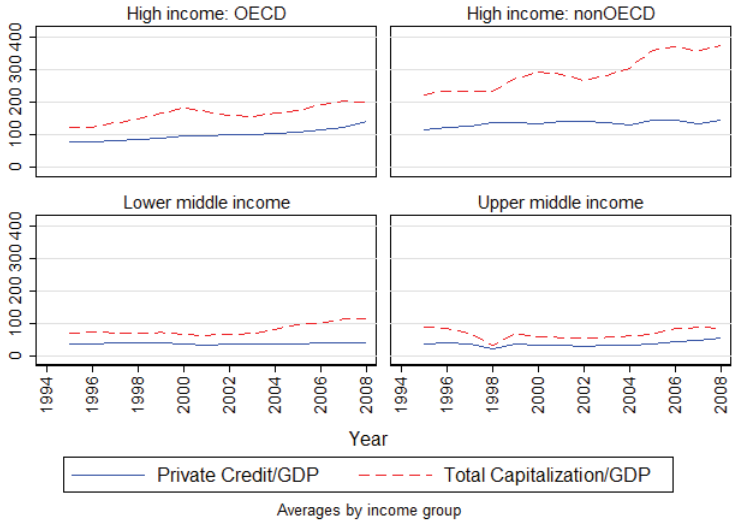


Notes: Proper MPK is the price and natural capital (land) corrected measure and Naive MPK is only the price corrected measure but doesn't include natural capital (land). These measures are averaged by income group. Source: Author's calculations, using data from Penn World Tables PWT version 8.0 and The Changing Wealth of Nations database (World Bank).

Figure 2: Naive and Proper MPK evolution

The naive measure overestimates MPK for all groups, but the bias is much bigger for Low and (Upper and Lower) Middle income countries where land accounts for a significantly higher share in production than in High income countries. In this sense, naive MPK is on average higher in Middle income countries than in richer ones. However, when considering the proper MPK measure, MPK differences across countries begin to shrink; this is particularly true for rich OECD countries and Upper Middle countries. Whereas, for rich non OECD countries the measure is the least overestimated and is by far the largest among all groups. However, it is also convenient to point out that the latter group is particular in its kind as well, since it includes countries such as Hong Kong and Singapore. These small differences between MPK across capital-rich and capital-poor countries, suggest that more than mere impediments to international capital movements across countries, must be at play behind the "up-hill" trend of capitals: if return to capital is not much higher in capital-poor countries, the incentives

for capital to flow from richer to poorer countries disappear.



Notes: Credit is total private credit over GDP and Total Capitalization is total private credit plus stock market capitalization over GDP. These measures are averaged by income group. Source: Author's calculations from Global Financial Development Database (World Bank).

Figure 3: Financial Development measures averaged by income group

In line with this and in the same way as Lucas (1990), Caselli and Feyrer (2007) argue that lower capital-to-labor ratios in poorer countries are due to lower complementary factors and *inefficient uses of factors*. One type of inefficiency can be related to the financial system's ability to optimally channel resources in the economy, as argued by Prasad et al. (2007) and Antras and Caballero (2009). When one examines standard measures of financial development for these different groups, a big heterogeneity is found across the groups. Figure 3 presents the evolution of financial development over the period 1995-2008 using two common *de facto* measures of the depth of the financial system: total private credit as a share of GDP and total capitalization as a share of GDP -which, besides credit includes capitalization of the stock market (the blue dotted line). Regardless of the measure considered, it is clear that the financial system is extremely heterogeneous among rich, middle income and poor countries. Both measures are most of the time, well above 100% (as a share of GDP) for rich countries, while it hardly ar-

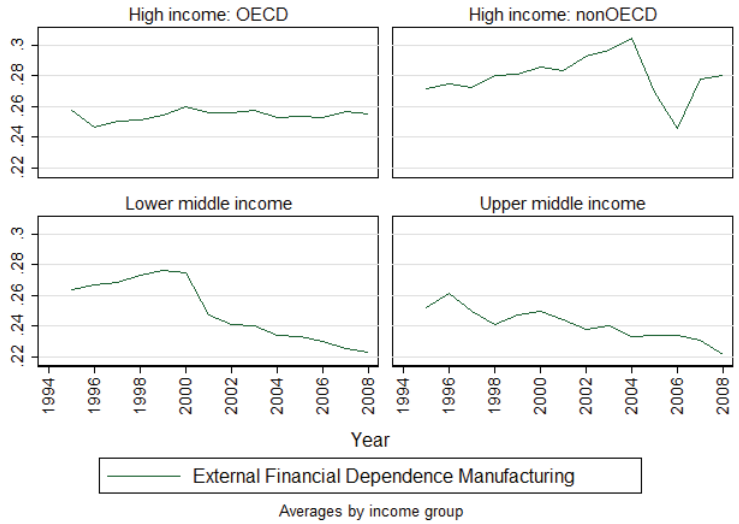
rives to 100% for Middle income countries and they are significantly lower in Low income countries - well below 50% (with the exception of a modest improvement in total capitalization in Lower Middle income countries after 2003).

Not only these variables are much higher in absolute terms for richer countries, but when one considers their evolution, rich countries' financial development evolves much faster than in developing countries. Therefore, it seems reasonable considering the well-functioning of financial markets as a good candidate in explaining one type of inefficiency in developing countries, which can explain the coexistence of small differences in MPK across countries and the large differences in capital-to-labor ratios. This is reinforced by the strong correlation between our two measures of financial development and capital-to-labor ratios, which is presented in Table 7 in the Appendix. In turn, this motivates an analysis opposing developed and developing countries in order to assess our empirical question. On top of this, it is worth noting the drop suffered by Upper Middle countries around 1998-2000, which is explained by the fact that during this period most of the countries from this group experienced a crisis or financial turmoil (6 out of 10 countries).

One last important stylized fact motivating our analysis concerns the average external financial dependence of a country's manufacturing production. Figure 4 displays the evolution of this variable during 1995-2008, which is constructed for each country using industry level data and is averaged by income groups in this figure. It reflects the degree of specialization of a country's production in financially intensive activities. An important aspect of this figure is the similarity of the external financial dependence level between High income and Middle income countries before 2000. This similarity is at odds with the large differences in financial development among developing and developed countries that we just described above.[9]

There is a strand of the literature arguing that financial intensive activities should develop more extensively in countries with stronger financial systems, given that financial development reduces the cost of raising external funds for firms. Therefore, one should expect big differences in

[9] Again, the volatility for High Income Non OECD is to be taken with caution due to the small number of countries in the group. This time it is explained mainly by the fact that Israel drops out of the sample between 2005-2006 and its figures push up the group average (being on average around 1.5 times the values for Hong Kong and Cyprus). Nonetheless, Cyprus did experience a drop in this variable in 2004, which is the year in which it entered the E.U..



Notes: External Financial Dependence is our measure of average financial dependence at the country level, where each sector is attributed a dependence index from Rajan and Zingales (1998) and is weighted by production in each sector. In these figures, this measure is averaged by income group. Source: Author's calculations from Klapper et al. (2006)) and Unido Database (United Nations).

Figure 4: External Financial Dependence measure averaged by income group

specialization in financially dependent activities across countries given the important financial development heterogeneity among developed and developing countries. Even though the related literature has shown that financial development and access to finance is positively and causally correlated with faster growth of financially dependent sectors (Rajan and Zingales (1998)) and higher exports (Beck (2003) and Manova (2013)) in these sectors, we observe that before the year 2000 the aggregate differences in specialization in financially dependent sectors are not strikingly important and this might be one reason explaining why the return to capital is not higher in capital scarce economies.

One explanation behind the difference between this literature and our stylized facts is the different periods of time studied. Accordingly, we don't use the same external financial dependence measure that these studies use, which is the original index in Rajan and Zingales (1998). Actually, the index from Klapper et al. (2006) is not positively related with the original R&Z's

index. The latter measure is based on Compustat data from the 1980's, while the one on which we rely is based on Compustat data from the 1990's given that our analysis studies the period over 1995-2008. The difference between both indexes arises in large part because of changes in the industrial environment between the two periods in the U.S.. This means, in turn, that the industry external dependence index varies over time.

Nonetheless, the pattern clearly changes after 2000 in developing countries, where there is a sharp decline in the production in financially intensive sectors. This is in line with a mean differences t-test between developed and developing countries, where differences in specialization in financially intensive sectors are not statically different in the years before 2000 but they are statistically different after 2000. These differences after 2000 are statically significant at the highest levels of acceptance and are driven by lower production in financially intensive sectors in developing countries. Table 1 displays these results. This points towards a production structure in developing countries that is more in accordance with their comparative advantage in the second period.

Finally, the mean differences test for MPK (using the proper measure) in Table 1 is also in line with the stylized facts, where average MPKs are statistically different and are always higher in developed countries, but where the differences are much lower in the second period. These results taken altogether suggest that specializing in accordance to the country's comparative advantage (here, determined by financial development) is related to increases the aggregate MPK. These facts point to the validity of AC's theory, who argue that financial underdeveloped economies have a comparative advantage in less financially dependent sectors. Next section formally examines this question within an econometric framework which takes into account other possible mechanisms behind these stylized facts, and which provides exogenous sources of variation in these financial frictions.

Table 1: t-test Mean differences among groups

	Mean		Difference	(p-value)
	Developing	Developed		
MPK_{t1}	9.63	12.56	-2.93^a	0.00
EFD_{t1}	0.26	0.26	0.00	0.63
MPK_{t2}	10.79	12.44	-1.66^a	0.00
EFD_{t2}	0.23	0.26	-0.02^a	0.00

EFD is the weighted average External Financial Dependence. t1 is the period 1995-2000 and t2 is the period 2001-2008. ^{c} $p < 0.10$, ^{b} $p < 0.05$, ^{a} $p < 0.01$

4. Econometric analysis

Our empirical objective is to test whether *higher shares of production in less financially dependent sectors are related to higher aggregate MPK in countries with weaker financial intermediation systems.* For this purpose, we begin by examining whether specialization in financially intensive sectors differently affects developed and developing countries. Next, we ask whether these different effects stem from differences in the level of financial development at the country level.

4.1. MPK and External Financial Dependence: developed vs. developing countries

How the overall return to capital of a country is affected by production in financially intensive sectors? Given that developed dramatically differ from developing countries in terms of financial development and that we expect production in financially intensive sectors to differently affect both types of countries. We proceed in two steps in order to answer this question. First, we examine how financially intensive production is related to MPK in a given country, where we condition the relation to depend on whether the country is a developing or a developed economy. Second, we evaluate whether these differences among developed and developing countries come from differences in the efficiency of their financial itermediation.

We, therefore, begin by estimating the following two-way fixed effects model,

$$\begin{aligned} ln\, PMPKL_{it} = \alpha &+ \lambda_1\, External\ Dep_{it} \\ &+ \lambda_2\, External\ Dep_{it} \times 1[Dev_i = 1] \\ &+ \beta^{'} X_{it} + \eta_i + \psi_t + \epsilon_{it} \end{aligned} \tag{1}$$

where $ln\, PMPKL_{it}$ is the aggregate marginal product of capital for country i at time t, corrected by relative capital prices and using a proper measure of capital share in income, as explained in section 3. $External Dep_{it}$ is the logarithm of weighted average external financial dependence and $1[Dev_i = 1]$ is a binary variable taking the value of one when the country is classified as developed and zero otherwise. Provided our hypothesis, we expect λ_2 to be positive given that financial development is strongly related to the level of development of a country. X_{it} are time-varying control variables at the country level such as financial development, natural resources rents, financial openness (*Chinn-Ito Index*), trade openness (de

facto measure). All these variables are introduced in logarithms. Finally, following the literature, overall risk is accounted for and proxied by the following variables: democracy accountability, government stability, law and order, and internal conflict. Finally, η_i are country fixed effects and ψ_t are time effects. In order to account for heteroskedasticity and allow correlation of errors across repeated observations within countries, standard errors are clustered at the country-level.

4.2. MPK and External Financial Dependence: is financial development the relevant channel?

Next, going one step further in testing our proposition, we evaluate whether the different effects of financially intensive production between developed and developing countries are driven by differences in the development of the financial system. For this purpose, we estimate a slightly different version of equation 1, where we instead allow the effect of financially intensive production to vary with the level of financial development of the country. This, with the aim of assessing whether it is only aggregate development that matters, or if it is rather financial development the key variable driving the results. We do so by including an interaction term between our proxy of external financial dependence and two alternative measures of financial development by focusing on each one at a time, as follows,

$$\begin{aligned} ln\, PMPKL_{it} = \; & \alpha + \gamma_1 External\ Dep_{it} + \gamma_2 Fin\ Dev_{it} \\ & + \gamma_3 \left(External\ Dep_{it} \times Fin\ Dev_{it}\right) \\ & + \beta' X_{it} + \eta_i + \psi_t + \epsilon_{it} \end{aligned} \tag{2}$$

where $Fin\, Dev_{it}$ is the logarithm of a time-varying measure for financial development in each country, as measured by either of the two alternative standard variables: (1) *Total private credit over GDP* and (2) *Total Capitalization*, which is total private credit plus stock market capitalization over GDP. The estimation is first performed on the whole sample of countries and then separately on developed and developing countries. The separate samples estimations imposes less constraints given that it allows the estimated coefficients (for both our variables of interest and the control variables) to differ between developed and developing countries. In this sense, given our hypothesis, we expect γ_3 to be positive and γ_1 negative. In other words, we expect production in financially intensive sectors to be positively related to higher returns to capital only if there is a sound financial system capable of efficiently intermediating resources to these sectors.

Finally, given that financial development and the aggregate return to capital may have numerous common determinants which are not captured by the fixed effects, we implement an Instrumental Variables–Two Stage Least Squares approach (IV-2SLS) where financial development is instrumented by each country's legal origin as a source of exogenous variation in financial development, an instrument proposed by La Porta et al. (1997) and La Porta et al. (1998). We particularly follow Aghion et al. (2005) who are interested in the interaction term between financial development and an exogenous variable, which they instrument by the interaction between the latter and legal origins. Therefore, we code Legal origins as an indicator variable equal to 1 if the country has French traditions, equal to 2 if these are German or Scandinavian and equal to 3 if these are English. This captures the idea that the financial system is stronger in countries whose legal origins are English and worse in those with French legal traditions. Note that Legal origins is a time invariant indicator which is used as an instrument for financial development, which varies over time, and given that we estimate a two-way fixed effects model, the effect of financial development will be muted as it will be absorbed by the country fixed effects. Nonetheless, our main effect of interest is the interaction term, which varies over time given that legal origins is interacted with a time-varying variable, $External\ Dep_{it}$.

4.3. Results

Table 2 shows the estimates for a linear unconditional MPK regression in column (1) and for equation (1) in column (2), where the effect of financial dependence is allowed to depend on the overall development of the country, captured by the dummy variable, $1[Dev_i = 1]$. Both specifications are performed on the whole sample of countries.

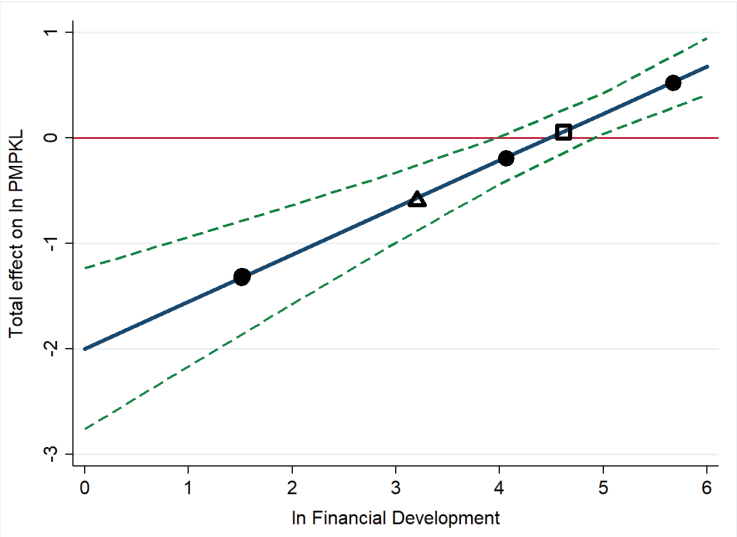
The estimated coefficient on External Dependence, $\hat{\lambda}_1$, in column (1), is negative but insignificant. This suggests, therefore, that there is no overall effect of specializing in financially intensive sectors on the MPK of a country. However, this relation is likely to be encompassing both a strong negative and a strong positive effect at the same time. This is confirmed by results in column (2), where the effect is allowed to adjust for developed and developing countries. $\hat{\lambda}_1$ becomes stronger in magnitude and significant at the 1-percent level, while the coefficient on the interaction term with the development dummy, $\hat{\lambda}_2$ is positive and significant at highest levels of acceptance. Thus, production in financially intensive sectors is on average, negatively related to the aggregate return of capital in a developing country, while the relation is positive for developed countries ($\hat{\lambda}_2 > \hat{\lambda}_1$ in absolute terms).

Are these differences among developed and developing countries due to the interaction of financial frictions at the country and the sector level? Table 3 displays estimation results for equation (2), which addresses this question with the help of the interaction term between both frictions. Columns (1) and (2) correspond to the unconditional and conditional (on financial development) MPK regressions on the whole sample of countries, respectively. Columns (3) and (4) report the same estimations on the High income countries sample and columns (5) and (6) on the developing countries sample (Low and Middle Income economies).

From a comparison of signs and significance of the *External Dependence* coefficients across the different MPK regressions an interesting pattern arises: when all countries are pooled together, there seems again to be no average effect of specializing in financially dependent sectors, given that $\hat{\gamma}_1$ is not even significant at the lowest level of acceptance. However, the unconditional regressions results (for High income and Low-Middle income) suggest that this apparent insignificance is due to the highly significant and opposite effects that *External Dependence* has on developed and developing countries' MPK. Interestingly, when the interaction term with financial development is introduced for the whole sample, the magnitude of the coefficient on *External dependence* becomes 7 times bigger and statistically significant at the highest levels, while the sign of the interaction is positive and also significant at the 1-percent level. This means that, on average, for a given country in our sample, increasing its local production of financially intensive goods is negatively related to its aggregate MPK, unless it works under a sufficiently developed financial system.

A graphical representation of this effect is found in Figure 5. It shows that the average marginal effect of financial frictions is slightly negative when evaluated at the average level of financial development in the whole sample (when the log of financial development is equal to 4), while it is positive for the maximum level of financial development (where ln financial development attains 5.5) and strongly negative for the lowest level (where ln financial development is equal to 1.6). Additionally, if we compute the effect at the average level of financial development of developed economies (square at 4.5) it is close to zero, while it is negative for the average level of financial development in developing economies (triangle at 3.4).

Regarding each of the groups of countries separately, the results seem to hint at the same effect and in favor of our hypothesis. For High income countries, $\hat{\gamma}_1$ is positive and significant at the 1-percent level for the unconditional regression. Whereas, when it is interacted with financial development it becomes statistically insignificant and the sign flips. In addition, the co-



Average marginal effect of ln External Dependence with 95% confidence intervals at different levels of ln Financial Development. Circles represent the minimum, mean and maximum levels of ln Financial Development in the sample, the triangle represents the mean for developing countries while the square is the mean for developed economies. Estimation results for equation (2) reported in column (2) Table 3, where we plot $\partial \ln PMPKL_{it}/\partial \, External\ Dep_{it} = \gamma_1 + \gamma_3 \, (Fin\ Dev_{it})$.

Figure 5: Average marginal effect of External Dependence on PMPKL

efficient on the interaction term is not significant at any acceptance level. The exact opposite happens to Low and Middle Income countries, where $\hat{\gamma}_1$ has a statistically significant, important (in magnitude, with respect to the ones in the whole sample of countries) and negative effect on MPK in both specifications. On top of this, the introduction of the interaction term strengthens the negative main effect of *External Dependence* with respect to the unconditional regression (being 4.3 times more important in absolute terms). Both effects become significant at the 1-percent level and go in the opposite direction ($\hat{\gamma}_1 < 0$ and $\hat{\gamma}_3 > 0$). Hence, these findings point in the direction of our priors, where the existence of financial frictions in developing countries add to the reasons explaining why the level of the aggregate return to capital is not as high as predicted by their relatively low capital-to-labor ratios.

Given that we exploit the within variation of the data, this means that for a given High income country - where the financial system is considered to be

sufficiently developed, producing in financially intensive sectors improves, on average, the aggregate return to capital. Furthermore, providing additional credit to the economy doesn't seem to matter for this effect to take place, possibly because firms already get enough finance. On the other hand, the results for developing countries imply that providing additional credit to the economy is a necessary condition in order for expansion of production of financially intensive sectors to have a positive effect on the aggregate MPK. This suggests that firms do not get enough financing in these economies, given their relatively less efficient financial intermediation.

Most of the controls variables are self-explicative and display the expected sign: from the overall country risk -represented by *Democracy Accountability*, *Government Stability*, *Law and Order* and *Internal Conflict*- only *Law and Order* appears to be significant for Low and Middle income countries and *Democracy Accountability* seems to matter only for developed countries. The negative coefficient of financial development for developed countries might seem somehow strange, even if it is estimated without precision. However, one possible explanation for this can be that credit, efficiently intermediated to firms, translates into more capital. Thus, lower aggregate MPK as well since it is a decreasing function of capital given the classical hypothesis of diminishing marginal returns. On top of this, the coefficient on *Chinn-Ito Index* in developing countries may also be a bit puzzling at a first glance. On the one hand, *Chinn-Ito Index* reflects financial openness of a country and its coefficient has a negative sign. However, surprisingly, it doesn't appear to be significant. There can be two possible explanations for these results. Either, foreign finance does not necessarily translate into capital given the relatively inefficient domestic financial markets. Or *Chinn-Ito Index* is not necessarily reflecting overall capital openness in our estimations. The latter argument can be explained by the fact that financial openness is likely to be collinear with *Trade openness*.

On top of this, given that natural resources abundance is a source of comparative advantage - although not necessarily related to economic performance, as suggested by the negative sign on its coefficient and as has been shown by several authors-, it may be the case that there is still a trade-off in producing in financially intensive sectors despite being financially underdeveloped for these countries.[10] Therefore, the hypothesis that we test should be less relevant for these countries. In this sense, we replicate the analysis by excluding observations of countries whose rents/GDP are above 10 per-

[10]For an overview of the literature on the Resource Curse see: Frankel (2012).

cent. As expected, we find that the results are strengthened, although only for developing countries (in magnitude). In the case of the whole sample, the estimates display lower coefficients, but statistical significance remains at the highest levels of acceptance. This is not surprising given that on the one hand, out of the 9 resource intensive countries only one of them is a developed economy (Norway). On the other hand, from the benchmark results we know that the mechanism that we test is not at play in developed countries (were production in financially intensive sectors is positively related to MPK).[11] Finally, the alternative measure for financial development confirms estimation results obtained with the benchmark measure. Table 4 reports estimation results for equation (2) using the logarithm of *Total Capitalization* as a proxy for the efficiency of the financial system.

Last but not least, Table 5 reports estimates of equation (2) within the instrumental variable (IV) approach. Column (1) reports the IV-first stage estimates of the 2SLS regression where the dependent variable is the interaction term between financial development and external dependence, and where the instrumental variable is the interaction between legal origins (time invariant) and external dependence. Only the interaction term is instrumented given that country fixed effects subsume the effect of Legal origins, which is the instrument for financial development. Thus, column (2) reports the second stage, where the dependent variable is lnPMPKL and where the only instrumented variable is the interaction term. The main message arising from this IV estimation is that results from the simple two-way fixed effects model are confirmed and strengthened in magnitude, although estimated with less precision, when accounting for the endogeneity of financial development (the variables of interest are now significant at the 5-percent level).[12] Indeed, in line with the literature, one can conclude from the F-statistic of the first stage and from the sign and statistical significance of the instrument, that Legal origins is a valid instrument for a country's level of financial development.

[11] See Table 13 in the Appendix, together with the list of countries excluded.

[12] To be compared to column (2) in Table 3 which estimates equation (2) on the whole sample of countries.

Table 2: MPK, External dependence and Overall development

	Dependent variable: lnPMPKL	
	(1)	(2)
External dependence	-0.27	-0.62[a]
	(0.24)	(0.22)
Fin. Development	0.00	0.00
	(0.04)	(0.04)
$1[Dev_i = 1] \times$ External dependence		1.01[a]
		(0.24)
Controls		
Natural resources rents	-0.01	-0.03
	(0.03)	(0.02)
Trade openness	0.06	0.04
	(0.18)	(0.16)
Chinn-Ito index	0.03	0.05
	(0.10)	(0.08)
Democracy accountability	0.01	0.01
	(0.02)	(0.02)
Government Stability	-0.00	-0.00
	(0.01)	(0.01)
Law and Order	0.03	0.03
	(0.03)	(0.03)
Internal Conflict	-0.01	-0.01
	(0.01)	(0.01)
Country F.E.	Yes	Yes
Time F.E.	Yes	Yes
Observations	590	590
R^2	0.904	0.916

Standard errors in parentheses are clustered at the country level. Time-varying country level controls in logs, except dummies and PRS indexes. Fin. Development is the log of total private credit over GDP. [c] $p < 0.10$, [b] $p < 0.05$, [a] $p < 0.01$.

Table 3: MPK, External dependence and Financial development

	Dependent Variable: ln PMPKL					
	All countries		High Income		Low & Mid. Income	
	(1)	(2)	(3)	(4)	(5)	(6)
External dependence	-0.27	-2.00^a	0.38^a	-0.07	-0.54^b	-2.37^a
	(0.24)	(0.38)	(0.10)	(0.61)	(0.22)	(0.42)
Fin. Development	0.00	0.63^a	-0.06	0.06	0.08	0.88^a
	(0.04)	(0.12)	(0.05)	(0.17)	(0.06)	(0.21)
External dependence × Fin. Development		0.45^a		0.09		0.56^a
		(0.08)		(0.12)		(0.13)
Controls						
Natural resources rents	-0.01	-0.04^c	-0.02	-0.02	-0.06	-0.10^c
	(0.03)	(0.02)	(0.02)	(0.02)	(0.06)	(0.05)
Trade openness	0.06	0.06	-0.00	0.01	-0.05	-0.03
	(0.18)	(0.16)	(0.15)	(0.16)	(0.20)	(0.18)
Chinn-Ito index	0.03	0.07	0.10	0.10	-0.05	-0.02
	(0.10)	(0.08)	(0.10)	(0.10)	(0.09)	(0.09)
Democracy accountability	0.01	0.02	0.04^c	0.03^c	-0.03	-0.01
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Government Stability	-0.00	-0.00	0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Law and Order	0.03	0.03	0.01	0.01	0.07	0.08^c
	(0.03)	(0.03)	(0.02)	(0.02)	(0.05)	(0.04)
Internal Conflict	-0.01	-0.00	-0.01	-0.01	-0.03	-0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	590	590	332	332	258	258
R^2	0.904	0.918	0.947	0.947	0.901	0.911

Standard errors in parentheses are clustered at the country level. Time-varying country level controls in logs, except dummies and PRS indexes. Fin. Development is the log of total private credit over GDP. ^{c} $p < 0.10$, ^{b} $p < 0.05$, ^{a} $p < 0.01$.

Table 4: MPK, External Dependence and Alternative Financial development

	Dependent Variable: ln PMPKL					
	All countries		High Income		Low & Mid. Income	
	(1)	(2)	(3)	(4)	(5)	(6)
External dependence	-0.02	-1.66^{a}	0.36^{a}	0.65	-0.25	-1.95^{a}
	(0.15)	(0.48)	(0.09)	(0.82)	(0.17)	(0.57)
Fin. Development	0.06	0.56^{a}	-0.06	-0.13	0.12^{c}	0.75^{a}
	(0.05)	(0.12)	(0.06)	(0.20)	(0.06)	(0.21)
External dependence × Fin. Development		0.35^{a}		-0.05		0.43^{a}
		(0.09)		(0.15)		(0.14)
Controls						
Natural resources rents	-0.02	-0.04^{b}	-0.02	-0.02	-0.08	-0.11^{c}
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.06)
Trade openness	0.12	0.12	0.03	0.03	0.05	0.09
	(0.17)	(0.16)	(0.15)	(0.15)	(0.19)	(0.18)
Chinn-Ito index	0.02	0.04	0.11	0.11	-0.08	-0.06
	(0.09)	(0.08)	(0.10)	(0.10)	(0.10)	(0.11)
Democracy accountability	0.02	0.02	0.04^{c}	0.04^{c}	-0.02	-0.02
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Government Stability	-0.00	-0.00	0.00	0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Law and Order	0.03	0.03	0.01	0.01	0.08	0.08^{c}
	(0.03)	(0.03)	(0.02)	(0.02)	(0.05)	(0.05)
Internal Conflict	-0.00	-0.00	-0.01	-0.01	-0.03	-0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	563	563	331	331	232	232
R^2	0.893	0.900	0.947	0.947	0.872	0.878

Standard errors in parentheses are clustered at the country level. Time-varying country level controls in logs, except dummies and PRS indexes. Fin. Development is the log of total private credit plus stock market capitalization over GDP. ^{c} $p < 0.10$, ^{b} $p < 0.05$, ^{a} $p < 0.01$.

Table 5: Legal Origins and Financial Development (IV-2SLS)

Dependent Variable:	Fin. Development × External dependence	ln PMPKL
	IV-First Stage	2SLS
	(1)	(2)
External dependence	3.41[a]	-2.80[b]
	(0.37)	(1.15)
Legal origins × External dependence	0.49[b]	
	(0.19)	
Fin. Development × External dependence		0.59[b]
		(0.26)
Controls		
Natural resources rents	0.09[b]	-0.08[b]
	(0.04)	(0.04)
Trade openness	-0.32[c]	0.28[c]
	(0.17)	(0.15)
Chinn-Ito index	-0.33[a]	0.24
	(0.12)	(0.16)
Democracy accountability	0.04	-0.02
	(0.03)	(0.03)
Government Stability	0.01	-0.01
	(0.02)	(0.01)
Law and Order	-0.13[a]	0.11[b]
	(0.04)	(0.05)
Internal Conflict	0.02	-0.02
	(0.02)	(0.01)
Country F.E.	Yes	Yes
Time F.E.	Yes	Yes
Observations	590	590
R-squared	0.657	-1.824
F-statistic	45.13	

Dependent variable in (1) is "Fin. Development × External dependence". Dependent variable in (2) is ln PMPKL. Robust standard errors in parentheses. Time-varying country level controls in logs, except dummies and PRS indexes. Fin. Development is the log of total private credit over GDP. [c] $p < 0.10$, [b] $p < 0.05$, [a] $p < 0.01$.

5. Sensitivity Analysis

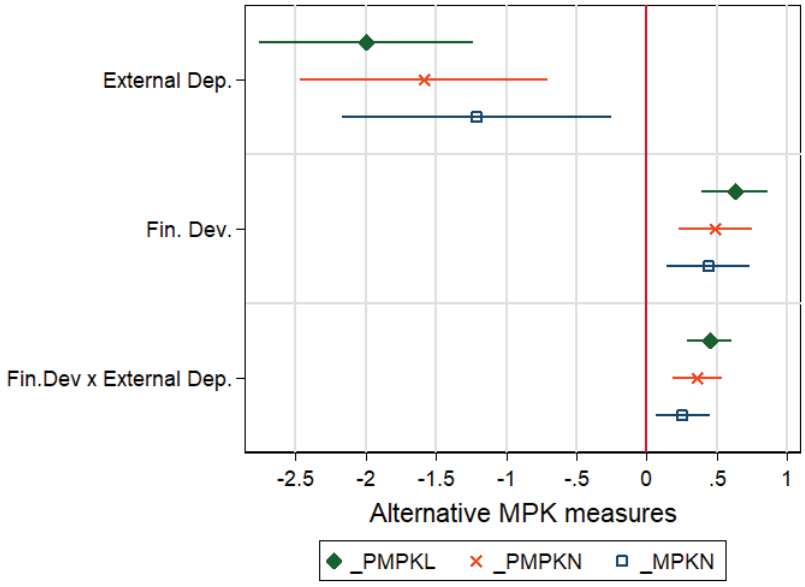
We consider two alternative "naive measures" of MPK: a first one including only the correction concerning the relative prices of capital (PMPKN), and a second one without any correction (MPKN). We following the notation in Caselli and Feyrer (2007), where N stands for "naive" and P for "price corrected".[13] We begin by presenting the estimations of equation (1) for each of these alternative MPKs in Table 14 in the Appendix. Next we report estimates of equation (2), where the effect of *External dependence* varies according to the level of financial development and is estimated for the three different samples (all countries, developed countries and developing ones). These results are reported in the Appendix in Table 15 for the price-corrected measure and in Table 16 for the MPK measure with no corrections at all.

Results in Table 14, show that the results are robust to alternative MPK measures, although the less corrections introduced in the MPK measure, the lower the effects and the less precisely estimated. However, the coefficient on the interaction term between *External dependence* and the overall development of the country, remains significant at the 5-percent level even with the "naivest" MPK measure (and at the 1-percent level with the price-corrected measure). Suggesting, again, that production in financially intensive sectors is negatively related to MPK in developing countries while the relation is positive for developed countries (given that it is still the case that $\hat{\lambda}_2 > \hat{\lambda}_1$). The same happens with the effect on the alternative MPK measures when we examine *External dependence* conditional on the level of financial development, where the magnitude of the coefficients is lower than before but they point to the same direction. Table 15 displays estimation results for the price-corrected MPK measure, which remain significant at the 1-percent level.

Concerning the "naivest MPK measure", in Table 16, where the coefficients display the lowest magnitude and significance with respect to our baseline specifications, the estimates still comply to our hypothesis. When the whole sample of countries is considered in column (2), the estimates of the interaction term, as well as the main coefficient on $External dependence$, are significant at the 5-percent level, while the one on $Fin. development$ remains significant at the highest levels of acceptance. Thus, again pointing that financially intensive production is negatively related to MPK when fi-

[13] See section 3 for more details on the differences between the naive and proper measures.

nancial development is low. Finally, estimation results for Low and Middle Income countries, in column (6) point that these effects are mostly driven by these countries, where the effects are strengthened. However, the coefficients on financial development and on the interaction term are estimated with less precision but remain significant at 5 and 10-percent, respectively.



Coefficients with 95% confidence intervals. Estimation results for equation (2) on each of the alternative MPK measures.

Figure 6: Coefficients Plot among alternative MPK measures

All these results are summarized in Figure 6, where the different coefficients obtained for each MPK measure are plotted, together with their confidence intervals. It can be observed that the results are robust to all the alternative MPK measures, although the more corrections introduced in the MPK measure, the further away from zero is the coefficient and the narrower its confidence intervals. A possible interpretation of these results is that the price-correction and the importance of natural capital adjustment might be particularly relevant when assessing the effects of financial frictions on MPK. On the one hand, a less efficient financial market translates into costlier production in financially intensive sectors, where relative capital prices appear to be important. On the other hand, by construction, the financially intensive sectors only concern the manufacturing in our analysis

and therefore, the adjustment for natural capital, becomes more relevant. In other words, if the share of income of reproducible capital -which is the one, that is the most likely to be concerned by financial frictions in the manufacturing sector, is very small in a given country but that financial frictions also are very important, then not accounting for the share on natural capital in total income would jeopardize the effect of financial frictions on MPK.

6. Conclusions

Large differences in capital ratios across countries should be reflected in large differences in marginal product of capital (MPK) and in capital flowing from capital-rich to capital scarce economies. More comprehensive data allowed us extending the proper MPK measures proposed by Caselli and Feyrer (2007) over time, for an unbalanced panel of 50 countries over the period 1995-2008. Our findings comply with their results, where the return to capital in capital-poor countries is not as high as predicted by their relatively low level of capital-to-labor ratios. Indeed, MPK seems to be the lowest in the capital-poorest countries. This implies that there are no incentives for capital to flow into capital-poor economies. CF attribute this to overall *inefficiencies* and differences in relative prices of capital. The main hypothesis tested in this paper is that one way through which these inefficiencies can work is in the form of an inability of the financial system to optimally allocate capital across different sectors, which pins down aggregate capital productivity.

Indeed, Antras and Caballero (2009) develop a theory where given the existence of heterogeneity in external financial needs across sectors, financial underdevelopment at the country level creates a misallocation problem which can be circumvented by specializing in sectors that are less subject to suffer from the financial malfunctioning. Therefore, financially underdeveloped countries could increase aggregate MPK and attract capital inflows by specializing in less financially intensive sectors. Thus, in this paper we connect this theory with the findings concerning the lower MPK's in developing countries and we examine the *inefficiencies* behind these lower return to capital in capital-poorer countries through the lens of AC's theory.

Accordingly, we examine how aggregate MPK between 1995 and 2008 in developing and developed countries is related to financial frictions, as measured by their aggregate production in financially intensive sectors and their level of financial development. Our findings point that on average, production in financially intensive sectors is negatively affects the aggregate MPK of a country and the effect becomes positive only when the financial

markets are sufficiently developed. This relation is only relevant for developing countries, who markedly differ from developed countries in terms of financial development. Alternative measures of financial development point in the same direction. On top of this, the findings are robust to an instrumental variable approach, where, we follow the literature and assess the exogenous effect of financial development by using Legal origins as an instrument. Hence, providing a causal interpretation of these finding. Finally, for the sake of robustness, instead of following Caselli and Feyrer (2007) we alternatively analyze the "more naive" MPK measures, and find that our findings still hold. Nonetheless, the less corrections introduced to the MPK measure, the lower the magnitude of the coefficients (in absolute terms) and the less precisely they are estimated.

Additionally, we find that after the year 2000 specialization patterns in financially underdeveloped economies are more in line with their comparative advantage, namely, in less financially intensive sectors. This is consistent with the slightly higher MPKs in these countries after this period. Thus, suggesting that such change in specialization improved the allocation of resources within less financially developed economies.

In conclusion, even though we do not directly evaluate misallocation of capital in this analysis, our findings imply that financial frictions depress the return to capital in financially underdeveloped economies. This, in turn, points that there is no misallocation of capital across countries given their actual levels of financial development and financial dependence. However, this suggests that there is, indeed, misallocation of capital within less financially developed economies and this might be one of the reasons why aggregate MPK is not higher in these countries and their level of capital inflows is not higher.

References

Aghion, P., Howitt, P., Mayer-Foulkes, D., 2005. The effect of financial development on convergence: Theory and evidence. The Quarterly Journal of Economics 120, 173–222.

Alfaro, L., Kalemli-Ozcan, S., Volosovych, V., 2008. Why doesn't capital flow from rich to poor countries? an empirical investigation. The Review of Economics and Statistics 90, 347–368.

Alfaro, L., Kalemli-Ozcan, S., Volosovych, V., 2014. Sovereigns, upstream capital flows, and global imbalances. Journal of the European Economic Association 12, 1240–1284.

Antras, P., Caballero, R.J., 2009. Trade and capital flows: A financial frictions perspective. Journal of Political Economy 117, 701–744.

Banerjee, A.V., Duflo, E., 2005. Growth theory through the lens of development economics. Handbook of economic growth 1, 473–552.

Beck, T., 2002. Financial development and international trade: Is there a link? Journal of International Economics 57, 107–131.

Beck, T., 2003. Financial dependence and international trade. Review of International Economics 11, 296–316.

Buera, F.J., Kaboski, J.P., Shin, Y., 2011. Finance and development: A tale of two sectors. The American Economic Review 101, 1964–2002.

Caselli, F., Feyrer, J., 2007. The marginal product of capital. The Quarterly Journal of Economics 122, 535–568.

Djankov, S., La Porta, R., Lopez-de Silanes, F., Shleifer, A., 2008. The law and economics of self-dealing. Journal of Financial Economics 88, 430–465.

Do, Q.T., Levchenko, A.A., 2007. Comparative advantage, demand for external finance, and financial development. Journal of Financial Economics 86, 796–834.

Feenstra, R.C., Inklaar, R., Timmer, M.P., 2015. The next generation of the penn world table. The American Economic Review 105, 3150–3182.

Frankel, J.A., 2012. The natural resource curse: a survey of diagnoses and some prescriptions .

Gertler, M., Rogoff, K., 1990. North-south lending and endogenous domestic capital market inefficiencies. Journal of Monetary Economics 26, 245–266.

Gollin, D., 2002. Getting income shares right. Journal of Political Economy 110, 458–474.

Gopinath, G., Kalemli-Özcan, Ş., Karabarbounis, L., Villegas-Sanchez, C., 2017. Capital allocation and productivity in south europe. The Quarterly Journal of Economics 132, 1915–1967.

Gourinchas, P.O., Rey, H., 2014. External adjustment, global imbalances, valuation effects, in: Handbook of international economics. Elsevier. volume 4, pp. 585–645.

Kiyotaki, N., Moore, J., et al., 1997. Credit chains. Journal of Political Economy 105, 211–248.

Klapper, L., Laeven, L., Rajan, R., 2006. Entry regulation as a barrier to entrepreneurship. Journal of financial economics 82, 591–629.

La Porta, R., Lopez-de Silanes, F., Shleifer, A., Vishny, R.W., 1997. Legal determinants of external finance. The journal of finance 52, 1131–1150.

La Porta, R., Lopez-de Silanes, F., Shleifer, A., Vishny, R.W., 1998. Law and finance. Journal of political economy 106, 1113–1155.

Lucas, R.E., 1990. Why doesn't capital flow from rich to poor countries? The American Economic Review , 92–96.

Manova, K., 2013. Credit constraints, heterogeneous firms, and international trade. Review of Economic Studies 80, 711–744.

Maskus, K.E., Neumann, R., Seidel, T., 2012. How national and international financial development affect industrial r&d. European Economic Review 56, 72–83.

Midrigan, V., Xu, D.Y., 2014. Finance and misallocation: Evidence from plant-level data. The American Economic Review 104, 422–458.

Moll, B., 2014. Productivity losses from financial frictions: can self-financing undo capital misallocation? The American Economic Review 104, 3186–3221.

Portes, R., Rey, H., 2005. The determinants of cross-border equity flows. Journal of International Economics 65, 269–296.

Prasad, E.S., Rajan, R.G., Subramanian, A., 2007. Foreign capital and economic growth. Technical Report. National Bureau of Economic Research.

Rajan, R.G., Zingales, L., 1998. Financial dependence and growth. The American Economic Review 88, 559–586.

Reinhardt, D., Ricci, L.A., Tressel, T., 2013. International capital flows and development: Financial openness matters. Journal of International Economics 91, 235–251.

Reinhart, C.M., Rogoff, K.S., 2004. Serial default and the "paradox" of rich-to-poor capital flows. American Economic Review 94, 53–58.

A. Caselli and Feyrer's Proper MPK measure

Assuming a constant return-production function (not necessarily a Cobb-Douglas -assumed here for illustration purposes) and perfect competition conditions in domestic capital markets, the marginal product of capital equalizes the rental rate of capital,

$$Y_{it} = \left(K^{\alpha} L^{1-\alpha}\right)_{it}$$
$$\frac{\partial Y_{it}}{\partial K_{it}} = r_{it} = MPK_{it}$$
$$MPK_{it} = \left(\alpha K^{\alpha-1} L^{1-\alpha}\right)_{it} = \left(\alpha \frac{Y}{K}\right)_{it}$$

where α_k is an estimate of **reproducible-capital share** in income,

$$\alpha_k = \frac{P_k \times K}{W} \times (1 - LaborShare)$$

And accounting for relative price of final-to-capital goods (which matters in a two or multi-sector model),

$$MPK_{it} = \overbrace{\left[\frac{P_k \times K}{W} \times (1 - Labor\ Share)\right]_{it}}^{\alpha_k} \times \left[\frac{P_c \times GDP}{P_k \times K}\right]_{it}$$

Where $\frac{P_k \times K}{W}$ is the share of reproducible capital in the total wealth of the country, W, defined as the sum of **Produced Capital** and **Natural Capital**, both recovered from the World Bank's Changing Wealth of Nations. The latter defined as:

Natural Capital= Timber + Non Timber Forest Resources + Protected Areas + Crop Land + Pasture.

The rest of the variables, *Labor Share* and $\frac{P_c \times GDP}{P_k \times K}$ are recovered from the PWT 8.0. It is worth mentioning that the literature has raised concerns about the correct way of estimating labour share in income given that the "naive" measure does not account for the labor income of self-employed workers, which is not directly observable. The estimate of *Labor Share* in this PWT 8.0 version treats this issue, which is adjusted (methods discussed in Feenstra et al. (2015)) in order to account for self-employment.[14] See Feenstra et al. (2015) for more details on the construction of these variables.

[14]This issue was first raised by Gollin (2002), who discusses different methods for estimating the labor compensation of self-employed workers.

B. External Financial Dependence

ISIC	Industry	External dependence
15	Food products and beverages	0.1809
16	Tobacco products	0.9445
17	Textiles	0.2615
18	Wearing apparel, dressing and dyeing of fur	0.1743
19	Leather, leather products and footwear	0.0981
20	Wood and products of wood and cork (except furniture)	0.156
21	Pulp, paper and paper products	0.1233
22	Publishing, printing and reproduction of recorded media	0.0959
23	Coke, refined petroleum products and nuclear fuel	-0.0439
24	Chemicals and chemical products	0.7905
25	Rubber and plastics products	0.2995
26	Other non-metallic mineral products	-0.1205
27	Basic metals	0.1468
28	Fabricated metal products, except machinery and equipment	0.1664
29	Machinery and equipment, n.e.c.	0.0765
30	Office, accounting and computing machinery	0.5015
31	Electrical machinery and apparatus, n.e.c.	0.1373
32	Radio, television and communication equipment	0.3276
33	Medical, precision and optical instruments, watches and clocks	0.6425
34	Motor vehicles, trailers and semi-trailers	0.3943
35	Other transport equipment	0.1235
36	Furniture, manufacturing n.e.c.	0.3761

ISIC Industries Rev. 3 (excluding recycling, code 37)

Table 6: Industry-level External dependence from Klapper et al. (2006)

This proxy for each industry's external financial dependence is calculated by Klapper et al. (2006) and was recovered from Maskus et al. (2012). It follows the methodology in Rajan and Zingales (1998) and is calculated based on data from U.S. companies over 1990-1999 using Compustat database from Standard and Poor's. Specifically, it is computed as the industry-level median (across firms) of the ratio of capital expenditures minus cash flow (summed over all years) over capital expenditures (summed over all years).

C. Descriptive Statistics

Table 7: Cross-correlation between financial development and K/L ratios

	Credit/GDP	Total Capitalization	K/L
Credit/GDP	1.00		
Total Capitalization	0.83	1.00	
K/L	0.67	0.64	1.00

See Table 8 for variable definitions. *Source:* Author's calculations using data from World Bank.

Table 8: Key variables evolution: 1995-2008 averages by income group

Income Group	Year	K/L	Naive MPK	Proper MPK	External Dep.	Credit	Total Cap.
High: OECD	1995	45,645.44	17.57	11.82	0.26	61.84	112.23
	2000	51,905.12	16.25	11.25	0.26	72.98	143.30
	2005	61,346.53	17.65	12.18	0.25	77.59	147.33
	2008	114,380.65	12.50	10.76	0.26	138.62	200.19
High: nonOECD	1995	45,645.44	17.57	11.82	0.26	61.84	112.23
	2000	51,905.12	16.25	11.25	0.26	72.98	143.30
	2005	61,346.53	17.65	12.18	0.25	77.59	147.33
	2008	114,015.82	20.25	19.26	0.28	143.91	372.77
Lower middle	1995	45,645.44	17.57	11.82	0.26	61.84	112.23
	2000	51,905.12	16.25	11.25	0.26	72.98	143.30
	2005	61,346.53	17.65	12.18	0.25	77.59	147.33
	2008	15,367.10	21.13	8.71	0.22	39.70	114.36
Upper middle	1995	45,645.44	17.57	11.82	0.26	61.84	112.23
	2000	51,905.12	16.25	11.25	0.26	72.98	143.30
	2005	61,346.53	17.65	12.18	0.25	77.59	147.33
	2008	41,513.71	19.40	12.54	0.22	53.51	84.43

K/L is capital per worker, Naive MPK is marginal product of capital corrected by relative capital prices but not accounting for the importance of non-reproducible capital (or natural capital) in total production, Proper MPK accounts for non-reproducible capital, External Dep. is the measure of external financial dependence weighted by the share of each sector in a country's manufacturing production, Credit is total private credit as a share of GDP, Total Cap. is total capitalization as a share of GDP which includes credit and capitalization of the stock market. *Source:* Author's calculations and WDI from World Bank.

Table 9: Summary Statistics Developing Countries: averages 1995-2008

Country	PMPKL	PMPKN	MPKN	External Dep.	Credit/GDP	Total Cap./GDP	obs.
Azerbaijan	8.62	29.02	33.01	0.11	8.04	.	8
Bulgaria	12.09	22.82	22.06	0.25	24.38	33.85	12
Cameroon	5.88	17.57	26.61	0.22	7.63	.	8
Colombia	8.41	18.96	17.04	0.25	27.44	42.66	11
Ecuador	6.56	26.74	20.59	0.13	26.38	33.28	14
Egypt, Arab Rep.	19.28	43.19	54.22	0.26	48.52	87.54	6
India	8.01	23.63	24.52	0.29	29.83	75.91	14
Indonesia	9.09	21.65	22.46	0.34	26.68	51.85	12
Iran, Islamic Re	6.71	17.80	19.67	0.25	28.27	42.36	13
Jordan	10.28	14.05	12.23	0.32	74.95	188.69	14
Latvia	10.18	14.27	17.70	0.19	52.68	62.49	8
Lithuania	13.08	17.95	23.43	0.21	29.75	48.88	9
Malaysia	11.54	18.82	12.30	0.26	115.60	272.40	13
Mexico	14.39	20.70	25.31	0.31	19.18	44.51	13
Moldova	2.43	5.33	8.44	0.16	21.50	.	8
Morocco	10.99	16.46	14.62	0.31	49.12	88.05	14
Philippines	10.34	22.31	20.92	0.27	40.40	93.09	9
Poland	8.66	13.67	14.44	0.24	25.03	41.78	12
Romania	9.30	16.38	15.72	0.20	14.38	24.09	12
Sri Lanka	5.72	11.32	13.21	0.30	27.48	41.77	10
Tunisia	11.85	17.78	16.46	0.22	62.86	74.82	12
Turkey	20.17	33.12	33.32	0.23	17.69	39.30	14
Uruguay	12.33	20.39	15.45	0.23	32.24	29.19	12
Average	10.32	20.02	20.26	0.25	36.19	72.51	11.73

See Table 8 for variable definitions. *Source:* Author's calculations and WDI from World Bank.

Table 10: Summary Statistics Developed Countries: averages 1995-2008

Country	PMPKL	PMPKN	MPKN	External Dep.	Credit/GDP	Total Cap./GDP	obs.
Australia	8.54	11.82	12.35	0.22	84.01	181.12	11
Austria	8.89	9.77	10.75	0.22	104.29	131.26	11
Belgium	11.12	11.83	11.64	0.31	77.76	149.47	8
Cyprus	10.99	13.31	11.37	0.22	197.85	244.61	14
Czech Republic	9.43	11.11	12.56	0.22	45.23	68.52	11
Denmark	8.86	10.36	10.86	0.25	111.19	167.93	14
Finland	9.51	12.16	11.06	0.22	62.18	178.16	14
France	9.09	10.19	12.28	0.27	87.43	164.77	10
Germany	9.40	10.08	11.51	0.27	112.80	164.02	10
Greece	13.23	15.15	13.74	0.20	53.39	97.22	9
Hong Kong SAR, C	20.90	20.91	16.23	0.21	147.12	481.87	14
Hungary	8.68	10.69	13.48	0.26	40.03	64.11	11
Ireland	24.24	28.78	27.44	0.44	114.47	176.97	14
Israel	17.58	19.41	14.42	0.33	76.54	134.04	12
Italy	12.83	14.13	11.84	0.22	74.15	115.32	14
Japan	12.17	12.50	11.62	0.28	196.53	271.59	13
Korea, Rep.	16.09	17.05	15.58	0.28	81.01	132.98	14
Netherlands	9.45	10.73	13.23	0.28	138.08	241.55	12
New Zealand	9.50	17.46	20.88	0.17	110.33	150.21	13
Norway	11.69	17.64	18.43	0.22	77.95	118.91	12
Portugal	9.80	10.75	9.24	0.20	133.59	175.83	10
Singapore	25.06	25.06	17.13	0.37	104.10	275.98	14
Slovak Republic	9.14	11.36	13.88	0.22	40.99	46.85	13
Spain	8.73	9.83	10.36	0.23	109.49	180.35	14
Sweden	11.71	14.08	15.05	0.27	95.49	195.66	13
United Kingdom	13.67	14.88	16.74	0.26	135.34	273.08	14
United States	10.39	11.96	12.47	0.31	171.88	302.84	13
Average	12.49	14.45	14.10	0.26	105.05	185.87	12.55

See Table 8 for variable definitions. *Source:* Author's calculations and WDI from World Bank.

D. Data sources and variable definitions

D.1. Variable Sources and Definition

Table 11: Variable Sources and Definition

Trade openness, Fin. Development, Natural Resources	From the WDI World Bank. (1) *De facto* Trade openness defined as Total Trade (Exports + Total Imports) as a % of GDP. (2) Two alternative measures Financial Development: Total Credit to Private sector as a % of GFP and Total Capitalization= Total Credit to Private sector + Market Capitalization)/GDP. (3) Natural Resources Rents as % of GDP.
Capital flows.	From IFS IMF. Total capital inflows (excluding official flows). Comprises FDI Portfolio Equity (% GDP). Definition BOP5,6.
Value Added$_{ikt}$	From the Industrial Statistics database UNIDO. Industry-country Value Added (ISIC Rev. 3).
Consumption$_{kit}$	From the Industrial Demand-Supply database UNIDO. Industry-country Apparent Consumption (ISIC Rev. 3). Computed as: Domestic output + Total imports -Total exports.
Total Wealth (W)	From the WB "Changing Wealth of Nations". Country level Total Wealth is defined as Natural Capital + Reproducible Capital.
Capital (K)	From the PWT. Country level capital stocks are estimated based on cumulating and depreciation past investments using the perpetual inventory method (PIM).
Labour Share	From the PWT. Computed using National Accounts data on compensation of employees, GDP and mixed income. Adjustments are made accounting for self-employed.
GDP, P_k, P_c	From the PWT. (1) GDP in PPP (2) Investment Prices. (3) Consumption Prices.
Chinn-Ito index	The KAOPEN index is an index measuring a country's degree of capital account openness. The index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)
Government Stability	A measure of both of the government's ability to carry out its declared program(s), and its ability to stay in office. The risk rating assigned is the sum of three subcomponents: Government Unity, Legislative Strength, and Popular Support
Internal Conflict	From PRS. A measure of political violence in the country and its actual or potential impact on governance. The risk rating assigned is the sum of three subcomponents: Civil War/Coup Threat, Terrorism/Political Violence, and Civil Disorder.

Table 11 – *Continued on next page*

Table 11 – *Continued from previous page*

Law and Order	From PRS. Two measures comprising one risk component. Each sub-component equals half of the total. The "law" sub-component assesses the strength and impartiality of the legal system, and the "order" sub-component assesses popular observance of the law. Higher score: lower risk
Investment Profile	From PRS. Factors affecting the risk to investment that are not covered by other political, economic and financial risk components. The risk rating assigned is the sum of three subcomponents: Contract Viability/Expropriation, Profits Repatriation, and Payment Delays. Higher score: lower risk
Corruption	From PRS. Corruption within the political system that is a threat to foreign investment by distorting the economic and financial environment, reducing the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and introducing inherent instability into the political process. Higher score: lower risk
Democracy Acc.	Democracy Accountability from PRS Group. A measure of, not just whether there are free and fair elections, but how responsive government is to its people. The less responsive it is, the more likely it will fall. Even democratically elected governments can delude themselves into thinking they know what is best for the people, regardless of clear indications to the contrary from the people. Higher score: lower risk

D.2. Links to data websites

- World Bank Changing Wealth of Nations:
  `http://data.worldbank.org/data-catalog/wealth-of-nations`
- Penn World Tables 8.0:
  `http://www.rug.nl/research/ggdc/data/pwt/pwt-8.0`
- World Bank World Development Indicators (WDI) :
  `http://data.worldbank.org/data-catalog/world-development-indicators`
- PRS Group:
  `http://epub.prsgroup.com/list-of-all-variable-definitions`
- International Financial Statistics databae IMF:
  `http://data.imf.org/?sk=5DABAFF2-C5AD-4D27-A175-1253419C02D1`
- Chinn-Ito Index (KAOPEN):
  `http://web.pdx.edu/~ito/Chinn-Ito_website.htm`
- Industrial Statistics database UNIDO:
  `http://www.unido.org/resources/statistics/statistical-databases/indstat2-2015-edition.html`

E. Additional tables

E.1. Natural Resources

Table 12: Natural Resources Intensive countries

Country	Average	Frequency	Percent
Azerbaijan	54.60	8	11.76
Cameroon	12.12	5	7.35
Ecuador	16.64	12	17.65
Egypt, Arab Rep.	23.9	2	2.94
India	10.91	1	1.47
Indonesia	14.38	9	13.24
Iran, Islamic Rep.	30.40	13	19.12
Malaysia	15.72	9	13.24
Norway	16.45	9	13.24

Natural Resources intensity defined as rents above 10 percent of GDP, where the sample average is 4.1 percent and the median value is only 0.95 percent. *Source:* Author's calculations and WDI from World Bank.

Table 13: Exclusion of Natural Resources Intensive Countries

	Dependent Variable: ln PMPKL					
	All countries		High Income		Low & Mid. Income	
	(1)	(2)	(3)	(4)	(5)	(6)
External dependence	-0.03	-1.69^{a}	0.38^{a}	-0.30	-0.35	-3.18^{a}
	(0.18)	(0.58)	(0.10)	(0.62)	(0.25)	(0.85)
Fin. Development		0.52^{a}	-0.04	0.14	0.07	1.22^{a}
		(0.16)	(0.04)	(0.17)	(0.05)	(0.35)
External dependence × Fin. Development		0.38^{a}		0.13		0.83^{a}
		(0.11)		(0.12)		(0.25)
Controls						
Natural resources rents	-0.02	-0.04^{c}	-0.03	-0.03	-0.06	-0.11^{c}
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.05)
Trade openness	0.12	0.12	0.10	0.11	0.05	0.06
	(0.20)	(0.18)	(0.12)	(0.13)	(0.25)	(0.21)
Chinn-Ito index	0.02	0.05	0.10	0.10	-0.08	-0.04
	(0.09)	(0.08)	(0.09)	(0.09)	(0.11)	(0.12)
Democracy accountability	0.02	0.02	0.04^{c}	0.03^{c}	-0.03	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Government Stability	-0.00	-0.00	0.01	0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Law and Order	0.03	0.02	0.01	0.01	0.09	0.08
	(0.03)	(0.03)	(0.02)	(0.02)	(0.06)	(0.05)
Internal Conflict	-0.00	0.00	-0.01	-0.01	-0.02	-0.02
	(0.02)	(0.02)	(0.01)	(0.01)	(0.03)	(0.03)
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	522	522	323	323	199	199
R^2	0.924	0.930	0.958	0.958	0.925	0.934

Standard errors in parentheses are clustered at the country level. Time-varying country level controls in logs, except dummies and PRS indexes. Fin. Development is the log of total private credit over GDP. Natural Resources intensity defined as rents above 10 percent of GDP. Countries excluded are listed in Table 12. ^{c} $p < 0.10$, ^{b} $p < 0.05$, ^{a} $p < 0.01$.

E.2. Alternative MPK measures

Table 14: Alternative MPK measures and Overall development

Dependent variable:	lnPMPKN		lnMPKN	
	(1)	(2)	(3)	(4)
External dependence	-0.21	-0.48^{b}	-0.22	-0.42^{c}
	(0.23)	(0.23)	(0.20)	(0.22)
Fin. Development	-0.01	-0.02	0.08^{c}	0.08^{c}
	(0.03)	(0.03)	(0.04)	(0.04)
$1[Dev_i = 1] \times$ External dependence		0.81^{a}		0.61^{b}
		(0.25)		(0.28)
Controls	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
Observations	590	590	590	590
R^2	0.925	0.934	0.879	0.885

Standard errors in parentheses are clustered at the country level. All regressions include country time-varying controls (all variables in logs except dummies and PRS indexes). Fin. Development is the log of total private credit over GDP. lnPMPKN is marginal product of capital corrected by relative capital prices but not accounting for the importance of non-reproducible capital (or natural capital) in total production, while lnMPKN does not account for any adjustment (i.e., neither for non-reproducible capital nor for relative capital prices). ^{c} $p < 0.10$, ^{b} $p < 0.05$, ^{a} $p < 0.01$.

Table 15: Alternative MPK (including the price-correction) and Fin. development

	Dependent Variable: ln PMPKN					
	All countries		High Income		Low & Mid. Income	
	(1)	(2)	(3)	(4)	(5)	(6)
External dependence	-0.21	-1.59[a]	0.32[a]	0.50	-0.41[c]	-1.93[a]
	(0.23)	(0.44)	(0.09)	(0.61)	(0.22)	(0.35)
Fin. Development	-0.01	0.48[a]	-0.06	-0.11	0.06	0.73[a]
	(0.03)	(0.13)	(0.05)	(0.18)	(0.05)	(0.15)
External dependence × Fin. Development		0.36[a]		-0.04		0.47[a]
		(0.09)		(0.12)		(0.09)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	590	590	332	332	258	258
R^2	0.925	0.935	0.936	0.936	0.920	0.930

Standard errors in parentheses are clustered at the country level. All regressions include country time-varying controls (all variables in logs except dummies and PRS indexes). Fin. Development is the log of total private credit over GDP. lnPMPKN is marginal product of capital corrected by relative capital prices but not accounting for the importance of non-reproducible capital (or natural capital) in total production. [c] $p < 0.10$, [b] $p < 0.05$, [a] $p < 0.01$.

Table 16: Alternative MPK (no corrections at all) and Fin. development

	Dependent Variable: ln MPKN					
	All countries		High Income		Low & Mid. Income	
	(1)	(2)	(3)	(4)	(5)	(6)
External dependence	-0.22	-1.21[b]	0.13	0.14	-0.39[c]	-1.35[b]
	(0.20)	(0.48)	(0.17)	(0.74)	(0.21)	(0.54)
Fin. Development	0.08[c]	0.44[a]	-0.04	-0.04	0.10	0.53[b]
	(0.04)	(0.15)	(0.05)	(0.18)	(0.06)	(0.25)
External dependence × Fin. Development		0.26[b]		-0.00		0.30[c]
		(0.10)		(0.13)		(0.15)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	590	590	332	332	258	258
R^2	0.879	0.885	0.858	0.858	0.890	0.894

Standard errors in parentheses are clustered at the country level. All regressions include country time-varying controls (all variables in logs except dummies and PRS indexes). Fin. Development is the log of total private credit over GDP. lnMPKN is the "naivest" measure of marginal product of capital, not adjusting for relative capital prices and not accounting for the importance of non-reproducible capital (or natural capital) in total production. [c] $p < 0.10$, [b] $p < 0.05$, [a] $p < 0.01$.